THIRD FIVE-YEAR REVIEW REPORT FOR MONSANTO CHEMICAL CO. (SODA SPRINGS PHOSPHOROUS PLANT) EPA ID: IDD08180994 SUPERFUND SITE CARIBOU COUNTY, IDAHO

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Executive Summary

Pursuant to the Comprehensive Environmental Response Compensation and Liability Act and the National Contingency Plan (NCP), the U.S. Environmental Protection Agency (EPA) has conducted the Third Five-Year Review for the Monsanto Chemical Company Phosphorous Plant (Monsanto Site) Superfund Site in Soda Springs, Idaho. The Five-Year Review was conducted to determine if human health and the environment are being protected through the implementation of the selected remedy.

The Monsanto Site is an operating elemental phosphorous plant located 1 mile north of Soda Springs in Caribou County, Idaho. It was placed on the National Priorities List on August 30, 1990, and a Record of Decision (ROD) was issued in April 1997. The contaminants of concern (COCs) identified in the ROD included radium-226 in soil, and fluoride, cadmium, manganese, nitrate, and selenium in groundwater.

The ROD selected the following remedies:

- Monitored Natural Attenuation (MNA) with Institutional Controls (ICs) for contaminated groundwater
- Either ICs or soil excavation on buffer properties not owned or controlled by Monsanto, at the discretion of the owner, for contaminated soils
- No Further Action (NFA) for operating area source piles and materials, subject to continued operations and ongoing Five-Year Reviews
- NFA for air, surface water, and sediments in Soda Creek

Previous site improvement actions prior to the signing of the ROD in 1997 for the Monsanto Site included the following:

- Removal of the Old Hydroclarifier suspected of impacting groundwater
- Replacing underground fuel storage tanks with aboveground tanks
- Abandoning wells that created hydraulic connection between upper and lower aquifers
- Decommissioning old Underflow Solids (UFS) Ponds including; removing contaminated soil, filling with molten slag, and sealing with a bentonite cap closing.
- Excavating, and sealing the Northwest Pond
- Installed wells around the Old Hydroclarifier

The Third Five-Year Review was conducted in accordance with *Comprehensive Five-Year Review Guidance (*EPA, 2001) and includes the following:

- Review of available Monsanto Site data in order to evaluate compliance with the MNA time frame specified by the ROD and the current arsenic maximum contaminant level (MCL).
- Review of federal and state regulations promulgated since the last (second) Five-Year Review that could affect the remedy's overall protectiveness with respect to performance standards specified in the ROD
- Interviews with Monsanto Site stakeholders to obtain their appraisal of how the remedy is performing and to identify concerns or suggestions of which EPA may not otherwise be aware.

The results of this Five-Year Review indicate that the remedial actions for the Monsanto Site were completed in accordance with the requirements of the ROD; however, the overall remedy is not performing as intended. The ROD anticipated that pumping the Monsanto plant's production wells would contain the contaminated groundwater plume, and MNA would restore groundwater quality. However, groundwater, surface water, soil, and sediment data collected since the last Five-Year Review indicate:

- Although concentrations of many of the COCs in groundwater have decreased from historical highs in the 1990s, several remain above their respective remediation goals (RGs) and will likely continue to exceed the RGs for the foreseeable future.
- Some of the COCs in groundwater have exhibited short-term increases and the 2012 Phase I of the source characterization study indicated that sources of COCs may remain on the Monsanto Site.
- Selenium does not appear to be attenuating in groundwater, and its plume in shallow groundwater has migrated past the property boundaries at levels above the RG. The downgradient extent of the groundwater selenium plume has not been defined, and may extend into areas where registered domestic wells exist.
- Selenium in surface waters of Soda and Mormon Creek in the Monsanto Site vicinity exceed State of Idaho Water Quality Standards for aquatic life.
- Soil Concentrations are below the RG in the non-IC properties surrounding the Plant.
- Contaminants such as arsenic, selenium, cadmium are in sediments in Soda Creek are substantially higher in reaches downstream from the Monsanto Property than they are upstream.
- The ROD did not identify possible domestic use of groundwater downgradient of the Monsanto Site. However, a recent review of records in the Idaho Department of Water Resources database revealed that registered and possibly unregistered private wells are located downgradient of Monsanto's current property boundary. It appears most residents are on city water, and wells in area immediately south of the Monsanto Site do not appear to be used for drinking water. However, the contaminated groundwater plume is poorly defined and it is unknown if there are potential risks to human health via registered or unregistered domestic wells.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Monsanto Chemical Co. (Soda Springs Plant)		
EPA ID: IDD081830994		
Region: 10	**State:** Idaho	**City/County:** Soda Springs/Caribou

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:**
Author name (Federal or State Project Manager): Mark Ader
Author affiliation: EPA Region 10
Review period: August 2008 – August 2013
Date of site inspection: Multiple dates
Type of review: Statutory
Review number: 3
Triggering action date: September 19, 2008 (Second Five-Year Review)
Due date *(five years after triggering action date)*: September 19, 2013

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
N/A

Issues and Recommendations Identified in the Five-Year Review:

OU(s): N/A	Issue Category: Remedy Performance
	Issue: Concentrations of COCs in groundwater, within the plant boundary, remain above RGs/MCLs, exceed RGs/MCLs in groundwater and surface water beyond the Monsanto property boundary, the nature and extent of groundwater plume(s) of site-related COCs are not well defined, and trends indicate that groundwater RGs will not be met in the 5- to 30-year time frame anticipated in the ROD.

	Recommendation: Define the full nature and extent of groundwater contamination by identified COCs by implementing a focused Remedial Investigation. When the Remedial Investigation is completed, execute a focused Feasibility Study to evaluate the current remedy and the need to add additional remedial actions to achieve RAOs. If necessary execute a ROD amendment or ESD to achieve RAOs. Continue monitoring groundwater and surface water annually to observe changes in COC concentrations.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA	9/30/2015

Issues and Recommendations Identified in the Five-Year Review:

OU(s): N/A	**Issue Category: Remedy Performance**			
	Issue: Registered and possibly unregistered domestic and irrigation wells downgradient of the Monsanto Site may be exposed to the COCs that exceed the RGs.			
	Recommendation Investigate current usage of registered/unregistered domestic wells downgradient of the Monsanto Site and the relationship to the fully defined groundwater plume(s). Develop an institutional control plan for areas where groundwater COC have migrated beyond current IC boundary.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA	7/01/2014

Issues and Recommendations Identified in the Five-Year Review:

OU(s): N/A	**Issue Category: Remedy Performance**			
	Issue: Potential sources of COCs to groundwater remain in the old UFS Ponds, UFS Piles, Northwest Pond, and Old Hydroclarifier Areas.			
	Recommendation: Conduct the next phase of the Source Characterization to evaluate current sources and update the conceptual site model to evaluate if current remedies are appropriate.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA	9/30/2015

Issues and Recommendations Identified in the Five-Year Review:

OU(s): N/A	**Issue Category: Remedy Performance**			
	Issue: Concentrations of contaminants in sediments in Soda Creek exhibit higher concentrations downstream of facility.			
	Recommendation: Continued monitoring of sediments to compare results against new sampling protocol and determine if remedial action may be needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA	8/01/2018

Sitewide Protectiveness Statement	
Protectiveness Determination: Not Protective	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedy for the Monsanto Site is currently not protective because concentrations of COCs in groundwater remain above MCLs and RGs, contaminated groundwater plumes above the MCLs and RGs extend beyond the IC boundaries, the contamination in groundwater plumes has not been fully characterized which poses risks to domestic wells downgradient of the Monsanto Site, and monitoring trends indicate that the groundwater performance standards will not be met in the foreseeable future. Contaminated groundwater appears to be impacting surface water and sediment in nearby creeks. In addition, sources on the Monsanto facility may be contributing to groundwater contamination.	

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Acronyms and Abbreviations

CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
COC	contaminant of concern
DEQ	Idaho Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
IC	Institutional Controls
IDWR	Idaho Department of Water Resources
LBZ	Lower Basalt Zone
MCL	maximum contaminant level
mg/L	milligrams per liter
MIS	multi-incremental sampling
MNA	Monitored Natural Attenuation
NCP	National Contingency Plan
NFA	No Further Action
NPL	National Priorities List
O&M	operation and maintenance
OU	Operable Unit
POC	point of compliance
RAO	remedial action objective
RG	remedial goals
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
SOP	standard operating procedure
Trust	Greenfield Environmental Multistate Trust, LLC
UBZ	Upper Basalt Zone
UFS ponds	underflow solids
WQS	water quality standards

1. Introduction

The purpose of this Five-Year Review is to assess whether the remedy at the Monsanto Chemical Company Superfund Site (Monsanto Site) is protective of human health and the environment. The methods, findings, and conclusions of this review are documented in this report. In addition, this report outlines issues identified during the review and recommended actions to address them (EPA, 2001).

This Five-Year Review report is prepared pursuant to Comprehensive Environmental Response and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

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

EPA interpreted this requirement further in the NCP. 40 CFR §300.430(f)(4)(ii) states:

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

This report documents the Third Five-Year Review of the remedial actions implemented at the Monsanto Site. This review was conducted for the entire Monsanto Site from March 2013 through June 2013 by EPA. The Idaho Department of Environmental Quality (DEQ) is a support agency for this site and was involved in the development of this report. CH2M HILL provided support to the EPA in the data analysis and overall evaluation of the remedy for this Five-Year Review.

This review is required by statute because hazardous substances, pollutants or contaminants remain onsite above levels that allow for unlimited use and unrestricted exposure. This review and future reviews will be used to evaluate whether the remedy remains protective of human health and the environment and whether additional remedial action is necessary and appropriate. The triggering action for this review was the completion of the second Five-Year Review which occurred on September 19, 2008.

2. Site Chronology

Table 1 presents a chronology of significant events related to the Monsanto Site.

TABLE 1
Chronology of Site Events

Monsanto Purchased the site and initiated elemental phosphorous production.	1952
Landowner immediately south of the former Monsanto Site boundary identified local groundwater impacts, most notably fluoride-related health problems in livestock drinking from nearby springs.	Early 1980s
Golder was employed to assess the impacts of past and current operations on groundwater and surface water quality and found elevated concentrations of several metals and ions.	1984
CERCLA site inspection found elevated levels of metals and ions, consistent with Golder's findings.	April 1988
EPA placed the Monsanto Site on the National Priorities List (NPL).	August 30, 1990
Administrative Order on Consent was issued by EPA and agreed to by Monsanto for the preparation and performance of a Remedial Investigation Feasibility Study (RI/FS).	March 19, 1991
The Remedial Investigation Feasibility Study was conducted.	March 1991 to November 1995
Monsanto sampled between 50 and 60 monitoring wells, offsite wells, and springs every 6 months as part of the remedial investigation/feasibility study (RI/FS) work plan.	1991 to 1998
EPA issued a Record of Decision (ROD) for the Monsanto Site that documents the selected remedy for environmental media affected by operations at the plant.	April 30, 1997
The United States entered a Consent Decree, CIV9800154-E-BLW, in Idaho District Court with Settling Defendants Monsanto Company and P4 Production L.L.C. (a Monsanto subsidiary), collectively "Monsanto" for implementation of the ROD.	June 29, 1998
Wells and springs sampled annually as part of remediation monitoring.	1998 to present
Preliminary Close-out Report	September 20, 2000
First Five-Year Review completed.	September 30, 2003
Four additional groundwater wells installed south of the Monsanto Site.	June 2007
Second Five-Year Review completed.	September 19, 2008
Eight additional monitoring wells installed at EPA's request on south and west sides of Monsanto Site.	June-August 2011

TABLE 1
Chronology of Site Events

Offsite Multi-Incremental Sampling (MIS) of soil conducted for Third Five-Year Review.	October 2011 and July 2012
MIS Sediment Sampling was conducted for Third Five-Year Review.	October 2011 and July 2012

3. Background

The following sections present a brief overview of specific physical characteristics, land and resource use, history of contamination, and the basis for action for the Monsanto Site.

3.1 Physical Characteristics

The Monsanto Site is located in Caribou County, Idaho, approximately 1 mile north of the city of Soda Springs (Figure 1—all figures are included at the end of this report). P4 Productions, LLC, was formed by Monsanto to own and operate Monsanto's elemental phosphorus plant at this location after Monsanto entered into the June 1998 Consent Decree with the United States to implement the ROD. The Monsanto Site is comprised of approximately 800 total acres that include the 540-acre operating area and an additional approximately 260 acres of buffer area owned partly by Monsanto and partly by various farmers. The buffer area contains contaminants of concern (COCs) in surface soils from Monsanto Site operations and is therefore part of the Monsanto Site (defined by the extent of contamination). The Monsanto Site is subject to Institutional Controls (ICs) required by the 1997 ROD and 1998 Consent Decree. ICs are non-engineered instruments (for example, administrative and legal controls) that help to minimize the potential for human exposure to contamination and/or protect the integrity of a remedy.

The Monsanto Site is located at approximately 6,000 feet above mean sea level in elevation, within a tributary valley to the Bear River that is drained by Soda Creek. The valley is bordered by northwest-trending mountain ranges reaching approximately 8,000 feet above mean sea level in elevation. The valley is bordered by the Blackfoot Lava Field to the north, the Soda Hills on the west, and the Aspen Range on the east. Surface drainage in the valley is predominantly to the south. The closest surface water body is Soda Creek, located approximately 2,000 feet west of the facility. Soda Creek flows south until it discharges in Alexander Reservoir just west of the city of Soda Springs. The major river in the vicinity is the Bear River, located approximately 2 miles south southwest of the Monsanto Site. The Bear River also flows into Alexander Reservoir.

The regional groundwater flow is generally north to south. Groundwater is found within two primary hydrostratigraphic zones beneath the Monsanto Site, known as the Upper Basalt Zone (UBZ) and the Lower Basalt Zone (LBZ). Each of the two zones has been broken down into four subsections based on hydrogeological controls and groundwater quality (UBZ-1 through 4 and LBZ-1 through 4). Groundwater contamination plumes are within the UBZ at two to three operating area locations, depending on the COC, and generally migrate to the south. Natural springs are important hydrologic features of the basin, and emerge at several locations to the ground surface as result of discharge from the underlying groundwater aquifer.

The ROD specified that no floodplain zones, endangered species, or historical or archeological sites are known to exist in the immediate vicinity of the Monsanto Site. A review of current information from the Idaho Fish and Wildlife Office identified that the Canada Lynx is the only species on the threatened list for Caribou County.

3.2 Land and Resource Use

The town of Soda Springs has a population of 3,058 (U.S. Census Bureau 2013 http://www.census.gov/). Land use within the city limits is mostly residential with some commercial, agriculture, and light industrial zones.

The area north of Soda Springs is primarily rural in nature, although a light and heavy industrial zone extends from the north end of the city along State Highway 34 towards the Monsanto Site (Figure 1). The Monsanto Site includes agricultural land to the north, south and southwest of the operating area and is

surrounded by open agricultural land and rangelands. However, directly across State Route 34 to the east is the Kerr-McGee Chemical Corporation (Kerr-McGee) Superfund Site which formerly operated as a vanadium processing plant.

Monsanto has approximately 360 employees and approximately 100 contract employees working at the facility. Land use within the fenced operating area was agricultural before the plant was built, has been industrial since, and reasonably anticipated future land use is expected to remain industrial.

Significant groundwater resources lie underneath the broad valley where both the Monsanto Site and the city of Soda Springs are located. Groundwater extracted by four onsite production wells provides the process water for operations at the Monsanto Site. Groundwater is also the main source of drinking water for the area, with Foundation Spring and Lower Ledger Spring serving as the sources of drinking water for the City of Soda Springs. Formation Spring is located northeast of the Monsanto Site and Upper and Lower Ledger Springs are located to the southeast of the Monsanto Site. Groundwater beneath the Monsanto Site generally flows south- to southwesterly toward Soda Springs.

One private well, the Lewis well, is located on a property that does not have soil contamination or established ICs. The Lewis residence was connected to the city water supply on August 5, 1991. Since being connected to the city water supply, the well use has reportedly been limited to livestock watering, irrigation and is a monitoring well for the Monsanto Site annual groundwater sampling. The COC concentrations for this well are discussed in Section 6.4.1. These limitations remain wholly voluntary in the absence of an enforceable IC.

The ROD indicated that no wells downgradient of the Monsanto Site are currently used for drinking water purposes. Additionally, according to Idaho Department of Water Resources (IDWR) databases, a number of other water wells may be located downgradient of the Monsanto Site and outside areas subject to established ICs. These include monitoring wells, domestic wells, and industrial wells. More details and principal uses of these wells are discussed in Section 6.4.5.

3.3 History of Contamination

Monsanto purchased the property in 1952 to use local phosphate-rich ore to manufacture elemental phosphorus. It also operates local mines that supply the plant. In 1984, Monsanto hired Golder Associates, Inc. (Golder) to characterize groundwater impacts from past and current operations after a landowner immediately south of the Monsanto Site complained that livestock drinking water from several nearby springs experienced problems related to excess fluoride exposure.

The pre-CERCLA investigation showed that groundwater under the Monsanto Site contained elevated levels (above maximum contaminant levels [MCLs]) of fluoride, cadmium, and selenium. Monsanto concluded that the UFS Pond, Northwest Pond, Old Hydroclarifier, and intermediate processing steps in the elemental phosphorous production process were leaking the COCs into the subsurface soil and underlying groundwater system.

Across State Route 34 to the east of the Monsanto Site, Kerr- McGee formerly owned and operated a vanadium production facility beginning in 1964. The Kerr-McGee Site was placed on the NPL on October 4, 1989. Groundwater contamination from the Kerr-McGee Site (specifically molybdenum) extends onto the southeast portion of the Monsanto Site. This plume still exists and is subject to ongoing investigation and follow-up by EPA under a separate ROD. A third Five-Year Review for the Kerr-McGee Site recently deferred a protectiveness finding pending further sampling of rising levels of some COCs in the Kerr-McGee plume. Like the Monsanto Site, MNA was the selected groundwater remedy for the Kerr-McGee Site. In 2006, Kerr-McGee reincorporated as Tronox, Inc. and subsequently filed for Chapter 11 bankruptcy in 2009. In 2011, the ownership and responsibility for the Kerr-McGee (Tronox) property was transferred to the Greenfield Environmental Multistate Trust LLC (Trust) as part of the bankruptcy settlement. The Kerr-McGee (Tronox) property is currently owned and maintained by the

Trust for the benefit of the United States and the State of Idaho. The Trust is responsible for activities related to the Kerr McGee Site.

3.4 Initial Response

In 1987, EPA sampled and found elevated levels of fluoride, cadmium, selenium, and sulfate in monitoring and production wells at the Monsanto Site. Due largely to potential human health and environmental exposures from contaminated groundwater flowing south from the Monsanto Site towards Soda Springs, and due also to documented environmental and likely human exposures to excess fluoride from at least one local well, EPA proposed and listed the Monsanto Site on the NPL.

Prior to implementing the remedial action selected in the 1997 ROD, site improvements to reduce the threats to groundwater were conducted and included the following (Golder, 2008):

- **August 1985.** Removal of Old Hydroclarifier suspected of impacting groundwater and replacement with a new unit.
- **1986.** Replaced four underground fuel storage tanks with above-ground tanks equipped with concrete sumps.
- **1987.** Abandoned four of the original monitoring wells (TW-3, 4, 5, and 6) that created hydraulic connection between upper and lower aquifers.
- **1983 to 1988.** Took the old Underflow Solids (UFS) Ponds out of service, removed contaminated soil, backfilled, then filled with molten slag and sealed with a bentonite cap.
- **1988.** Closed and excavated the Northwest Pond, and sealed the bottom with bentonite. This area is permitted by the DEQ to receive plant sanitary solid waste.
- **1985 to 1989.** Installed recovery wells around the Old Hydroclarifier and used these to intercept contaminated groundwater. The groundwater was pumped into the new hydroclarifier between 1985 and 1989. The pumping ceased in the spring of 1989 was never resumed.
- **1993.** Connected plant sewage evaporation ponds to municipal wastewater system, and closed the ponds in 1995.

3.5 Basis for Taking Action

Pursuant to a March 19, 1991, Administrative Order on Consent issued by EPA, Monsanto completed an RI/FS under EPA oversight between March 1991 and April 1996. Investigations covered groundwater, soil, source materials, surface water, air, biota, and sediments. Based on exceedances of EPA risk screening criteria, COCs were identified. Sixty monitoring wells, 18 spring locations, numerous offsite soil sites, and sediment locations from Soda Creek and Alexander Reservoir were sampled.

The list of potential exposure concerns identified during the RI/FS included the following:

- Radionuclide (radium-226) exposures from slag and source materials in the operating area, primarily to Monsanto employees
- Potential residential exposures to metals (arsenic and beryllium) and radionuclides in groundwater, soil, and air immediately outside the operating area if future residential development were not controlled, specifically along the southern and northern Monsanto plant fencelines
- Potential exposures to other hazardous substances in soil inside the operating area to current and future workers
- Groundwater threats to the city of Soda Springs water supply

- Surface water discharges to Soda Creek

At the conclusion of the RI/FS, the first three concerns listed above provided the basis for the remedial action developed for the Monsanto Site. The last two concerns were carried through the RI/ FS, but EPA concluded in its ROD that remedial action was not necessary to address them.

4. Remedial Actions

This section describes the Remedial Actions including remedial action objectives (RAOs) selected in the ROD and information about remedy implementation, and operations and maintenance (O&M).

4.1 Remedial Action Objectives

The RAOs for the Monsanto Site are as follows:

- The ultimate goal is to ensure that groundwater contamination sources have been eliminated and that natural attenuation will eventually (within 5 to 30 years) restore the groundwater aquifers affected by past releases from Site.
- Prevent human ingestion of, inhalation of, or direct contact with groundwater at levels exceeding the MCLs for cadmium, fluoride, manganese, nitrate, and selenium.
- Prevent external exposure to radionuclides in soils at levels that pose cumulative estimated risks above 3×10^{-4}, corresponding to a dose equivalent of approximately 15 millirems per year.
- Prevent the ingestion or inhalation of soils containing radionuclides at levels posing cumulative estimated risks exceeding $3 \times 10^{-4,}$ or metals (arsenic, beryllium) at levels posing cumulative estimated carcinogenic risks exceeding 1×10^{-5}.

4.2 Remedy Selection

The EPA signed the Record of Decision (ROD) for the Monsanto Site on April 30, 1997. The ROD identified the potential COCs for soil and sediment as well as COCs for groundwater based on exceedances of EPA risk-screening criteria, and documented the selected remedy for environmental media affected by operations at the plant (EPA, 1997). The remedy addressed the multiple pathways of concern: groundwater, soils, and source piles, air, surface water, and sediments. The major components of the selected remedy are described in the following text.

4.2.1 Groundwater

The selected remedy for groundwater was monitored natural attenuation (MNA) with ICs to prevent use of contaminated groundwater for drinking purposes, until such time as cadmium, fluoride, selenium, nitrate, and manganese concentrations in groundwater decline to below the MCLs or risk-based concentrations for those substances. Example ICs include legally enforceable prohibition on drinking water wells in the affected area to prevent human exposure. Except for the annual monitoring of groundwater, springs, and the discharge outfall, no further action was deemed necessary because [at the time] there were no drinking water users of the affected groundwater and because the combination of past remediation actions and natural attenuation was predicted to restore groundwater to levels that would allow for unrestricted use and exposure within 30 years.

The ROD established groundwater remedial goals (RGs) for the COCs. These are the MCLs under the Safe Drinking Water Act for cadmium, fluoride, nitrate, and selenium, and a risk-based concentration for manganese. Table 2 provides a summary of RGs. The ROD also established the points of compliance for RG goal monitoring. Figure 2 shows the locations of groundwater monitoring wells and springs at the Monsanto Site and in the vicinity.

The ROD established points of compliance (POC) for groundwater RG monitoring. The POC for groundwater monitoring included the following:

- Soda Creek
- South Monsanto facility fenceline monitoring Wells TW-19, 34, 35, and 29

- Southern Monsanto Site boundary monitoring Wells TW-53, 54, 55, and the Harris Well
- Monsanto Site production wells PW-01, PW-02, and PW-03.

Since the 1997 ROD, Golder (2008) identified two modifications for POC wells at the south Monsanto facility fenceline, as follows:

- Well TW-19 was replaced with TW-20 because of low water productivity at TW-19
- Well TW-29 was replaced with Well TW-39 because the initial listing of TW-29 was found to be a typographical error.

These modifications were instituted 2008. Furthermore, Mormon A Spring has been identified as an alternate groundwater POC for the Harris Well because some uncertainty exists regarding this well's construction details within the UBZ. The groundwater monitoring POC well locations are included on Figure 2.

4.2.2 Offsite Soils

The ROD specifies the offsite soil sampling be conducted at least every five years to determine the concentration of COCs for that year, and to verify that source control is effectively preventing spread of Monsanto Site contaminants and/or recontamination of offsite soils.

Upon receipt of results from the Five-Year Review offsite soil sampling programs, a title search or equivalent will be conducted to verify that any property parcels with soil concentration greater than the RG for offsite soils are under IC, if applicable. If such properties are present that are not covered by existing ICs, then action will be taken to implement the selected soil remedy for that property. The ROD states that the selected remedy for offsite soils containing radium-226 above the RG is an election of the affected property owners to have their property either (1) cleaned via excavation, containment, and replacement of contaminated soils (none of the property owners elected this option), or (2) rendered under an IC in the form of an environmental easement placed in their deed to prevent residential uses.

4.2.3 Source Piles

The ROD concluded that no further action was necessary for source piles and materials under CERCLA.

4.2.4 Air

The ROD concluded that no further action was necessary for air under CERCLA.

4.2.5 Sediments

The ROD did not specify a remedy for sediments. The ROD specifies that sediment samples should be collected to support the Five-Year Review to determine whether the constituent concentrations in Soda Creek sediments are increasing, decreasing (as predicted), or remaining stable. Thus, sediment sampling is required every five years.

4.2.6 Surface Water

No surface water remediation goals were established under the ROD (EPA, 1997). Several sample locations were established to monitor and evaluate discharges of groundwater to surface water (Soda Creek) and effects of discharges on surface water quality. These locations are not POC locations, but are used to evaluate water quality in Soda Creek. The State of Idaho Surface Water Cold Water Standard (IDAPA 58.02.01) has been in the Idaho rules, by reference to the NTR (National Toxics Rule, 40 CFR 131.36), since 1994. To further evaluate downstream concentrations of selenium in Soda Creek, five additional surface water sampling stations were established in May 2010, and three additional surface water sampling points were established in May 2011. Therefore, at this time, water quality in Soda Creek is monitored downstream all the way to US Highway 30, approximately 2 miles of stream length.

TABLE 2
Groundwater Remediation Goals for the Monsanto Site

Parameter	Remediation Goal (mg/L)	Regulatory Source
Cadmium	0.005	MCL
Fluoride	4	MCL
Nitrate as NO_3/nitrate as N	44/10	MCL
Selenium	0.05	MCL
Manganese	0.18	Risk-Based Concentration
Surface Water Cold Water Standards (IDAPA 58.02.01, 2004)*		
Selenium	0.005	State of Idaho, Water Quality Standard (Chronic Criteria Concentration)

- Selenium no ev

4.3 Remedy Implementation

Monsanto is conducting long-term operation and maintenance (O&M) which consists primarily of monitoring activities at the Monsanto Site. These activities consist of the following:

- Water Quality Monitoring
  - Execution of annual groundwater, springs, and Soda Creek surface water quality monitoring to assess the extent of contamination relative to applicable regulatory levels, remediation goals, groundwater plume boundaries with respect to RGs selected for the Monsanto Site, RAOs, and groundwater MNA modeling projections.
  - Assessment of contaminant trends in groundwater and surface water to determine if COCs levels are declining at an acceptable rate. Evaluate the need for additional groundwater modeling and remedial actions if actual groundwater recovery appears to significantly differ from model projections.
  - Ensure ICs remain in place and are effective.
- Sediments
  - Collection of sediment samples every five years to support each Five-Year Review assessment of whether sediment contaminant concentrations are stable or declining as predicted.
- Soils
  - Collecting offsite soils every five years to support each Five-Year Review to:
    - Assess the concentrations of COCs in soils,
    - Verify that source controls are effectively preventing further spread of Monsanto Site contaminants, and
    - Evaluate need to implement additional ICs or removal actions and identify possible recontamination of soils from source areas or spread to additional areas through ground disturbance and airborne dispersal.

  - Confirming that ICs are in place for all soil grids surrounding the Monsanto Site that contain ^{226}Ra concentrations greater than the remediation goal of 3.7 picoCuries per gram and 15 millirems per year for radionuclides at the Monsanto Site, based on a statistically valid sampling program.
  - Submitting reports every five years to the EPA on contaminated soil outside the Monsanto Site boundary. All property owners elected to have ICs placed over the option of soil excavation and disposal.
- Maintenance and Operation
  - Verifying that facility operations continue to be in compliance with environmental and worker health and safety requirements so that potential releases and exposures remain adequately controlled, and the remedy remains effective. Evaluate dust control efforts and land-use restrictions, and assess if there are plans for plant closure in the foreseeable future

5. Progress Since Last Five-Year Review

The second Five-Year Review was completed in 2008. Section 5.1 summarizes the findings of the 2008 Five-Year Review. Section 5.2 describes the actions taken since the 2008 Five-Year Review was completed.

5.1 2008 Second Five-Year Review Summary of Findings

The 2008 Five-Year Review Report stated that the remedy was not generally functioning as intended by the ROD. Monitoring of the groundwater revealed that the risk-based groundwater RGs and MCLs were not being met for selenium, nitrate, and cadmium and noted the increasing trend of selenium. The increasing trend raised questions about the performance of MNA as a remedy for groundwater and whether it would meet standards in a reasonable period of time. Levels of selenium measured in area springs also exceeded surface water standards. Table 3 describes issues and recommendations identified in the 2008 Five-Year Review Report. A determination of the protectiveness of the remedy was deferred and stated:

> "A protectiveness determination cannot be made at this time for the Monsanto Site until further information is obtained. Further information will be obtained by evaluating:
>
> - Selenium levels in downgradient surface water
> - Surface water characteristics and aquatic life
> - Applicability of a surface water selenium standard
> - The ability of and time frame for current remedies to achieve standards"

In addition to the "protectiveness deferred" statement, the 2008 Five-Year review included the following three determinations:

- **Human Exposure Environmental Indicator Status.** The Site remains "Under Control" because exposures that could pose an unacceptable risk are being controlled through ICs on surrounding properties and through compliance with OSHA worker health and safety requirements at the operating facility.
- **Groundwater Migration Environmental Indicator Status.** The Site was considered "Under Control" because exposures that could pose an unacceptable risk are being controlled through continued pumping of the four Monsanto production wells, and some natural attenuation is occurring.
- **Cross Program Revitalization Measure Status.** The Site is considered "protective for people under current conditions" because of ICs on surrounding properties and through compliance with OSHA worker health and safety requirements at the operating facility, and the Monsanto Site is in use as an operating industrial facility.

5.2 Actions taken Since 2008 Second Five-Year Review

Table 3 summarizes the actions taken in response to the recommendations/follow-up actions identified in the 2008 Five-Year Review. In addition, recommended actions were identified during review of 2009-2011 annual surface water and groundwater reports provided by Monsanto.

TABLE 3
Actions Taken Since Last Five-Year Review

Issues from Previous Review	Recommendations/Follow-up Action from Second Five-Year Review	Milestone Dates and Responsibility	Outcome
Levels of selenium measured in area springs (Mormon A, Calf, Southwest, and Homestead) exceed the State of Idaho's water quality standards for selenium for protection of cold water aquatic life which was not in the ROD; need more information to determine if standard would be applicable and how it affects protectiveness.	Evaluate and determine the applicability and impact of the State of Idaho's water quality standards for selenium and assess what, if any, changes need to be made to the cleanup goals and/or the selected remedy. To address this, EPA needs further information about selenium levels in downgradient surface water, surface water characteristics and aquatic life and the requirements of the standard If after completing the above action a new standard for surface water needs to be adopted, further evaluation will be needed to determine whether the groundwater remedy can address the selenium in surface water in a reasonable time frame, to identify and evaluate other remedial alternatives and identify options to provide protectiveness in the interim.	For first recommendation; June 2009 (Monsanto with EPA oversight) For second recommendation; if necessary, December 2009 (Monsanto with EPA oversight)	• Continued annual monitoring of springs and surface water in Mormon Creek and Soda Creek • Monsanto added five new surface water sampling stations in May 2010 to evaluate surface water quality in Soda Creek downstream from the Monsanto Site • Monsanto added three surface water sampling stations in May 2011 to evaluate surface water quality in Soda Creek all the way to US Highway 30, near Alexander Reservoir • In 2011, Monsanto installed downgradient monitoring Wells TW-63 through TW-70 to better understand relationship between groundwater and the springs that feed the creeks. • No changes to cleanup goals or selected remedy. In 2012, selenium concentrations in Soda Creek downstream from the Monsanto Site and downstream from the flow-diverted reach were below the Idaho surface water standard. • Because the flow-diverted reach of Soda Creek is fed primarily by springs that discharge impacted groundwater, a remedy revision via an ESD or ROD amendment for groundwater that reduces selenium to acceptable levels should improve surface water quality in the flow-impaired reach of Soda Creek.

TABLE 3
Actions Taken Since Last Five-Year Review

Issues from Previous Review	Recommendations/Follow-up Action from Second Five-Year Review	Milestone Dates and Responsibility	Outcome
Selenium and other COC concentrations are increasing in some groundwater wells and springs, which calls into question whether the MNA remedy will achieve cleanup goals throughout the Monsanto Site in a reasonable time frame.	MNA effectiveness should continue to be evaluated over the next five years, and if not effective, additional remedial actions need to be evaluated	2012, during next Five-Year Review sampling event, (Monsanto with EPA oversight)	• Continued monitoring groundwater, and extended the groundwater monitoring well network with eight new wells in 2011. The new wells indicated expanded contaminant plumes and selenium concentrations above the RGs migrating past the Monsanto Site boundary. • Conducted Phase I of a Source Area Characterization in 2012 concluded that sources of contaminants could remain. • EPA anticipates negotiating an Administrative Settlement Agreement and Order for a supplemental focused remedial investigation and feasibility study to address the groundwater contamination issues. Based on EPA Project Manager discussions with Monsanto, Monsanto is anticipated to be receptive. Negotiations are anticipated this year.
Wind dispersal of dust and particulates may be contributing to offsite contamination.	Implement EPA-approved standard operating procedure (SOP) for wind dispersal prevention	June 2009 (Monsanto with EPA oversight)	EPA approved Wind Dispersal SOP which has been implemented at the Monsanto Site since approval.
Wind dispersal of dust and particulates may be contributing to offsite contamination.	Using soil sampling data from surrounding properties, evaluate effectiveness of wind dispersal prevention plan	September 2013 (Monsanto with EPA oversight)	Soil concentrations is either below RGs in offsite soils, or affected parcels are subject to ICs.

6. Five-Year Review Process

Section 6 addresses the activities completed as part of this Five-Year Review.

6.1 Administrative Components

This Five-Year Review was conducted by EPA Region 10 staff with the assistance of CH2M HILL under EPA Contract 68-S7-04-01, Task Order 0060, and by representatives from DEQ. The review was conducted consistent with EPA's Comprehensive Five-Year Review Guidance (EPA, 2001). The evaluation was performed between March and June, 2013.

6.2 Community Notification and Involvement

Monsanto was notified of the initiation of the Five-Year Review in early January, 2013. A notice was posted in the Caribou County Sun on January 31, 2013. This community notification solicited public comments related to the performance of the remedy for the Monsanto Site. EPA received no responses from the public or any other entity. A copy of the community notification is included in Appendix A.

6.3 Supporting Documents

A review of data reports pertinent to the Third Five-Year Review includes the following documents:

- Record of Decision, Monsanto Chemical Co. (Soda Springs Plant (EPA, 1997)
- Review of Technical Memorandum: Evaluation of Natural Attenuation Controls - Monsanto Soda Springs Site (CH2M HILL, 2009)
- Annual Groundwater and Surface Water Summary Reports (Golder 2009, 2010, 2012f, 2012g)
- Draft Soil Report, Third CERCLA Five-Year Review (2012b)
- Soda Creek Sediment Sampling and Analysis, Third CERCLA Five-Year Review (Golder, 2012d)
- Source Area Characterization – UBZ-2, Monsanto Soda Springs Idaho Plant (Golder, 2012e)

The entire list of documents reviewed for this report is listed in Appendix B.

6.4 Data Review

Groundwater, surface water, soils, and sediment data trends pertinent to this Five-Year Review period are discussed in the following text. COCs for the Monsanto Site include cadmium, fluoride, nitrate, manganese, and selenium. Other constituents that are monitored in the groundwater include chloride, molybdenum and sulfate.

Table 2 lists the ROD RGs for groundwater. No surface water RGs were established under the ROD. However, a State of Idaho Cold Water Standard for selenium was established in 1994 by reference to the National Toxics Rule (Table 2). Figures 2 and 3 show the locations of ground water monitoring wells, groundwater flow directions, springs, and surface water sampling locations. Discussions of individual COC trends in each media are provided in the following sections. Figures and tables, adapted from data reports prepared by Golder, are included to illustrate data trends.

6.4.1 Groundwater Quality Trends

In accordance with the 1997 ROD, "If groundwater recovery appears to significantly differ from model(ed) projections, the model and the need for additional groundwater remedial actions should be re-evaluated."

Overall, groundwater concentrations of COCs decreased at most monitoring locations during the period immediately following the implementation of the remedial actions in the mid-1980s and early 1990s. However, in several cases, the downward trends have stabilized at concentrations above RGs, and, therefore, have not achieved the MNA predictions anticipated in the ROD. At some locations, concentrations of COCs have been increasing near and downgradient from source areas over recent years.

Based on long-term monitoring, COC concentrations in the underlying LBZ aquifers are generally stable and below RGs indicating that the deeper groundwater is currently not significantly impacted by source areas at the Monsanto Site. However, COC concentrations in the shallow UBZ aquifers exhibit exceedances of the RGs. Therefore, the following discussion is limited to potential impacts to the UBZ aquifers based on data collected from monitoring wells located in UBZ-1 and 2, and UBZ-4.

6.4.1.1 UBZ-1 and 2 Area

Distribution. The suspected primary source area for the UBZ-1 and 2 groundwater plume is the old UFS Ponds (Figure 2). COCs in the UFS groundwater plume include cadmium, fluoride, manganese, nitrate, and selenium. This plume also contains the non-COC indicator monitored analytes chloride, molybdenum and sulfate. The 2012 distributions of each of these groundwater constituents are illustrated in Figures 4, 5, 6, 7, 8, 9, 10, 11, and 12, respectively. Figures 13 through 22 depict the time-history concentrations, including the maximum concentrations and trends at key monitoring well locations. Tables 4 and 5 provide a summary of constituent concentration trends.

In general, the groundwater plume in UBZ-1 and 2 from the old UFS Ponds travels toward the south, consistent with the general direction of groundwater flow at the Monsanto Site. However, the downgradient extent of each constituent varies as a result of varying mobilization and transport mechanisms, such as source intensity and subsurface geochemical/retardation processes, and also possible structural controls such as faulting of the basalt flows.

Figure 8 indicates that selenium is the only COC emanating from the old UFS Pond source area that exceeds its corresponding RG outside of the southern Monsanto property boundary at TW-65 with a concentration of 0.068 mg/L. It is unknown how far beyond this boundary that selenium exceeds its RG. The distribution of molybdenum as shown in Figure 10 indicates the southern extent of the molybdenum plume may be associated with the release from the Kerr-McGee Site rather than Monsanto's old UFS Pond source area.

Figures 5 and 7 indicate that two COCs, fluoride and nitrate, exceed their groundwater RGs outside of the south Monsanto facility fenceline and south boundary POC monitoring locations, but not outside of the IC boundary. In 2012, the fluoride concentration in TW-39 was 4.06 mg/L, and the nitrate concentrations are 12.0 and 9.99 mg/L at TW-63 and TW-64, which is possibly attributable to the agricultural activities in the area. Additionally, one indicator non-COC groundwater constituent from the old UFS Pond source area (sulfate) exceeds its background concentration beyond these POC locations. The remaining two COCs, cadmium does not significantly extend beyond the Monsanto Site POC wells (Figure 4) and manganese is not detected in the POC wells (Figure 6)..

Figures 8 and 12 show the interpreted configuration of the selenium plume in 2012 and 2002, respectively. The early definition of this plume has expanded over the years using data from the 2007 and 2011 addition of several downgradient monitoring wells. It is unknown if the extent of the plume has changed over these years, only that successive expansions of the groundwater monitoring network has consistently shown that the plume is not fully characterized. Based on available data, the plume is at least 2 miles long and the southern extent of this plume has not been fully delineated. The plume has migrated southward past the southern IC boundary and property line within the UBZ-1 and 2 aquifer(s), and concentrations of selenium are increasing or are currently stable above RGs in the many downgradient UBZ-1 and 2 monitoring locations (see Figures 15, 17, 20 and 21). This plume appears to be following a

southerly preferential flow path in the gamma 3, 4 and 5 zones, the three shallowest water-bearing zones beneath the Monsanto Site.

In addition, a geologic displacement, known as the Subsidiary Fault was originally interpreted by Monsanto to be a hydraulic barrier that would prevent the migration of COCs from UBZ-2 to UBZ-1 north of the fenceline along the south side of the plant. However, water quality data collected from wells installed in 2011 and from the springs in UBZ-1 indicate that migration of COCs in groundwater does occur across this fault toward the west and southwest. For example, cadmium has been detected at a concentration of 0.127 mg/L, far above the RG of 0.005 mg/L in 2011 in Well TW-69; Well TW-69 is a new well (not a POC) located in UBZ-1. These data clearly indicate that cadmium has migrated across the Subsidiary Fault into the UBZ-1 illustrating that the fault is at least a leaky boundary.

Source Area Trends. Table 4 shows the long-term and short-term concentration trends for all of the constituents. The UBZ-1 and 2 source area wells downgradient of the old UFS ponds are TW-22, TW-24, and TW-37. The constituents of particular concern in the source area wells are highlighted on Table 4 and are described in more detail in the following text.

The COCs fluoride, manganese, and nitrate in the source area wells generally exhibit stable to decreasing trends. However, in 2012, fluoride and manganese persisted above their respective RGs in each of the three source area wells, whereas, nitrate was below its RG. Nonetheless, the overall trend for these three COCs is that they are attenuating in the vicinity of the old UFS Pond source area.

Figure 13 shows the time-history concentration of selenium in the old UFS Pond source area wells (TW-22, TW-24, and TW-37). The selenium trend is relatively stable with small fluctuations since 2007 well above the RG of 0.05 mg/L in Wells TW-22 and TW-37. TW-24 exhibits an increasing trend since 2006 and concentrations have remained above RG since monitoring began which indicates that an active selenium source(s) likely exists. In 2012, selenium exceeded the RG of 0.05 mg/L in source area Wells TW-22, TW-24, and TW-37 at concentrations of 0.13 mg/L, 0.275 mg/L, and 0.206 mg/L, respectively. Selenium does not appear to be attenuating in these source area wells.

Figure 14 shows that after initially declining, in the past 10 years cadmium has clearly exhibited an increasing concentration trend in source area Well TW-37. In addition, Well TW-24 is generally stable or may be increasing in cadmium. In 2012, cadmium exceeded the RG of 0.005 mg/L in TW-37 and TW-24 at concentrations of 0.626 mg/L and 0.303 mg/L, respectively. Cadmium does not appear to be attenuating in these source area wells.

Downgradient Trends. The following discussion focuses on COC trends in three groupings of downgradient monitoring locations to the south: the Monsanto plant's south fenceline, the southern Monsanto property boundary, and south of the southern property boundary. Each grouping represents groundwater conditions progressively downgradient and further away from the old UFS Ponds source area. Tables 4 and 5 show the long-term and short-term trends for constituents in downgradient UBZ-1 and 2 POC wells, Soda Creek, and other downgradient monitoring locations, respectively. The constituents of particular concern based on apparent increasing trends are highlighted in these tables.

Of particular concern is elevated selenium at several downgradient UBZ-1 and 2 monitoring locations. Data indicate that selenium exceeds RGs and is increasing at several downgradient POC and other monitoring locations in both UBZ-1 and UBZ-2.

Figure 15 shows the time-history concentration of selenium (including the most recent 2012 data) near the south Monsanto plant fenceline for downgradient POC wells TW-20 and TW-39 and non-POC southwest corner downgradient well TW-10. Selenium concentrations have typically exceeded the selenium RG of 0.05 mg/L in each of these wells since 1991 and are presently increasing in TW-10 and TW-39 to concentrations of 0.34 and 0.41 mg/L, respectively. At TW-20, selenium concentrations are highly variable, but continue to exceed the selenium RG since 1991 with a 2012 concentration of 0.112 mg/L.

At Wells TW-10, TW-20, and TW-39, the selenium concentrations appear to come in “pulses” suggesting climate (precipitation) or groundwater flow patterns of the Monsanto plant’s production wells may play a role in ongoing selenium releases and transport. Selenium concentrations in the other two south Monsanto plant fenceline POC wells, TW-34 and TW-35, appear to be stable below the selenium RG (graphs not included, see Golder, 2012g). These wells are located deeper within the UBZ-2 aquifer and are considered to be transitory between the UBZ-LBZ aquifers (Golder, 2012g), which probably explains why selenium is not significantly elevated in these two wells. Overall, these data indicate that selenium is not attenuating at the south Monsanto plant fenceline. In addition, cadmium concentrations have persisted above the cadmium RG since 1985 in south Monsanto plant fenceline POC Well TW-39 and have been increasing since 2007 to a concentration of 0.021 mg/L (Figure 16) indicating that cadmium is not attenuating at this POC location.

Figures 17 and 18 show time-history concentration graphs of selenium south of the south Monsanto plant fenceline in down-gradient groundwater POC monitoring locations at TW-53, TW-54, TW-55, Harris Well, and Mormon A Spring and non-POC sample locations at Mormon Creek and Mormon B and C Springs (the springs discharge groundwater from the UBZ-1 and 2 aquifers, thus are considered representative of groundwater). At POC well TW-53 and the Harris Well, selenium concentrations have exceeded the selenium RG since 1991 and 1993, respectively. At POC Well TW-54, selenium concentrations have exceeded the selenium RG since 1992 and are highly variable. Similar to some Monsanto plant fenceline wells, the selenium in south boundary POC wells at TW-53, TW-54, and the Harris Well, appears to come in “pulses” suggesting climate (precipitation) or groundwater flow patterns of the Monsanto plant’s production wells may play a role in ongoing selenium releases and transport.

At POC Mormon A Spring and non-POC Mormon Creek (Figure 18), which are fed by discharging groundwater from the UBZ-1, selenium has been increasing in the long-term (since 1991 at Mormon A Spring) to a concentration of 0.0284 and persistently exceeds both the groundwater RG and surface water chronic water quality standards (WQS) for selenium at both locations. At non-POC Mormon B and C Springs, also fed by discharging groundwater from the UBZ-1, selenium concentrations have been stable and persist above the groundwater RG since 1991.

At POC well TW-55, selenium concentrations appear to be relatively stable below the RG. This well is completed in the gamma 3 zone, which is deeper than the gamma 4 zone and appears to be less impacted by selenium.

Overall, these data indicate that selenium is not attenuating at the Monsanto Site’s south property boundary monitoring locations. Note also that the cadmium concentrations have stabilized above the cadmium RG in Mormon A Spring since 1981 (concentration of 0.015 mg/L in 2012) and has exhibited a short-term increase in Mormon Creek above the RG (Figure 19).

Further south of the south Monsanto plant fenceline monitoring locations, selenium exceeds RGs in several downgradient non-POC wells, including wells 59, 62, 63, 64, 65, and 70. The time-history concentrations of selenium in these wells are shown in Figures 20, 21, and 22. These wells were installed between 2007 and 2011 and, in general, these wells do not have enough history to interpret trends with confidence. Nonetheless, these wells indicate that selenium has clearly migrated a considerable distance from the source area and exceeds the selenium RG at many of these downgradient locations including wells at the southern Monsanto property boundary. Overall, these data do not support a premise that selenium is attenuating at the IC boundary.

Location	Formation	Cadmium			Fluoride			Manganese			Nitrate as N			Selenium			Chloride			Molybdenum			Sulfate		
		Long Term Trend			Long Term Trend			Long Term Trend			Long Term Trend			Long Term Trend			Long Term Trend			Long Term Trend			Long Term Trend		
NW Pond		Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012
TW-29 (background)	UBZ-4 γ3	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇧	⇧	1991-2012	⇔	⇔	1991-2012	⇔	⇔
TW-29 (background)	UBZ-4 γ3																2001-2012	⇧							
TW-16	UBZ-4 γ3	1991-2012	⇩	⇔	1991-2012	⇩	⇔	1991-2012	⇩	⇔	1993-2012	⇔	⇧	1993-2012	⇩	⇧	1991-2004	⇔	⇧	1992-2012	⇔	⇔	1993-2012	⇔	⇧
TW-16	UBZ-4 γ3																2004-2012	⇧		2004-2012	⇔				
TW-17	UBZ-4 γ3	1995-2012	⇔	⇧	1995-2012	⇔	⇔	1992-2012	⇧	⇧	1992-2012	⇔	⇔	1992-2012	⇔	⇧	1992-2012	⇩	⇧	1992-2012	⇩	⇔	1992-2012	⇩	⇧
TW-18	LBZ-4	1991-2022	⇔	⇔	1991-2022	⇔	⇧	1996-2012	⇧	⇔	1991-2012	⇔	⇔	1991-2012	⇩	⇔	1996-2012	⇧	⇧	2004-2012	⇔	⇔	1991-2012	⇔	⇔
Old UFS Pond Area																									
TW-57 (background)	UBZ-2 γ5	1992-2012	⇔	⇔	1992-2012	⇔	⇔	1992-2012	⇔	⇔	1992-2012	⇔	⇔	1992-2012	⇔	⇔	1992-2012	⇔	⇔	1992-2012	⇔	⇔	1992-2012	⇔	⇔
TW-22	UBZ-2 γ4?	1997-2012	⇩	⇔	1997-2012	⇩	⇔	1997-2012	⇩	⇔	1999-2012	⇔	⇔	1999-2012	⇩	⇔	1998-2012	⇔	⇔	2000-2012	⇩	⇩	1999-2012	⇩	⇔
TW-24	UBZ-2 γ4	1994-2012	⇔	⇧	1996-2012	⇩	⇧	2004-2012	⇔	⇔	2000-2012	⇔	⇔	1997-2012	⇔	⇧	1993-2012	⇔	⇧	1997-2012	⇩	⇧	1998-2102	⇩	⇔
TW-37	UBZ-2 γ4	1991-2001	⇔	⇧	1991-2012	⇩	⇔	1991-2012	⇩	⇔	1991-2012	⇔	⇔	1991-2012	⇩	⇔	1991-2001	⇩	⇧	1991-2012	⇩	⇩	1991-2012	⇔	⇔
TW-37	UBZ-2 γ4	2002-2012	⇧														2002-2012	⇧							
TW-45	LBZ-2 γ2	1991-2012	⇩	⇔	1991-2012	⇩	⇔	1993-2012	⇩	⇔	1994-2012	⇔	⇔	1995-2012	⇔	⇔	1996-2012	⇩	⇔	1991-2012	⇩	⇔	1994-2012	⇩	⇔
Old Hydroclarifier and Plant Area Wells																									
TW-26	LBZ-4	1994-2012	⇔	⇔	1996-2012	⇧	⇔	1996-2012	⇩	⇔	1993-2012	⇔	⇩	1993-2012	⇔	⇔	1998-2012	⇩	⇩	1992-2012	⇩	⇔	1996-2012	⇔	⇔
TW-40	UBZ-4 γ3	1992-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇩	⇔	2006-2012	⇔	⇔	2003-2012	⇔	⇧	1991-2012	⇔	⇩	1992-2012	⇔	⇧	1999-2012	⇔	⇧
TW-43	UBZ-4 γ3	1991-2012	⇩	⇔	1991-2012	⇩	⇔	1991-2012	⇩	⇔	1991-2012	⇔	⇩	2002-2012	⇩	⇔	1991-2012	⇔	⇩	1991-2012	⇩	⇩	1999-2012	⇔	⇔
TW-44	LBZ-4	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇧	⇔	1991-2012	⇔	⇔	1991-2012	⇩	⇔	1991-2012	⇧	⇔	1991-2012	⇔	⇔	1991-2012	⇧	⇧
UFS Piles Wells																									
TW-48	UBZ-4 γ3	1991-2012	⇩	⇔	1991-2012	⇧	⇔	1991-2012	⇔	⇔	1991-2012	⇔	⇧	1991-2012	⇔	⇔	1991-2012	⇔	⇔	2003-2012	⇔	⇔	1991-2012	⇩	⇔
TW-49	UBZ-4 γ3	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇔	⇧	1991-2012	⇔	⇔	1991-2012	⇧	⇔	2002-2012	⇔	⇔	1991-2012	⇔	⇧
TW-50	UBZ-4 γ3	2005-2012	⇩	⇩	1991-2012	⇧	⇧	2001-2012	⇩	⇧	1991-2012	⇧	⇔	1991-2012	⇧	⇩	1999-2012	⇧	⇧	2003-2012	⇩	⇧	2003-2012	⇧	⇧
2007 Monitoring Wells[1]																									
TW-59	UBZ-2 γ4			⇔			⇔			⇔			⇔			⇩			⇔			⇔			⇩
TW-60	UBZ-1 γ4			⇔			⇔			⇔			⇔			⇔			⇔			⇔			⇔
TW-61	UBZ-1 γ4			⇔			⇔			⇔			⇔			⇔			⇔			⇔			⇔
TW-62	UBZ-2 γ4			⇔			⇔			⇩			⇔			⇩			⇔			⇔			⇩
UBZ-1 Wells and South of Plant Springs																									
TW-08	UBZ-1 γ3	1996-2012	⇔	⇔	1996-2012	⇔	⇔	1996-2012	⇔	⇔	1996-2012	⇔	⇔	1996-2012	⇩	⇔	1996-2012	⇔	⇔	1996-2012	⇔	⇔	1996-2012	⇔	⇔
TW-10	UBZ-1 γ5	1991-2012	⇔	⇔	1991-2012	⇩	⇧	1991-2012	⇔	⇔	1991-2012	⇧	⇔	1991-2012	⇧	⇧	1991-2012	⇔	⇔	1991-2012	⇔	⇧	1991-2012	⇧	⇩
TW-10	UBZ-1 γ5													2000-2012	⇔								2000-2012	⇩	
Mormon Creek	UBZ-1	2008-2012	⇔	⇧	2002-2012	⇔	⇔	2002-2012	⇔	⇔	2002-2012	⇔	⇧	2002-2012	⇔	⇧	2004-2012	⇩	⇩	2002-2012	⇔	⇧	2007-2012	⇔	⇔
Southwest Spring	UBZ-1	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1997-2012	⇩	⇔	1991-2012	⇔	⇔	1992-2012	⇔	⇔	1991-2012	⇩	⇔	1991-2012	⇩	⇧	2000-2012	⇔	⇔
Homestead Spring	UBZ-1	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇔	⇔	2006-2012	⇔	⇔	1991-2012	⇔	⇧	1991-2012	⇧	⇔	1991-2012	⇔	⇔	1991-2012	⇧	⇧

Notes:
1. Insufficient data for long-term trend calculation.

⇔ Concentrations relatively stable or no trend
⇩ Concentrations decreased
⇧ Concentrations increased

Highlighted cells are locations with long or short-term increasing concentration trends

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
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TABLE 4
Summary of Constituent Concentration Trends at Source Areas and Other Wells
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

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For the other COCs, fluoride, manganese, and nitrate, the time-concentrations show that these constituents are below the groundwater RGs and are interpreted to be stable (Tables 4 and 5). However, nitrate has been increasing in Mormon A Spring and Mormon Creek, and the concentration was just below the RG of 10 mg/L several times between 2005 and 2011.

6.4.1.2 UBZ-4 Area

Distribution. The suspected source areas for the UBZ-4 Plumes include the Northwest Ponds and the Old Hydroclarifier (Figure 2). COCs in this plume are cadmium, fluoride, nitrate, manganese, and selenium. This plume also contains chloride, molybdenum, and sulfate. The 2012 distributions of each of these groundwater constituents are illustrated in Figures 4, 5, 6, 7, 8, 9, 10, 11, and 12, respectively. Figures 23 through 26 depict the time-history concentrations, including the maximum concentrations and trends at key monitoring well locations in the UBZ-4 area. Tables 4 and 5 provide a summary of constituent concentration trends.

In general, groundwater plumes from the Northwest Ponds and the Old Hydroclarifier would be expected to travel toward the south, consistent with the general direction of groundwater flow at the Monsanto Site. However, the downgradient extent of each constituent within the UBZ-4 plume is at least partially controlled by the presence of four Monsanto Site industrial supply wells, PW-01, PW-02, PW-03, and PW-04, which are also located in UBZ-4. Essentially, the southern migration of these groundwater plumes from the Northwest Ponds and the Old Hydroclarifier is generally limited by these production wells. Note that each COC exceeds its RG within at least some portion UBZ-4. Note also that it is unknown how the plume might spread if the production wells were to be shut down over any length of time. Because the plume is generally contained within the UBZ-4, no downgradient monitoring wells have been constructed within the southern portion of UBZ-4.

As noted above, the Monsanto fault separates UBZ-2 from UBZ-4. This fault has been interpreted by Monsanto to be a hydraulic barrier that would prevent the migration of COCs from UBZ-4 to UBZ-2. However, the proximities and plume configurations for many of the COCs (Figures 6, 8, 9, 10, 11, and 12) in both the UBZ-4 and UBZ-2 aquifers and the differences in hydraulic gradient suggest that constituents in UBZ-4 may be able to migrate across the Monsanto Fault into the UBZ-2. The existing well network is not sufficient to confirm whether or not the Monsanto Fault actually isolates the two aquifers from one another. By way of evidence, Figure 27 shows hydrographs of monitoring Wells TW-26 and TW-37, which are separated by the Monsanto Fault. These wells display similar responses to pumping from the Monsanto plant's production wells, which suggests that the hydraulic barrier is limited and may allow flow and contaminant migration. The anticipated supplemental RI activities are intended to confirm these groundwater flow conditions and are outlined in Section 8.

Source Area Wells. The following discussion focuses on COC trends in the UBZ aquifer near the Northwest Ponds and the Old Hydroclarifier source areas. Tables 4 and 5 show the long-term and short-term trends for all the constituents. The constituents of particular concern in the source area are highlighted on these tables. Most of the COCs are decreasing or stable in the long- and short-term through mineral precipitation, dispersion, and capture by the Monsanto Site production wells (Table 5). Exceptions include cadmium, fluoride, manganese, nitrate, and selenium increasing primarily in the short-term in Wells TW-16, 17, and 18. The following figures illustrate some of these trends:

Figure 23 shows the time-history concentration of cadmium in the Northwest Pond Wells (TW-16 and TW-17). The cadmium trend in TW-16 has decreased from the historical high, but has stabilized well above the RG of 0.005 mg/L at 0.432 mg/L. The cadmium concentration in Well TW-17 has been increasing and has exceeded the RG since about 2007, with a 2012 concentration of 0.007. Overall, these data indicate that a cadmium source likely persists in this area.

Figure 24 shows the time-history concentration of selenium in the Northwest Pond Wells TW-16 and TW-17. The selenium in TW-16 persistently exceeds the selenium RG of 0.05 mg/L and is increasing in

the short-term, with a 2012 concentration of 0.189 mg/L. The concentration of selenium in Well TW-17 has been increasing since about 2009 and now equals the RG at a concentration of 0.05. Overall, these data indicate that a selenium source likely persists in this area.

Figure 25 shows the time-history concentration of manganese in the Northwest Pond Well TW-17. The manganese in TW-17 is above the RG of 0.68 mg/L, with a 2012 concentration of 3.01 mg/L. Manganese concentrations have been increasing since 1985 in TW-17. Overall, these data indicate that a manganese source likely persists in this area.

Production Wells. The four Monsanto plant production wells (PW-01, 02, 03, and 04) create two areas of depressed groundwater levels. One area of depressed water levels surrounds PW-04 at the north end of the Monsanto plant, and a second area surrounds Wells PW-01, 02, and 03 located in the center of the Monsanto plant (Golder, 2012g). The annual summary report states that "Pumping from the production Wells PW-01, PW-02, and PW-03 from UBZ-4 contains the plumes originating from the Northwest Pond and the Old Hydroclarifier areas to prevent offsite migration" (Golder, 2012g, Page 3). Most COC trends in the production wells are stable based on their time-history graphs. The COC trends in the Monsanto plant production wells are summarized in Table 5.

The production wells are constructed "open-hole" across multiple potential water-bearing zones and do not draw water from any specific "gamma" zone. The production wells remove water from multiple zones in the Upper and Lower Basalt Aquifer. Cadmium, fluoride and selenium have been increasing in PW-01 and PW-02 in the short-term, which raises concerns regarding residual source areas. Cadmium has increased to levels above the RG of 0.005 mg/L in both production wells (Figure 26). In addition, although not COCs, monitored constituents including chloride, molybdenum, and sulfate are increasing in both PW-01 and PW-02 and to some extent in PW-03, as well suggesting a persistent source may still be present in UBZ-4. In Addition, monitoring Well TW-26, which is the most approximately downgradient well from the source areas and should be controlled by pumping, exhibits an increasing selenium trend since the mid 1990s (Figure 28). This trend indicates that pumping may not completely capture the plume and control the migration of COCs in UBZ-4.

6.4.2 Surface Water Quality Trends

The remedy for surface water selected by the ROD is No Further Action (NFA). As such, no surface water remediation goals were established under the ROD (EPA, 1997). Nevertheless, several surface water bodies are in proximity and are potentially impacted by releases from the Monsanto Site. The principal water bodies include Soda Creek, Mormon Creek, and several springs that feed them. These are explained in more detail below and are compared to the Idaho Chronic Aquatic Standard (IDAPA 58.01.02) for discussion purposes.

6.4.2.1 Soda Creek

Several sample stations were established to monitor and evaluate the effect of discharges to surface water in Soda Creek. These locations are not POC locations for surface water, but are used to evaluate water quality in Soda Creek. Fifteen surface water sampling stations have been established, from Soda Creek upstream of any Monsanto Site influence to approximately 2 miles downstream where Soda Creek intersects US Highway 30. Soda Creek is flow-impaired between power canal diversions at the Soda Weir (SC-2) and the Soda upstream power return (SC-7), and below the irrigation diversion (SC-9). The flow ranges from 70 cubic feet per second (cfs) at the diversion weir (SC-2) down to 1 cfs below the diversion, increases to approximately 3 cfs because of inflow from Southwest Spring, Mormon Spring, and other base flow, increases up to 62.5 cfs below the power return (SC-7), and then decreases to 6.4 cfs at US Highway 30 below the irrigation diversion (Figure 3).

Location	Formation	Cadmium			Fluoride			Manganese			Nitrate as N			Selenium			Chloride [a]			Molybdenum [a]			Sulfate [a]		
		Long Term Trend			Long Term Trend			Long Term Trend			Long Term Trend			Long Term Trend			Long Term Trend			Long Term Trend			Long Term Trend		
		Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012	Trend	1991-2007	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012
Remediation Goal (mg/L)			0.005			4			0.18			10			0.05			n/a			n/a			n/a	
Groundwater																									
Production Wells																									
PW-01[b]	UBZ,LBZ-4	1991-2011	⇔	⇧ N	1991-2011	⇔	⇔ Y	1991-2011	⇔	⇔ Y	1991-2011	⇔	⇔ N	1991-2011	⇔	⇧ N	1991-2011	⇔	⇧	1991-2011	⇔	⇧	1991-2011	⇔	⇧
PW-01[b]	UBZ,LBZ-4																2004-2011	⇧							
PW-02	UBZ,LBZ-4	1994-2012	⇔	⇧ N	2001-2012	⇔	⇧ Y	1991-2012	⇔	⇔ Y	1991-2012	⇔	⇔ Y	1991-2012	⇔	⇧ Y	1991-2012	⇧	⇧	1991-2012	⇧	⇧	1991-2012	⇧	⇧
PW-02																	2004-2011	⇧							
PW-03	UBZ,LBZ-4	1991-2012	⇩	⇔ Y	2003-2012	⇔	⇔ Y	1999-2012	⇔	⇔ Y	1993-2012	⇔	⇔ Y	1994-2012	⇔	⇔ Y	1991-2012	⇧	⇧	1991-2012	⇔	⇔	1991-2012	⇧	⇧
PW-03																	2004-2011	⇧							
PW-04	UBZ,LBZ-4	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇔	⇔
Southern Plant Fence Line																									
TW-20	UBZ-2 γ4	2005-2012	⇩	⇔ N	1994-2012	⇩	⇔ Y	1994-2012	⇔	⇔ Y	2008-2012	⇔	⇧ N	2005-2012	⇔	⇔ N	2000-2012	⇔	⇔	1991-2012	⇩	⇩	2000-2012	⇔	⇩
TW-34	UBZ-2 γ3	1991-2012	⇔	⇔ Y	1991-2012	⇔	⇔ Y	1996-2012	⇔	⇔ Y	1991-2012	⇔	⇔ Y	1991-2012	⇔	⇔ Y	1991-2012	⇔	⇔	1991-2012	⇔	⇔	1991-2012	⇔	⇧
TW-35	UBZ-2 γ3	1994-2012	⇔	⇔ Y	1991-2012	⇔	⇔ Y	1991-2012	⇔	⇔ Y	1991-2012	⇔	⇔ Y	1993-2012	⇔	⇔ Y	1991-2012	⇩	⇔	1993-2012	⇔	⇔	1991-2012	⇩	⇔
TW-39	UBZ-2 γ4	1994-2012	⇔	⇧ N	1995-2012	⇔	⇧ N	1993-2012	⇔	⇔ Y	1997-2012	⇔	⇔ Y	1992-2012	⇔	⇧ N	1993-2012	⇔	⇧	1992-2012	⇔	⇧	1991-2012	⇧	⇧
Southern Boundary																									
TW-53	UBZ-1 γ5	1994-2012	⇔	⇔ Y	1999-2012	⇔	⇔ Y	1992-2012	⇔	⇔ Y	1993-2012	⇔	⇧ Y	1994-2012	⇔	⇩ N	1994-2012	⇔	⇔	2000-2012	⇔	⇔	1995-2012	⇔	⇩
TW-54	UBZ-2 γ4	2002-2012	⇔	⇔ Y	1997-2012	⇔	⇔ Y	1993-2012	⇩	⇔ Y	1996-2012	⇧	⇔ Y	1993-2012	⇔	⇩ N	1994-2012	⇔	⇩	1995-2012	⇩	⇩	1995-2012	⇔	⇩
TW-55	UBZ-2 γ3	1994-2012	⇔	⇔ Y	2002-2012	⇔	⇔ Y	1992-2012	⇔	⇔ Y	1996-2012	⇔	⇔ Y	1992-2012	⇩	⇩ Y	1992-2012	⇔	⇔	1992-2012	⇔	⇔	1992-2012	⇔	⇩
Mormon A Spring[c]	UBZ-1 γ5?	1997-2012	⇔	⇔ N	1996-2012	⇩	⇔ Y	1991-2012	⇔	⇔ Y	1996-2012	⇔	⇔ Y	1991-2012	⇧	⇔ N	1993-2012	⇔	⇔	1997-2012	⇔	⇔	1996-2012	⇔	⇔
Harris Well	UBZ-2 γ4	1994-2012	⇔	⇔ Y	1997-2012	⇔	⇔ Y	1993-2012	⇔	⇔ Y	1995-2012	⇔	⇔ Y	1994-2012	⇔	⇔ N	1994-2012	⇔	⇔	2000-2012	⇔	⇔	1995-2012	⇔	⇩
Surface Water/Non-Contact Cooling Water Discharge																									
Soda Creek*		Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012	Year	Trend	2008-2012
Soda Up Station (SC-1)	na	2001-2012	⇩	⇔ Y	2001-2012	⇔	⇔ Y	2001-2012	⇧	⇩ Y	2001-2012	⇔	⇔ Y	2001-2012	⇩	⇔ Y	2001-2012	⇔	⇔	2001-2012	⇔	⇔	2001-2012	⇔	⇔
Soda Down Station (SC-4)	na	2001-2012	⇔	⇩ Y	2001-2012	⇔	⇧ Y	2001-2012	⇩	⇩ Y	2001-2012	⇔	⇔ Y	2001-2012	⇩	⇩ Y	2001-2012	⇔	⇩	2001-2012	⇔	⇔	2001-2012	⇔	⇔
Discharge				2008-2012			2008-2012			2008-2012			2008-2012			2008-2012			2008-2012			2008-2012			2008-2012
Non-Contact Cooling Water	na	2000-2012	⇔	⇧	2000-2012	⇔	⇔	2000-2012	⇔	⇔	2000-2012	⇔	⇧	2000-2012	⇔	⇔	2000-2012	⇔	⇧	2000-2012	⇧	⇧	2000-2012	⇧	⇧

Notes:

a. Constituents included for illustrative purposes only, no remediation goal

b. PW-01 not sampled in 2012 because of pump maintenance. Trend is from 2007 to 2011.

c. Proposed alternative point of compliance for Harris Well

n/a: No remediation goal.

Highlighted cells are locations with long or short-term increasing concentration trends

* Natural Background

⇔	Concentrations relatively stable or no trenc
⇩	Concentrations decreased overall
⇧	Concentrations increased overall
Y	Equal to or less than EPA Remediation Goal in June 2012
N	Greater than EPA Remediation Goal in June 2012

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
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TABLE 5

Summary of Constituent Concentration Trends at Point of Compliance Wells and Soda Creek

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The flow in Soda Creek between the power canal diversion and the return is primarily from seepage through the flashboards, inflow from springs and creeks including Southwest Spring and Mormon Creek, and diffuse groundwater seepage. Farther to the south, the small creek formed by the Homestead Spring intersects Soda Creek within the flow-impaired reach. Of significance is that these springs and seeps are surface water expressions of groundwater and appear to represent COC-impacted groundwater discharging from the shallow aquifers in the UBZ-1 and UBZ-2.

A surface water POC based on risk to aquatic biota was not established in the ROD for Soda Creek. Nonetheless, total recoverable selenium exceeds the chronic aquatic standard (IDAPA 58.01.02) of 0.005 mg/L at Soda Creek sample stations SC-3, SC-4, SC-6, and SC-7 in 2012 (Figure 29). However, below the power canal return, dilution from the return causes the downstream selenium concentrations to drop below the Idaho chronic criteria of 0.005 mg/L. Overall, these data indicate that substantial selenium mass may be entering Soda Creek via the discharge of selenium contaminated groundwater. However, dilution below the power canal return is able to keep selenium concentrations below the chronic aquatic standard and have a decreasing concentration trend (Table 5).

The only other COC detected in Soda Creek with an established chronic aquatic WQS is cadmium. Cadmium was below the standard of 0.0006 mg/L with the exception of SC-8 (0.0012 mg/L) where the power canal return mixes with Soda Creek flow. These data indicate that cadmium impacts to the creek are probably minor.

6.4.2.2 Mormon Creek

Mormon Creek is a tributary to Soda Creek. Mormon Creek is fed by discharge from Mormon A, B, and C Springs, Calf Spring, and diffuse groundwater seepage. Flow in Mormon Creek is between about 0.25 and 0.5 cfs. The sampling station on Mormon Creek (MC-1) is located immediately above its confluence with Soda Creek. Mormon Creek and the small creek formed by the Southwest Spring intersect Soda Creek, and together provide the majority of the flow in the flow-impaired reach of Soda Creek below the power canal diversion noted in the preceding section.

A surface water POC based on risk to aquatic biota has not been established for Mormon Creek. Nonetheless, selenium at MC-1 has exceeded the chronic WQS of 0.005 mg/L since monitoring at this station began in 2002 (Figure 18, Table 4). Furthermore, selenium concentrations have been steadily increasing at MC-1 since that time. In 2012, total recoverable selenium was detected at 0.23 mg/L at MC-1. Overall, total recoverable selenium concentrations in Mormon Creek remain elevated, consistent with concentrations in the UBZ-1 and 2 selenium plume.

6.4.2.3 Springs

A surface water POC based on risk to aquatic biota has not been established for any of the springs. Nonetheless, total recoverable selenium has exceeded the chronic WQS of 0.005 mg/L at several springs during the period of study. At Mormon A, B, and C Springs (Figure 18) and Calf Springs (Figure 30), which are fed by discharging groundwater from the UBZ-1 and 2, selenium generally has been increasing or is stable in the long-term (since 1991) and persistently exceeds the surface water chronic WQS (0.005 mg/L). In 2012, the selenium concentration in Mormon A Spring (the largest contributor to Mormon Creek) was 0.284 mg/L, far above the chronic WQS. The concentrations of total recoverable selenium in the other springs that feed Mormon Creek (Calf and Mormon A and B Springs) ranged from 0.17 mg/L to 0.28 mg/L in 2012, also far above the chronic WQS.

At Southwest and Homestead Springs, total recoverable selenium concentrations are relatively stable, generally ranging below the groundwater RG of 0.05 mg/L but above the chronic WQS of 0.005 mg/L. In 2012, total recoverable selenium in Southwest and Homestead Springs (Figure 30) both exceeded the chronic WQS of 0.005 mg/L at concentrations of 0.02 mg/L and 0.046 mg/L, respectively. Overall, the total recoverable selenium data concentrations indicate that selenium is not attenuating at the springs

downgradient of the Monsanto Site and remain elevated—consistent with the passage of the UBZ-1 and 2 selenium plume.

The only other COC detected in springs that has a chronic aquatic WQS was cadmium. Cadmium concentrations have been stable above the surface water chronic WQS of 0.0006 mg/L in Mormon A Spring since 1981 and has exhibited a short-term increase in Calf Springs and Mormon Creek (Figure 19 and 29, respectively). The cadmium concentrations in Mormon A Spring have decreased from peaks in the 1980s but appear to have stabilized in the 1990s at concentrations around 0.015 mg/L. The cadmium concentrations have increased in the short-term in Mormon Creek (Table 4) to a concentration of 0.0072 mg/L. The cadmium concentrations in Calf Spring (Figure 31) were relatively stable up until 2008, but have been increasing since.

6.4.3 Sediments in Soda Creek and Alexander Reservoir

Monsanto conducted sediment sampling in 2011 to support the third Five-Year Review. These samples were not located in the same locations as sediments collected during the RI/FS and the first Five-Year Review, but rather followed a Multi-Increment Sampling (MIS) methodology as per the EPA-approved work plan.

Figure 32 shows the locations of the Sediment Sample Reaches in Soda Creek. Table 6 shows the sediment concentrations from the 2011 third Five-Year Review sampling event (Golder, 2012d). Figures 33 through 41 show the constituent concentrations and changes in concentrations from upstream to downstream in the eleven reaches sampled. As discussed in Section 4.1, Monsanto states that the 2011 Incremental Sampling Methodology data are not directly comparable to previously collected sediment data that were collected as single grab samples, and therefore, direct comparisons cannot be made to the 2002 and 2007 sample concentrations.

Elevated concentrations were detected in Reach 08, which is between Monsanto's southern property boundary and the 2nd Power Return (within the flow-impaired portion of Soda Creek). This portion of Reach 08 runs behind a residential area (Figure 42). The ROD stated that no further action is necessary under CERCLA for Soda Creek sediments. However, it goes on to state that because groundwater exceeds MCLs, and risk-based concentrations, reviews will be necessary to confirm that constituent concentration trends in groundwater and sediments are declining as predicted and eventually to confirm the achievement of MCLs. The Sediment Sampling report notes that an Ecological Risk Assessment initially concluded that action might be beneficial, but that toxicity testing of the additional samples was inconclusive. Therefore, at this point in time, it is unknown whether the elevated concentration of contaminants in the sediments present a risk to human, aquatic, or ecological receptors.

6.4.4 Offsite Soils

As required by the ROD, Monsanto collected offsite soil samples for the third Five-Year Review to determine the concentrations of COCs in soil grids surrounding the plant. Soil sampling results indicated that offsite soils above the remediation goal of 3.7 picoCuries per gram for radium-226 were located in similar parcels from the previous Five-Year Reviews and those parcels are under appropriate ICs (Golder, 2012b). A confirmation sampling event for Parcel 25 was conducted to subdivide the parcel because of the inconsistent topography (Golder, 2012a). Parcel 25 is not under an IC and originally exceeded the remediation goal; however, the confirmation sampling exhibited concentrations that were below the RG.

Location ID	Sample ID	Arsenic (As) (mg/kg)	As Q	Beryllium (Be) (mg/kg)	Be Q	Cadmium (Cd) (mg/kg)	Cd Q	Copper (Cu) (mg/kg)	Cu Q	Nickel (Ni) (mg/kg)	Ni Q	Polonium 210 (Po-210) (pCi/g)	Po-210 Q	Selenium (Se) (mg/kg)	Se Q	Silver (Ag) (mg/kg)	Ag Q	Vanadium (V) (mg/kg)	V Q
SED-01	SED-09-10312011-1	20.7		0.6		0.6		5.6		87.9		0.9		1.0	J	0.5	U	45.7	
SED-02	SED-03-07202012-1	31.8		1.00	J	0.82		8.5	J	48.9		1.24		5.0	U	2.0	U	70.4	J+
SED-03	SED-02-07202012-1	43.3		0.98	J	0.55		24.4		36.2		1.21		5.0	U	2.0	U	52.4	J+
SED-05	SED-08-10272011-1	16.5		0.99		6.0		8.0		48.4		1.41		6.3		0.087	J	71.1	
SED-06	SED-07-10262011-1	8.6		0.63		28.8		10.5		50.8		0.87		31.5	J	0.073	J	36.7	
SED-07	SED-06-10252011-1	23.8		0.8		34.2		16.3		59.4		1.1		46.4		0.1	J	55.0	
SED-08	SED-05-10242011-1	28.9		0.92		21.5		10.4		104		2.74		38.5		0.10	J	61.7	
SED-10	SED-10-07182012-1	83.3		1.2		13.7		11.9		36.5		1.27		4.1	J	2.0	U	72.4	J+
SED-11	SED-02-102111-1	15.9		0.53		10.0		18.3		27.5		0.90		3.9		0.19	J	31.8	
SED-12	SED-01-10212011-1	2.3	J	0.3		0.38		8.6		6.8		0.81		1.2	J	0.048	J	9.31	J
Triplicate Results (Average of Triplicates shown in above table)																			
SED-01-1	SED-09-10312011-1	22		0.73		0.57		5.1		115		0.5		0.99	J	0.5	U	55.6	
SED-01-2	SED-09-10312011-2	18.3		0.63		0.6		6		59.4		1.3		0.98	J	0.5	U	40.1	
SED-01-3	SED-09-10312011-3	21.7		0.53		0.65		5.6		89.3		1.03		0.93	J	0.5	U	41.3	
SED-07-1	SED-06-10252011-1	21.3		0.8		32.2		20.9		59.5		1.27		42.3		0.082	J	54.3	
SED-07-2	SED-06-10252011-2	24.5		0.81		31.7		10.9		53.8		1.15		41.5		0.075	J	54.3	
SED-07-3	SED-06-10252011-3	25.5		0.83		38.6		17		64.8		0.87		55.4		0.099	J	56.5	

QUALITY CONTROL STATISTICAL COMPARISONS[1]:

Location ID	QC Metric[2]	Arsenic (As) (mg/kg)		Beryllium (Be) (mg/kg)		Cadmium (Cd) (mg/kg)		Copper (Cu) (mg/kg)		Nickel (Ni) (mg/kg)		Polonium 210 (Po-210) (pCi/g)		Selenium (Se) (mg/kg)		Silver (Ag) (mg/kg)		Vanadium (V) (mg/kg)	
SED-01	RPD 1-2	18.4		14.7		5.13		16.2		63.8		88.9		1.0		0.0		32.4	
SED-01	RPD 2-3	17.0		17.2		8.00		6.9		40.2		23.2		5.2		0.0		2.9	
SED-01	RPD 1-3	1.4		31.7		13.11		9.3		25.2		69.3		6.2		0.0		29.5	
SED-07	RPD 1-2	14.0		1.2		1.6		62.9		10.1		9.9		1.9		8.9		0.0	
SED-07	RPD 2-3	4.0		2.4		19.6		43.7		18.5		27.7		28.7		27.6		4.0	
SED-07	RPD 1-3	17.9		3.7		18.1		20.6		8.5		37.4		26.8		18.8		4.0	

Location ID	QC Metric[3]	Arsenic (As) (mg/kg)		Beryllium (Be) (mg/kg)		Cadmium (Cd) (mg/kg)		Copper (Cu) (mg/kg)		Nickel (Ni) (mg/kg)		Polonium 210 (Po-210) (pCi/g)		Selenium (Se) (mg/kg)		Silver (Ag) (mg/kg)		Vanadium (V) (mg/kg)	
SED-01	s	2.06		0.10		0.040		0.45		27.8		0.41		0.032		0.0		8.6	
SED-01	x~=ave	20.7		0.63		0.61		5.6		87.9		0.94		0.97		0.50		45.7	
SED-01	% RSD	9.9		15.9		6.7		8.1		31.7		43.1		3.3		0.0		18.9	
SED-07	s	2.2		0.015		3.8		5.0		5.5		0.21		7.8		0.012		1.3	
SED-07	x~=ave	23.8		0.81		34.2		16.3		59.4		1.1		46.4		0.085		55.0	
SED-07	% RSD	9.2		1.9		11.3		31.0		9.3		18.7		16.8		14.5		2.3	

Notes:

1) RPD - relative percent difference for comparison of two quantities; RSD - relative standard deviation for comparison of a population of values.

2) Control limit for RPD is 35% for soil duplicates, according to National Functional Guidelines for Inorganic Superfund Data Review, Jan. 2010.

3) Control limit for percent RSD is 30%, according to industry standard for non-parametric data.

Samples collected Fall 2011 and July 2012

All results presented as dry weight

J: The associated value is an estimated quantity.

J+: The result is an estimated quantity, but the result may be biased high.

U: Analyte not detected above the detection limit.

Source: Draft Soda Creek Sediment Sampling and Analysis Third CERCLA Five-year Review, Monsanto Soda Springs Plant, December 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2MHILL with permission from Monsanto Chemical Company.

TABLE 7
Soda Creek Sediment Analytical Results
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

6.4.5 Groundwater Supply/Domestic Wells

A records search of the IDWR database (Well Driller's Report Database, http://www.idwr.idaho.gov/apps/appswell/searchWC.asp) provided information on registered wells in the vicinity of the Monsanto Site. Detailed information on the number of wells and their intended use was limited to Township, Range, and Sections. This information was assessed with respect to the general locations of these wells and a rough estimate of where downgradient plumes of site-relate COCs are thought to exist. Acknowledging the high level of uncertainty of the plume locations and dimensions, available data suggest a high likelihood that COC plumes may interact with or impact existing registered or unregistered domestic wells downgradient of Monsanto. Figure 43 shows the general locations of the wells in the search area.

The following types of wells are located in the specified search area boundary:

- 8 domestic wells
- 12 monitoring wells
- 1 test well

The presence, location, and use of other unregistered wells are unknown. Discussion with the City of Soda Springs Director of City Services, Alan Skinner, indicated that domestic wells could potentially be in use, downgradient of the Monsanto Site. No city codes require residents to use water service from the City of Soda Springs. The nature and extent of the southern end of the selenium and nitrate plumes have not been characterized.

6.5 Site Inspection

For the third Five-Year Review, EPA decided that a site visit and inspection was not required, because EPA's technical support contractor (CH2M HILL) has visited the Monsanto Site numerous times since the last Five-Year Review and Monsanto Site conditions have not changed significantly. CH2M HILL, DEQ, and EPA staff conducted telephone interviews regarding Monsanto Site conditions to support the Five-Year Review. The interview questions were formulated based on the Five-Year Review Site Inspection Checklist (Appendix D to OSWER Directive 9355.7-03B-P).

6.6 Interviews

CH2M HILL interviewed four individuals as part of the 3rd Five-Year Review process. The interviews were conducted to identify Monsanto Site conditions and issues, successes or problems related to the remedy, and status of O&M activities that has occurred since the last (second) Five-Year Review.

The following individuals were interviewed:

- **James McCulloch, Senior Environmental Technical Specialist, Monsanto Chemical Company, Soda Springs, Idaho.** Mr. McCulloch is Monsanto's CERCLA Project Manager for the Soda Springs facility. He indicated that EPA, its contractors, and also Monsanto's contractors have fulfilled their duties, and kept him informed and supplied him with appropriate levels of information regarding Monsanto Site activities. The remedial actions coincide with the objectives of Monsanto—ICs are in place and additional remedial actions have been identified that will move the overall project in compliance with CERCLA requirements. Some small-scale Monsanto Site-related projects are being constructed unrelated to CERCLA activities but these will not impact the future Monsanto Site remedial activities. In addition, Mr. McCulloch is involved in long-term development planning for the Monsanto Site
- **Alan Skinner, Director of City Services, City of Soda Springs, Idaho.** Mr. Skinner is the City of Soda Springs Director of City Services. Mr. Skinner was interviewed to provide information about

current water distribution information, known private well usage, and to identify any possible effects that the contamination could have on City of Soda Springs water service. As stated in Section 6.4 above, Mr. Skinner confirmed that current private well usage downgradient of the Monsanto Site is likely. Current municipal water supplies for the City of Soda Springs do not appear to be impacted by the Monsanto Site.

- **Dennis Owsley, Technical Hydrogeologist, Idaho Department of Water Resources (IDWR), Boise, Idaho.** Mr. Owsley was contacted regarding the possible presence of domestic wells in the Soda Springs area, in particular downgradient of the Monsanto Site. He said that domestic well use is possible. CH2M HILL asked how current the IDWR database is, and whether any better information is available to evaluate if active wells exist that are not recorded in the database. Mr. Owsley said that the IDWR database is the best source of information absent a ground survey. Mr. Owsley provided a map with well locations and names of well owners based on the State's data.
- **Clyde Cody, Idaho Department of Environmental Quality (DEQ), Boise, Idaho.** Mr. Cody was contacted to discuss the Idaho surface water chronic standard for selenium, which is 0.005 mg/L, versus the groundwater remediation goal of 0.05 mg/L. Selenium concentrations in Mormon Creek and the flow-impacted reach of Soda Creek within the Monsanto Site exceed the surface water standards. Downstream, however, below the power return where the flow increases and further downstream to US Highway 30, the selenium concentrations are 0.003 mg/L, which is below the surface water standard. Therefore, the suggested follow-up is continued annual monitoring to evaluate if the downstream trends increase and if they exceed surface water standards, and conduct the focused feasibility study to address and remediate groundwater contamination.

7. Technical Assessment

Section 7 presents a technical assessment of the remedy performance as implemented at the Monsanto Site. As outlined in EPA's *Comprehensive Five-Year Review Guidance* (EPA, 2001), this assessment is structured to answer the following three questions:

- Is the remedy functioning as intended?
- Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?
- Has any other information come to light that could affect the remedy's protectiveness?

These questions are addressed in the following sections.

7.1 Question A: Is the remedy functioning as intended?

7.1.1 Groundwater

The selected remedy for groundwater is MNA with ICs. MNA is currently not functioning as intended. Available groundwater monitoring data indicate that contaminant concentrations may not achieve the remediation goals within the 30-year time frame anticipated in the ROD. Furthermore, it is likely that the selenium plume is not contained or fully characterized. Previously unknown domestic users of impacted groundwater may exist.

Data projections at source area wells TW-37 and TW-22 indicate that selenium concentrations may not reach the RG within the ROD identified 30-year time frame. Figures 44 and 45 show selenium concentration trends in wells TW-22 and TW-37 since implementation of the initial remedial actions. While concentrations are declining at these locations, applying a power regression to illustrate the probable trend of future data indicates that the MCL of 0.05 mg/L may not be reached for decades beyond what is anticipated in the ROD at these locations. In addition, preliminary source area characterization data in 2011 indicate that sources of COCs likely remain, despite remedial actions in source area (Golder, 2012e).

Concentrations of selenium at several distant downgradient locations, which display long-term, short-term, or both concentration trends beyond the POC wells including; Monsanto plant south fenceline wells TW-20 and TW-39 south boundary wells TW-53 and TW-54, southwest corner well TW-10, the springs at Mormon A, Mormon B, and Calf Springs, and the Harris Well, indicate these COCs may not reach RGs within the ROD's 30-year time frame..

Overall, groundwater monitoring data indicate that because of (1) hydrogeologic complexities including faulting, (2) highly transmissive basalt interbeds, (3) fracture flows that create preferential flow paths, and (4) selenium mobility, the Monsanto Site is not conducive to MNA. EPA's Directive, *Use of MNA at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites* 9200.4-17P, (EPA, 1999) states "MNA will not generally be appropriate where site complexities preclude adequate monitoring and that preferred flow paths, fractured rock, and heterogeneous setting might cause MNA to not work effectively." Based on the geologic knowledge of this Site, it appears that the aquifer contains preferred flow paths caused by fault displacements and discrete layers of water-bearing zones with vertical hydraulic connection. Preferential flow paths, combined with several layers of groundwater zones, and variations of the groundwater flow through fractured rock and interbedded zones suggest that the accuracy of the Monsanto Site conceptual site model and the effectiveness of MNA as a sole remedial action is questionable. Finally, the hypothesized hydraulic boundaries of the Monsanto Fault and Subsidiary Fault have been found to likely not contain or limit the migration of the COCs in groundwater.

7.1.2 Surface Water

The selected remedy for surface water is NFA. The past five years of surface water data indicate that impacted groundwater continues to discharge as surface water. Data indicate impacts to surface water above State aquatic water quality standards in some locations and the NFA remedy selected in the ROD for surface water may not be protective. However, since surface water is significantly influenced by groundwater, i.e. the springs and impaired reach of Soda Creek are formed by groundwater discharging the impacted aquifers, addressing groundwater issues as outlined above will likely address the surface water exceedances. Continued monitoring is required to ensure this is the case. The following discussion addresses surface water issues at the Monsanto Site.

7.1.2.1 Springs

Overall, data indicate that groundwater discharges from the UBZ-1 and 2 groundwater plume is impacting surface water quality at several springs. As described above, the discharging groundwater forms the springs that feed the creeks, and therefore impacted groundwater becomes impacted surface water. If the remedy for groundwater does not perform as intended, these springs will continue to be impacted at the Monsanto Site. In summary:

- Limited attenuation is occurring for selenium and nitrate in several of the monitored springs. Based on the time-concentration graph for selenium in Mormon A Spring, it appears that there has been a 20+ year, relatively steady increase in selenium.
- Total recoverable selenium continues to exceed the Idaho chronic WQS of 0.005 mg/L at several springs. At Mormon A, B, and C Springs and Calf Springs, which are fed by discharging groundwater from UBZ-1 and 2 aquifers, selenium generally has been increasing or is stable in the long-term (since 1991) but persistently exceeds the surface water chronic WQS (0.005 mg/L).
- At Southwest and Homestead Springs, total recoverable selenium concentrations are relatively stable, but continue to generally exceed the chronic WQS of 0.005 mg/L.
- Cadmium concentrations have been stable, but the detected concentration continues to exceed surface water chronic WQS of 0.0006 mg/L in Mormon A Spring since 1981. Cadmium has also exhibited a short-term increase (last few years) above the chronic WQS in Calf Springs and Mormon Creek.

7.1.2.2 Soda Creek Surface Water

Selenium in Soda Creek exceeds State of Idaho chronic WQS of 0.005 mg/L at station SC-04, which is within the flow-impaired reach of this creek. However, selenium concentrations in Soda Creek downstream from the Monsanto Site are below this standard.

Therefore, NFA remains appropriate for this stream, provided annual sampling continue to demonstrate that selenium concentrations do not exceed applicable criteria. In addition, if the groundwater plume can be contained and remediated, then surface waters such as Mormon Creek and Soda Creek that are fed by springs are expected to exhibit improved water quality.

7.1.3 Soda Creek Sediments

The remedy of NFA was selected for sediments. The ROD called for continued monitoring of sediments in Soda Creek every five years and if the concentrations of COCs in the sediments are increasing, then action may be warranted. Increasing sediment concentrations would indicate that the overall remedy for groundwater is not performing as intended, where contaminated groundwater that discharges to creeks consequently impacts the sediments in Soda Creek. Current sample results exhibit increased concentrations of COCs in sediment downstream of the Monsanto Site compared with upstream.

7.1.4 Air, Source Piles, and Materials

The selected remedy for air is NFA for Source Piles and Materials. Monsanto actively manages the source piles, and continues to try new and effective methods to control wind dispersal of dust and COCs. Offsite surface soil concentrations are below respective RGs except in parcels that are already under ICs. Based on this, the remedy is performing as intended.

7.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

No. Toxicity data, cleanup levels, and RAOs used at the time of the remedy selection are still valid. However, the exposure assumption used in the ROD is not currently valid and is explained below:

- **Eight registered domestic wells potentially impacted by Monsanto Site COCs have been identified utilizing IDWR's database.** Available data suggest a high likelihood that COC plumes may interact with or impact previously unknown domestic wells that are located downgradient of the southern Monsanto property boundary. The risk assessment conducted during the Remedial Investigation in 1995 evaluated the future residential use of groundwater at properties only adjacent to the Monsanto Site and not downgradient in the residential areas of Soda Springs. Current groundwater data suggest that the plumes of site-related COCs may extend into the residential areas of Soda Springs, well beyond the areas considered in the risk assessment.

7.3 Question C: Has any other information come to light that could affect the remedy's protectiveness?

Yes, evaluation of the groundwater monitoring network conducted subsequent to the 2008 Second Five-Year Review revealed that the groundwater plumes of site-related COCs are not well defined and potential sources of COCs remain on Site. Furthermore, the undefined groundwater plumes could impact identified domestic wells downgradient of the Monsanto Site. Consequently, the areas where potential exposures to contaminated groundwater may occur (areas where ICs may be needed for possible private well domestic usage) are not defined.

7.4 Technical Assessment Summary

The remedy is currently not performing as intended based on the review of groundwater data; the groundwater monitoring network does not adequately characterize downgradient COC plume, MNA does not appear to be reducing concentrations of contaminants in groundwater as was predicted, domestic wells may be impacted, and surface water and sediments are impacted from interaction with the contaminated groundwater. In addition, there may be ongoing sources of contamination to groundwater remaining within the Monsanto plant. The toxicity data, cleanup levels, and RAOs used at the time of the remedy selection are still valid. The exposure assumptions used in the ROD are not currently valid.

Specifically, the southern edge of the selenium plume has not been identified and this plume appears to have migrated southward off the Monsanto property beyond the IC boundaries. Registered domestic wells have been identified downgradient of the plumes beyond the current IC boundary. Consequently, the areas where potential exposures to contaminated groundwater could occur are not well defined and the ability of the remedy to achieve RAOs and the time frame for doing so are in question.

8. Issues

Table 7 presents Issues Potentially Affecting the Remedy's Current and/or Future Protectiveness.

TABLE 7
Issues Potentially Affecting the Remedy's Current or Future Protectiveness

Issue	Affects Current Protectiveness? (Yes/No)	Affects Future Protectiveness? (Yes/No)
(1) Concentrations of COCs in groundwater and surface water remain above RGs/MCLs, exceed RGs/MCLs beyond the Monsanto property boundary, nature and extent of groundwater plume(s) of site-related COCs are not well defined, and, trends indicate that groundwater RGs will not be met in the 5- to 30-year time frame anticipated in the ROD.	Yes	Yes
(2) Registered and possibly unregistered domestic and irrigation wells downgradient of the Monsanto Site may be exposed to the COCs that exceed the RGs.	Yes	Yes
(3) Potential sources of COCs to groundwater remain in the old UFS Ponds, UFS Piles, Northwest Pond, and Old Hydroclarifier Areas.	Yes	Yes
(4) Concentrations of contaminants in sediments in Soda Creek exhibit higher concentrations downstream of facility.	Yes	Yes

9. Recommendations and Follow-up Actions

Table 8 lists the recommended follow-up actions related to the issues identified in Section 8 (on Table 7).

TABLE 8
Recommendations/Follow-up Actions Regarding Issues Potentially Affecting the Remedy's Current or Future Protectiveness

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions Affect Protectiveness? (Yes/No)	
					Current	Future
(1) Concentrations of COCs in groundwater and surface water remain above RGs/MCLs, exceed RGs/MCLs beyond the Monsanto property boundary, nature and extent of groundwater plume(s) of site-related COCs are not well defined, and trends indicate that groundwater RGs will not be met in the 5- to 30-year time frame anticipated in the ROD.	Define the full nature and extent of groundwater contamination by identified COCs by implementing a supplemental focused Remedial Investigation. When that Remedial Investigation is completed, execute a supplemental focused Feasibility Study to evaluate the current remedy and the need to add additional remedial actions to achieve RAOs. If necessary execute a ROD amendment or ESD to achieve RAOs. Continue monitoring groundwater and surface water annually to observe changes in COC concentrations.	Monsanto	EPA	09/30/2015	Yes	Yes
(2) Registered and possibly unregistered domestic and irrigation wells downgradient of the Monsanto Site may be exposed to the COCs that exceed	Investigate current usage of registered/unregistered domestic wells downgradient of the Monsanto Site and the relationship to the fully defined groundwater plume(s).	Monsanto	EPA	07/01/2014	Yes	Yes

TABLE 8
Recommendations/Follow-up Actions Regarding Issues Potentially Affecting the Remedy's Current or Future Protectiveness

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions Affect Protectiveness? (Yes/No)	
					Current	Future
the RGs.	Develop an institutional control plan for areas where groundwater COCs have migrated beyond current IC boundary.					
(3) Potential sources of COCs to groundwater remain in the old UFS Ponds, UFS Piles, Northwest Pond, and Old Hydroclarifier Areas.	Conduct the next phase of the Source Characterization to evaluate current sources and update the conceptual site model to evaluate if current remedies are appropriate.	Monsanto	EPA	09/30/2015	Yes	Yes
(4) Concentrations of contaminants in sediments in Soda Creek exhibit higher concentrations downstream of facility.	Continued monitoring of sediments to compare results against new sampling protocol and determine if remedial action may be needed.	Monsanto	EPA	08/01/2018	Yes	Yes

10. Protectiveness Statement

The remedy for the Monsanto Site is currently not protective because concentrations of COCs in groundwater remain above MCLs and RGs, contaminated groundwater plumes above the MCLs and RGs extend beyond the IC boundaries, the contamination in groundwater plumes has not been fully characterized which poses risks to domestic wells downgradient of the Monsanto Site, and monitoring trends indicate that the groundwater performance standards will not be met in the foreseeable future. Contaminated groundwater appears to be impacting surface water and sediment in nearby creeks. In addition, sources on the Monsanto facility may be contributing to groundwater contamination.

11. Next Review

Because hazardous substances, pollutants, or contaminates remain at the Monsanto Site above levels that allow for unrestricted use and unlimited exposure, another Five-Year Review is required. The next Five-Year Review will be conducted no later than five years from the signature date of this FYR in September 2018, but may be conducted earlier at EPA's discretion.

Figures

Appendix A
Community Notification and Involvement

Appendix B
Documents Reviewed

CH2M HILL, 2010. Draft comments on **"***2009 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant***"**, **"***Technical Memorandum: Evaluation of Natural Attenuation Controls - Monsanto Soda Springs Site***"** and conclusions on Monitored Natural Attenuation as a remedy for the Soda Springs Site. Prepared for EPA, Region X. June.

Golder Associates, Inc. 1995. Phase II Remedial Investigation Report for the Soda Springs Elemental Phosphorus *Plant*. Prepared by Golder Associates, Inc. for the Monsanto Chemical Company. February.

Golder Associates, Inc. 2008. *Second Five-Year Review Report for Groundwater Conditions at the Monsanto Soda Springs Plant* Prepared by Golder Associates, Inc. for the Monsanto Soda Springs Plant. July.

Golder Associates, Inc. 2009. *2009 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant*. Prepared for Monsanto Soda Springs Plant. December.

Golder Associates, Inc. 2010. *2010 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant*. Prepared for Monsanto Soda Springs Plant. December.

Golder Associates, Inc. 2012a. *Draft Report on Additional Soil Sampling in Parcel 25, Third CERCLA Five-Year Review.* Prepared by Golder Associates, Inc. for the Monsanto Soda Springs Plant. November.

Golder Associates, Inc. 2012b. *Draft Soil Report, Third CERCLA Five-Year Review.* Prepared by Golder Associates, Inc. for the Monsanto Soda Springs Plant. June.

Golder Associates, Inc. 2012c. *Monitor Well Drilling and Installation, Monsanto Soda Springs Idaho Plant*. Prepared by Golder Associates, Inc. for the Monsanto Soda Springs Plant. January.

Golder Associates, Inc. 2012d. *Soda Creek Sediment Sampling and Analysis, Third CERCLA Five-Year Review.* Prepared by Golder Associates, Inc. for the Monsanto Soda Springs Plant. December.

Golder Associates, Inc. 2012e. *Source Area Characterization – UBZ-2, Monsanto Soda Springs Idaho Plant*. Prepared by Golder Associates, Inc. for the Monsanto Soda Springs Plant. October.

Golder Associates, Inc. 2012f. *2011 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant*. Prepared for Monsanto Soda Springs Plant. February.

Golder Associates, Inc. 2012g. *2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant*. Prepared for Monsanto Soda Springs Plant. December.

U.S. Environmental Protection Agency. 1997. *Record of Decision, Monsanto Chemical Co. (Soda Springs Plant).*EPA ID: IDD081830994. Region X. April.

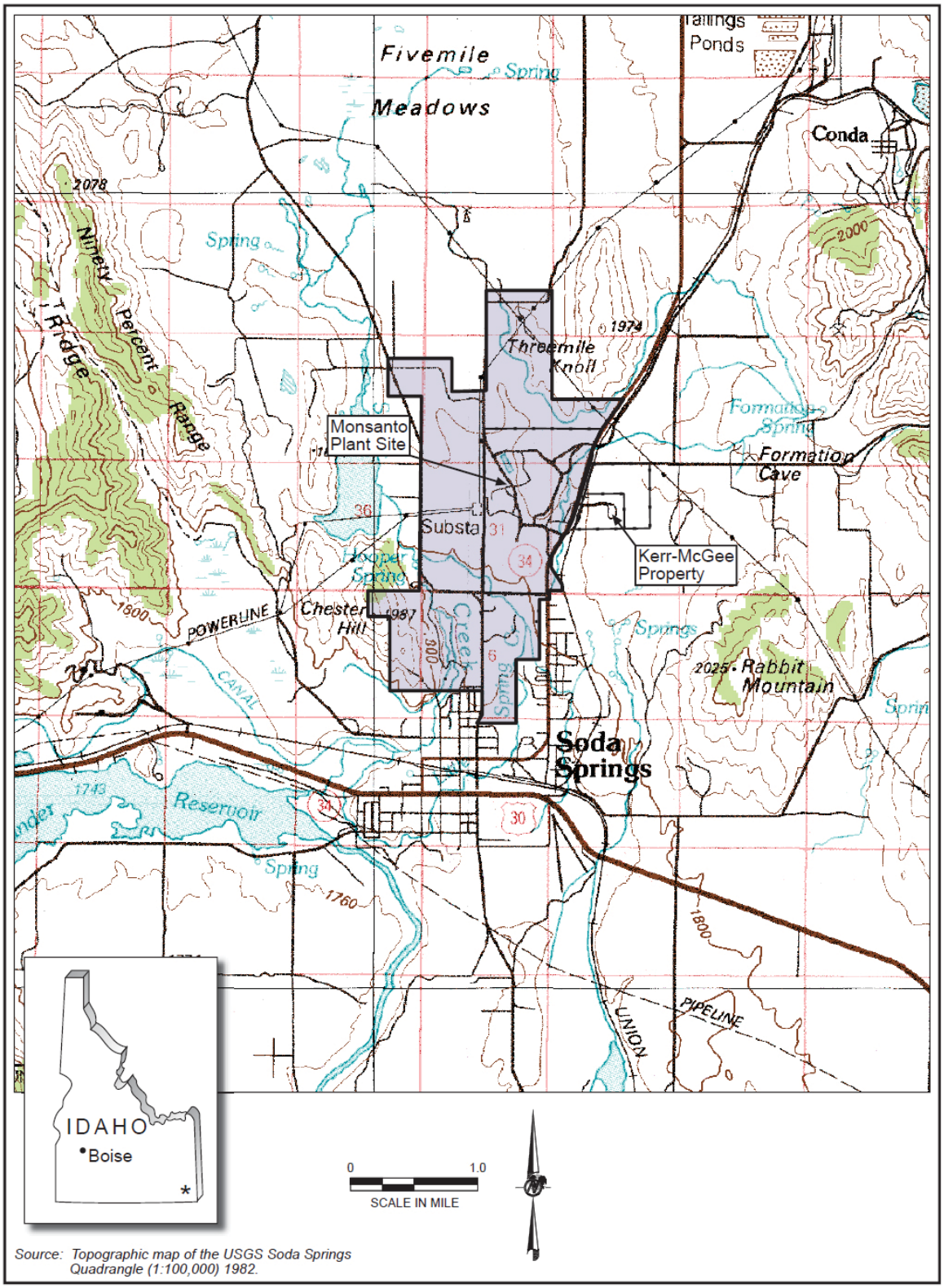
U.S. Environmental Protection Agency. 1999. *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites.* U. S. Environmental Protection Agency Office of Solid Waste and Emergency Response Directive 9200.4-17P

U.S. Environmental Protection Agency. 2001. *Comprehensive Five-Year Review Guidance*. EPA 540-R-01-007. U.S. Environmental Protection Agency. June.

U.S. Environmental Protection Agency, 2006. Freshwater Sediment Screening Benchmarks http://www.epa.gov/reg3hwmd/risk/eco/btag/sbv/fwsed/screenbench.htm

U.S. Environmental Protection Agency. 2008. *Second Five-Year Review Report, Monsanto Chemical Co. (Soda Springs Plant)* EPA ID: IDD081830994. August.

Figures



Source: Topographic map of the USGS Soda Springs Quadrangle (1:100,000) 1982.

Source: Revised 2009 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, Soda Springs, Idaho. January 6, 2011, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 1
Monsanto Plant Vicinity Map

Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

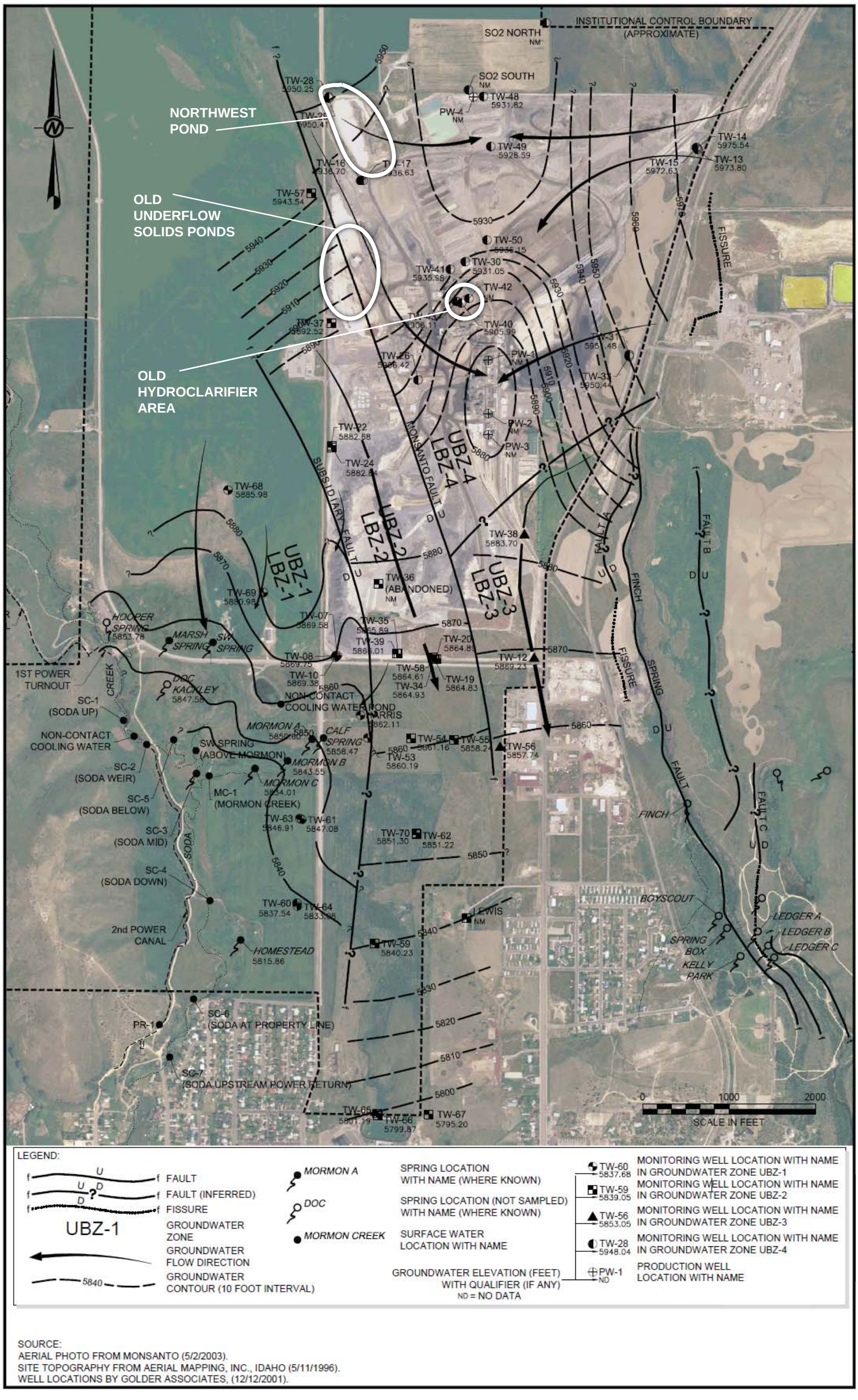


FIGURE 2
Groundwater Elevation, Monitoring Well Location, Springs, and Flow Direction in the Upper Basalt Zone (June 2012)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

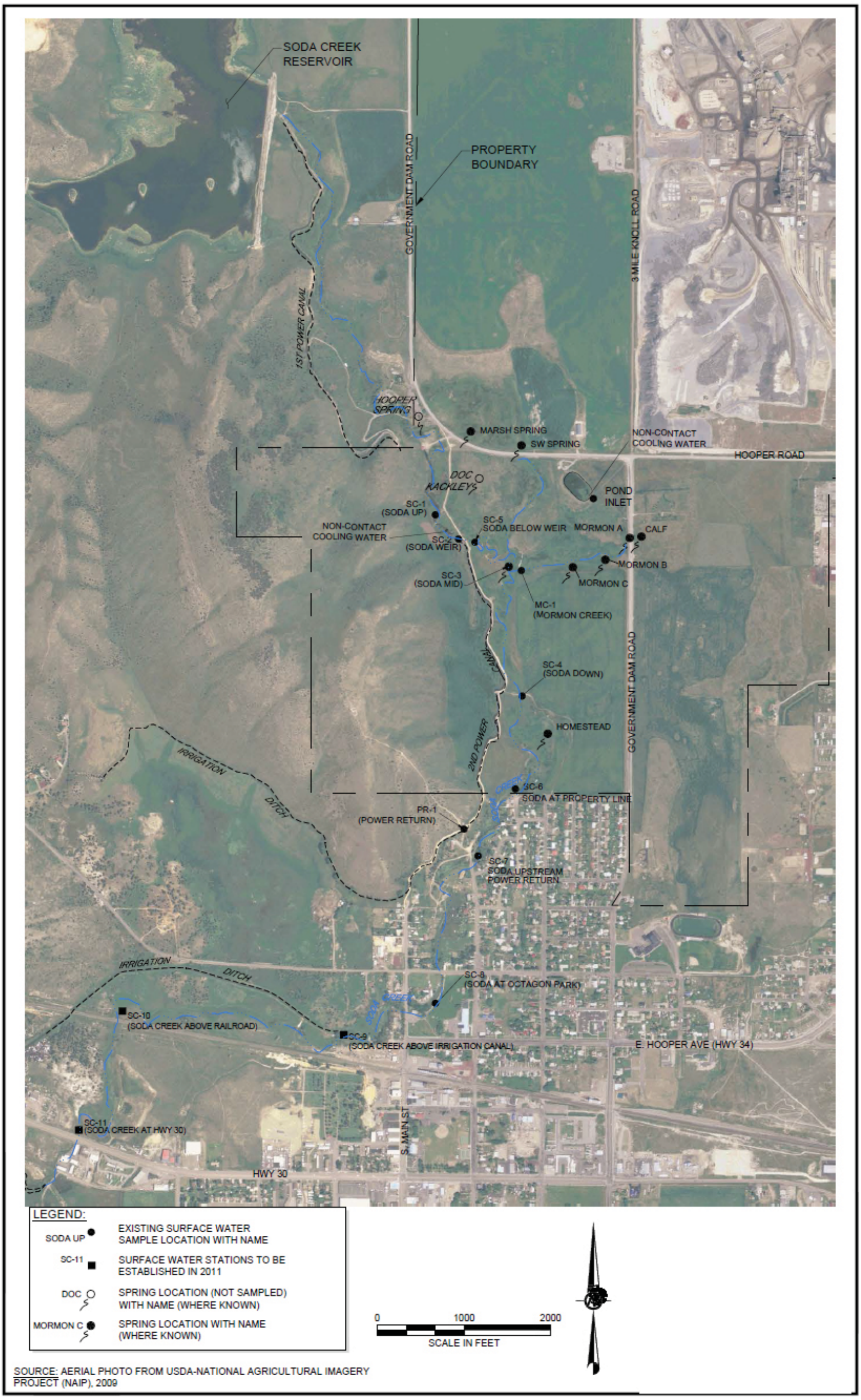


FIGURE 3
Soda Creek and Springs Sample Locations
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, Soda Springs Idaho, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

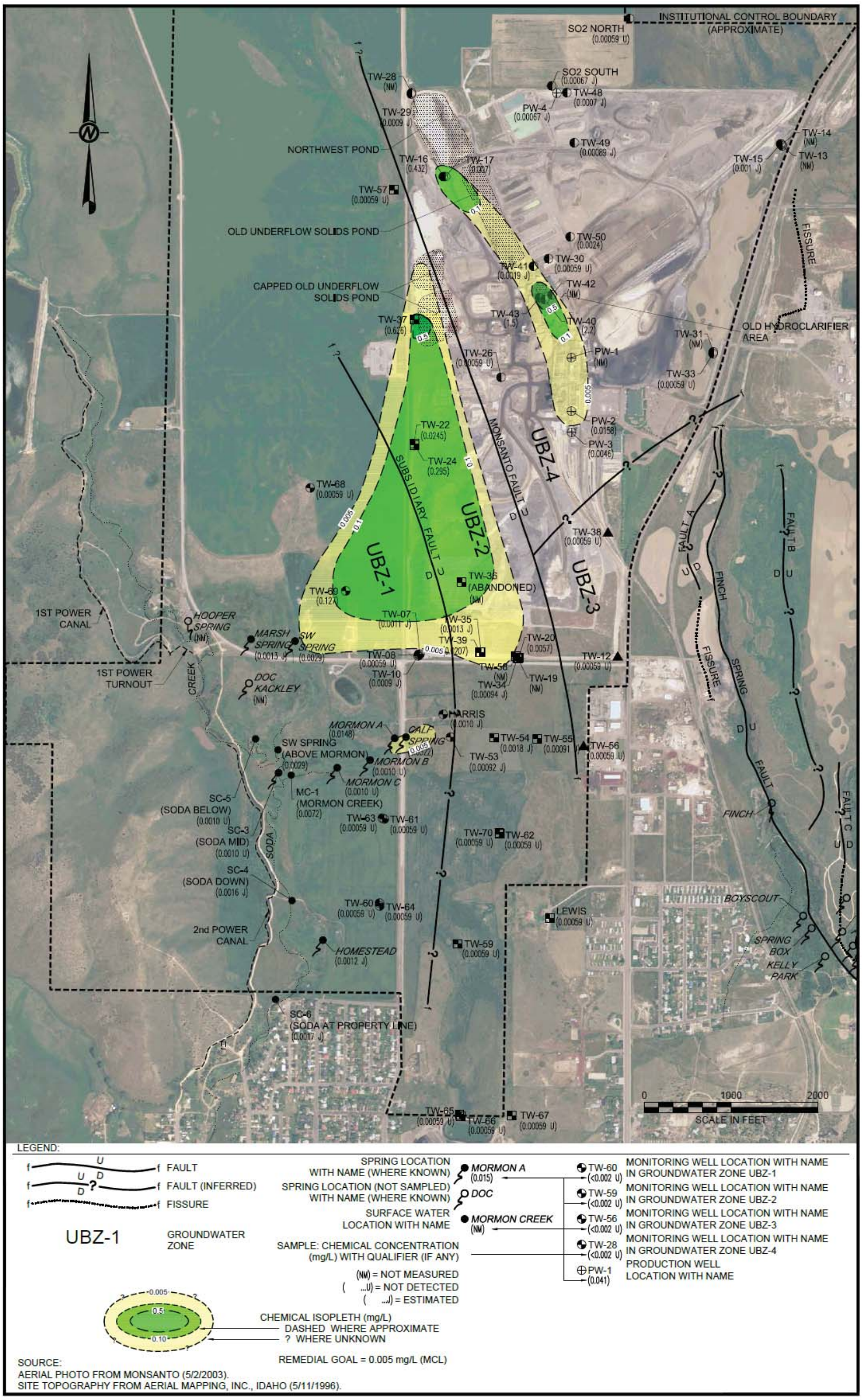


FIGURE 4
Cadmium in the Upper Basalt Zone (June 2012)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

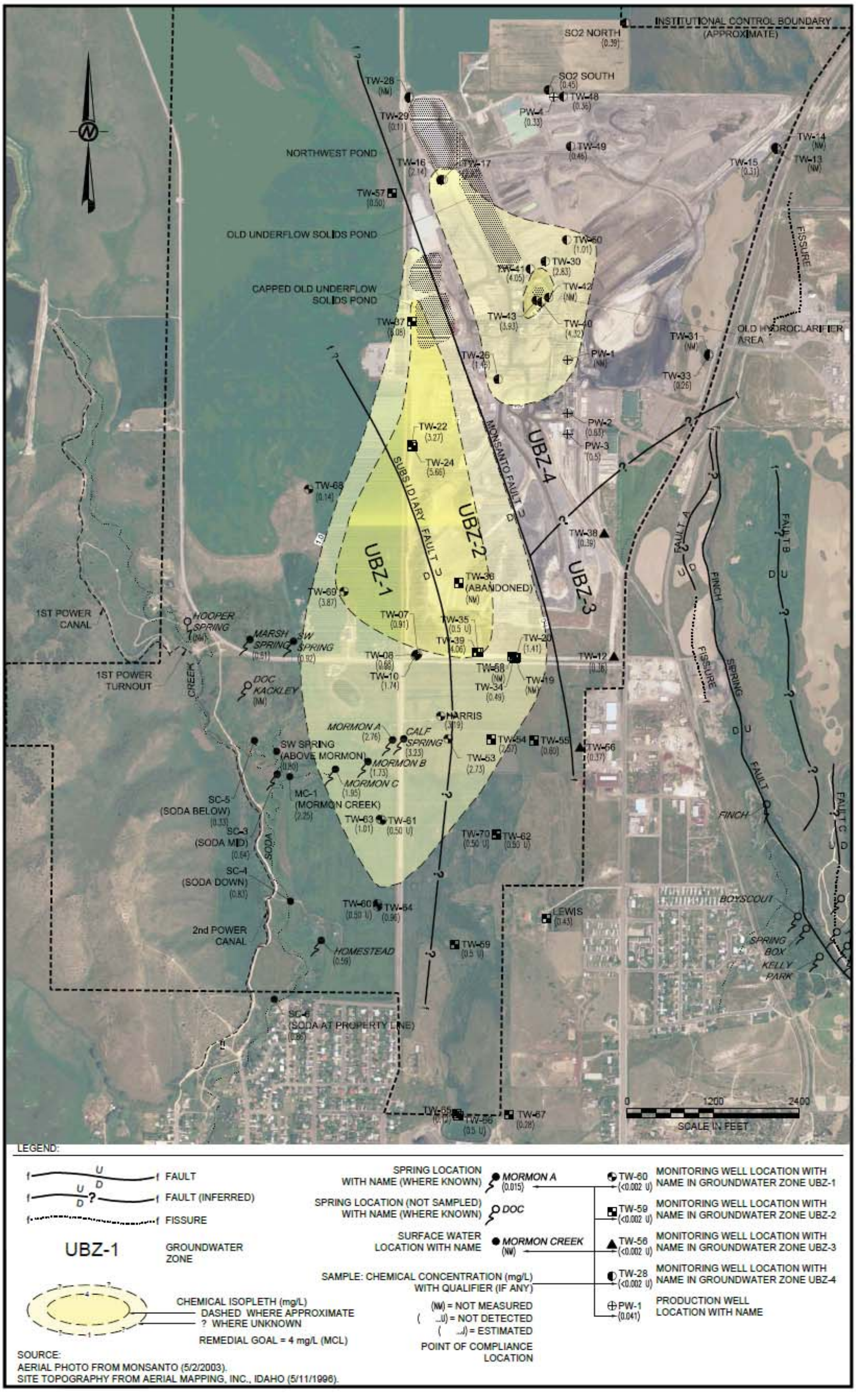


FIGURE 5
Fluoride in the Upper Basalt Zone (June 2012)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, Soda Springs Idaho, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

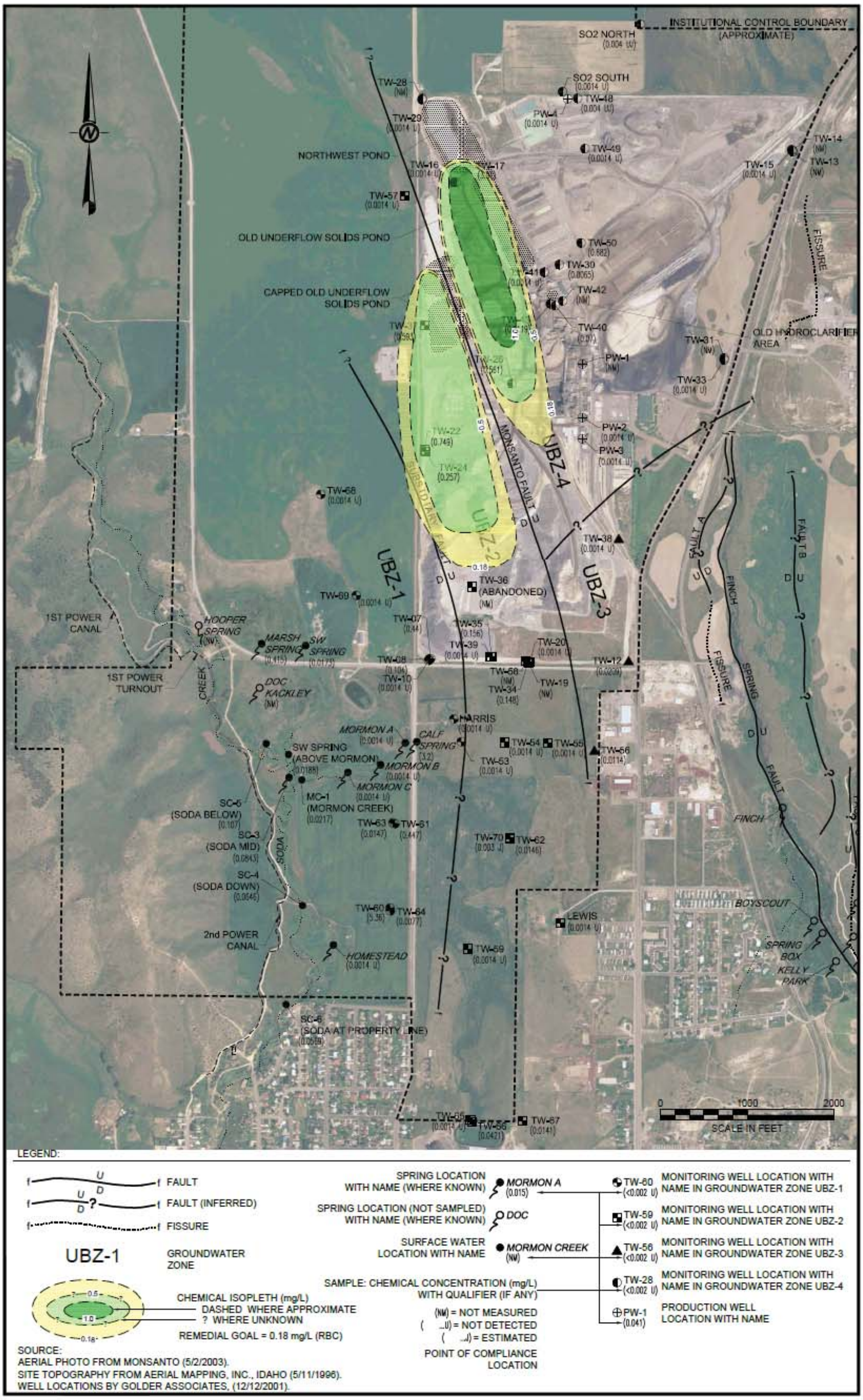


FIGURE 6
Manganese in the Upper Basalt Zone (June 2012)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, Soda Springs Idaho, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

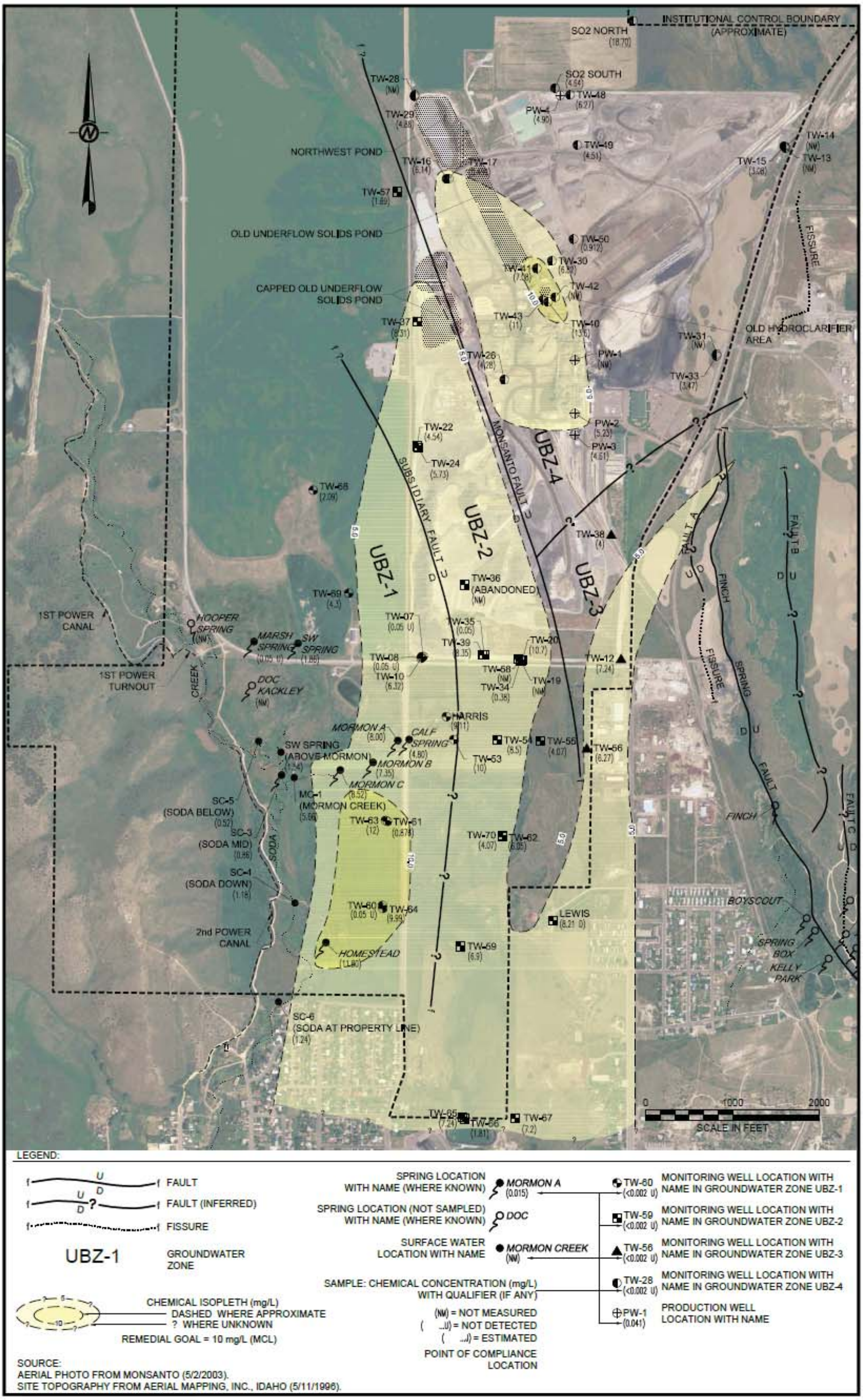


FIGURE 7
Nitrate in the Upper Basalt Zone (June 2012)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, Soda Springs Idaho, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

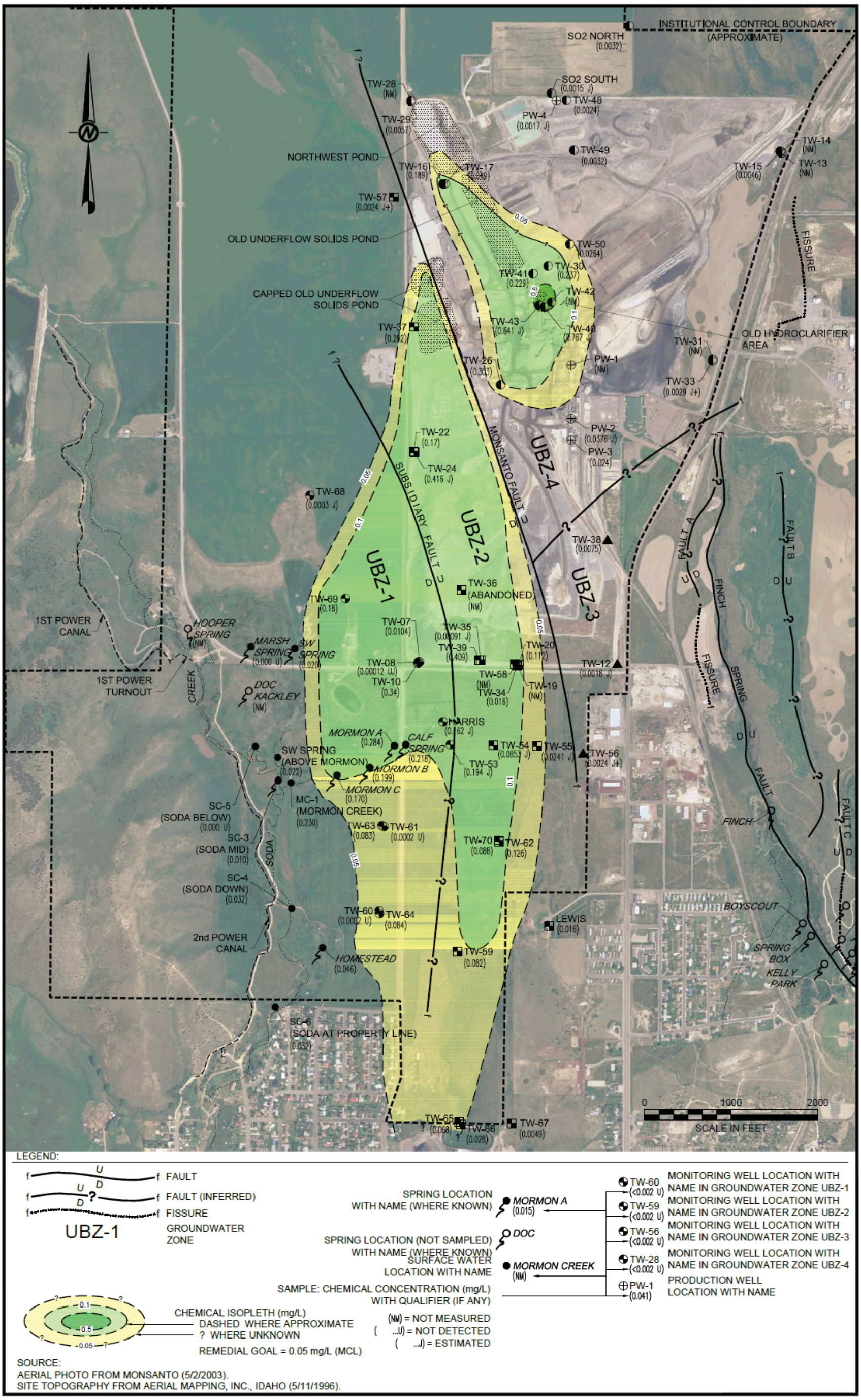


FIGURE 8
Selenium in the Upper Basalt Zone (June 2012)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

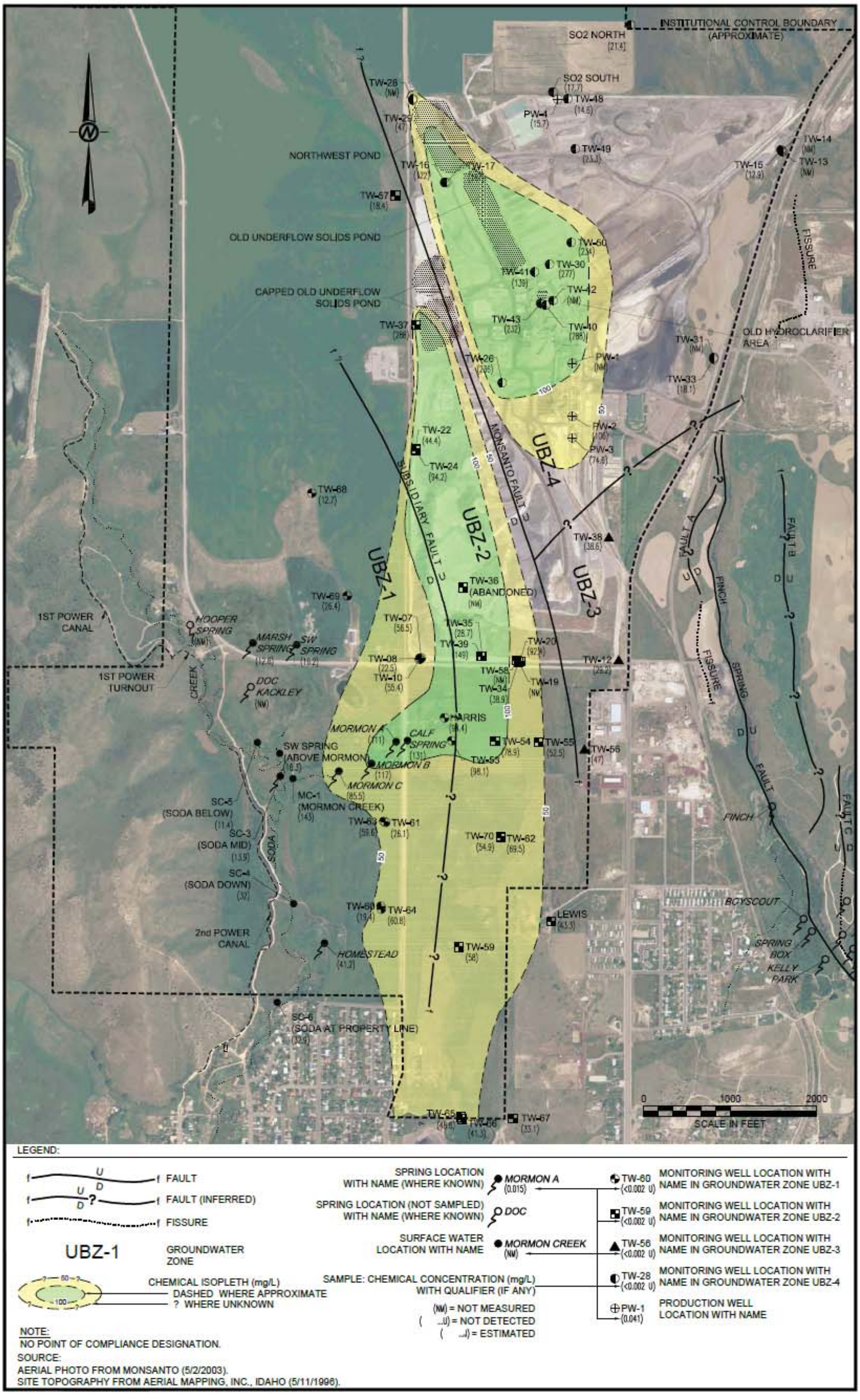


FIGURE 9
Chloride in the Upper Basalt Zone (June 2012)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, Soda Springs Idaho, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

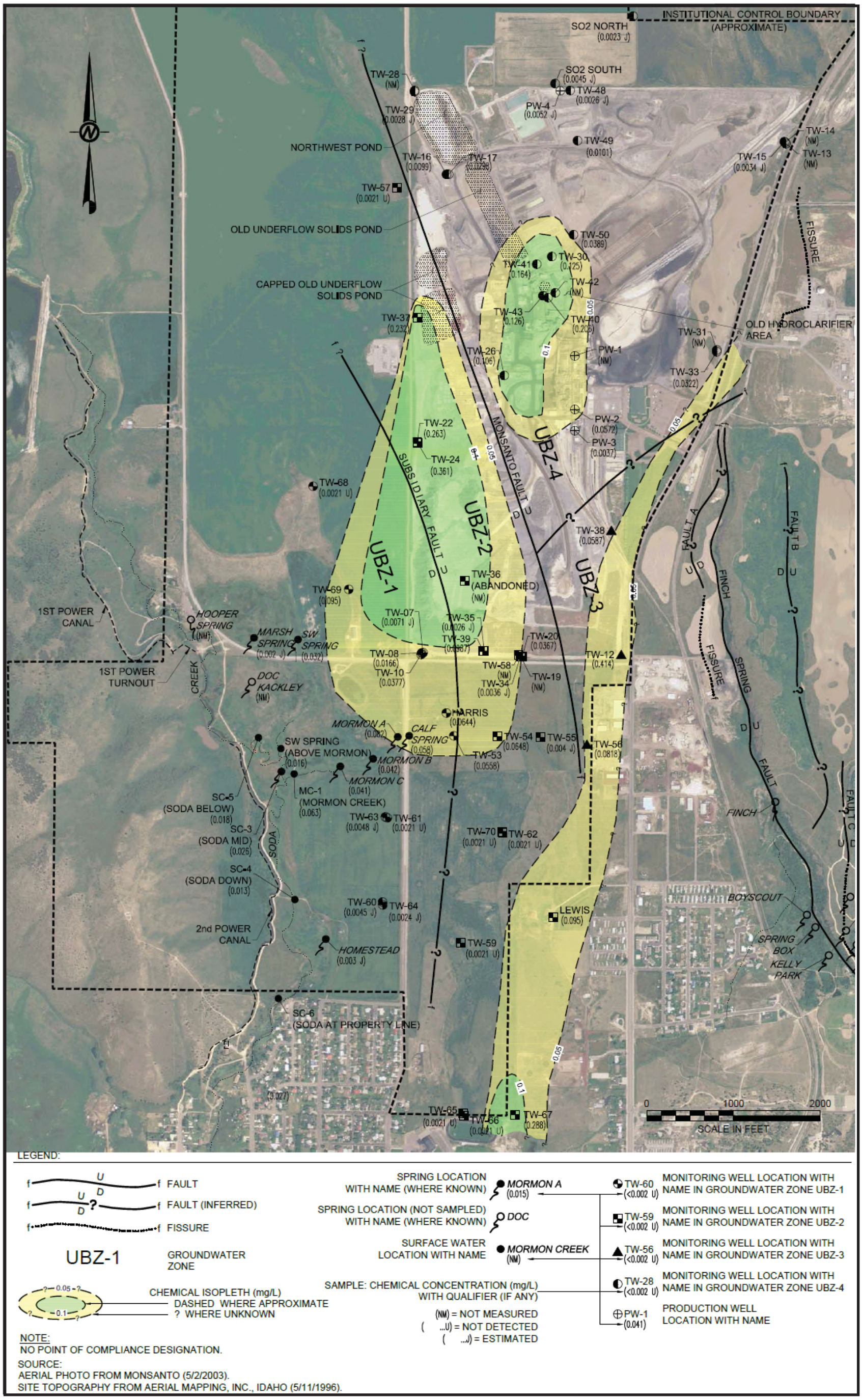


FIGURE 10
Molybdenum in the Upper Basalt Zone (June 2012)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

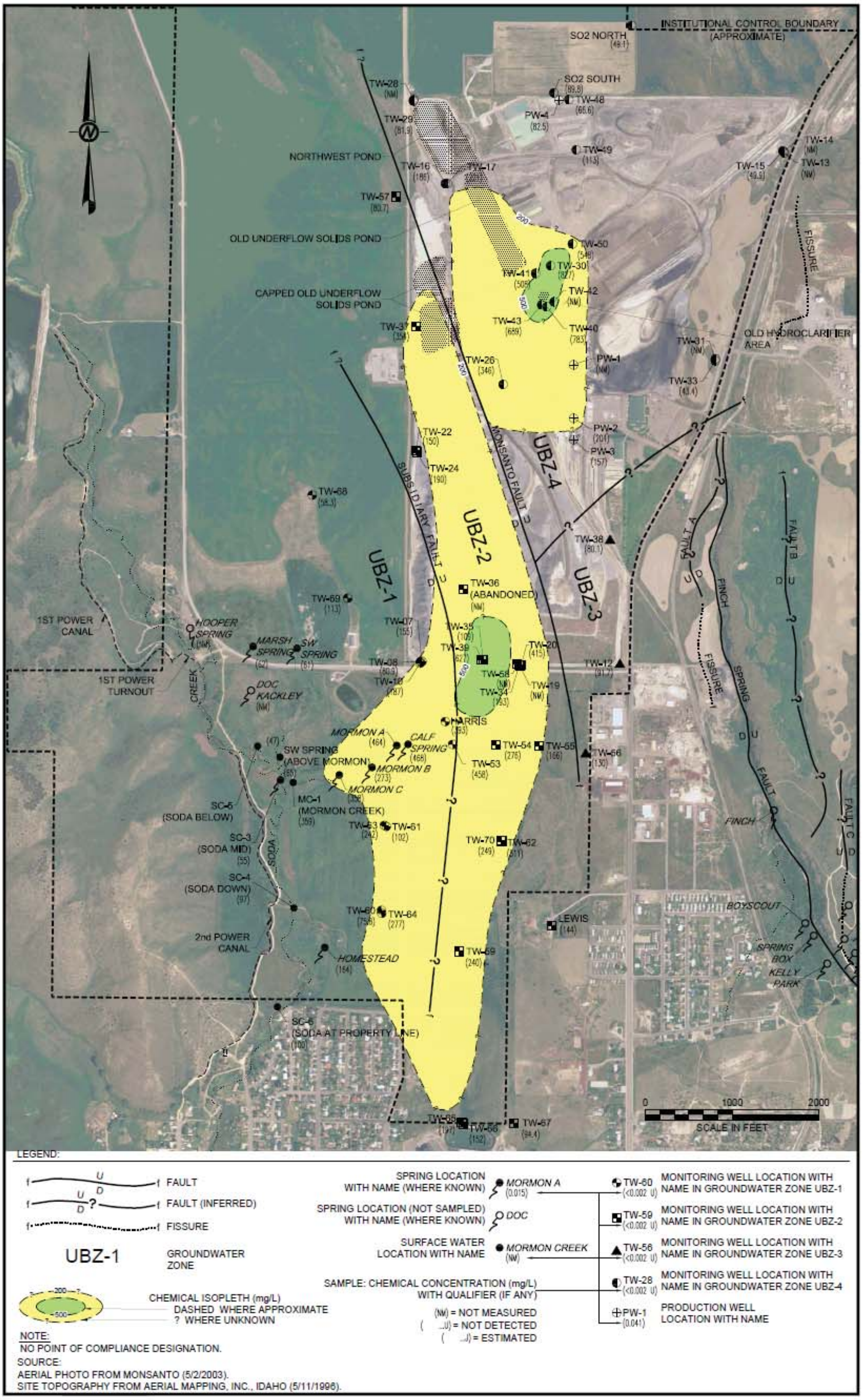


FIGURE 11
Sulfate in the Upper Basalt Zone (June 2012)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, Soda Springs Idaho, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

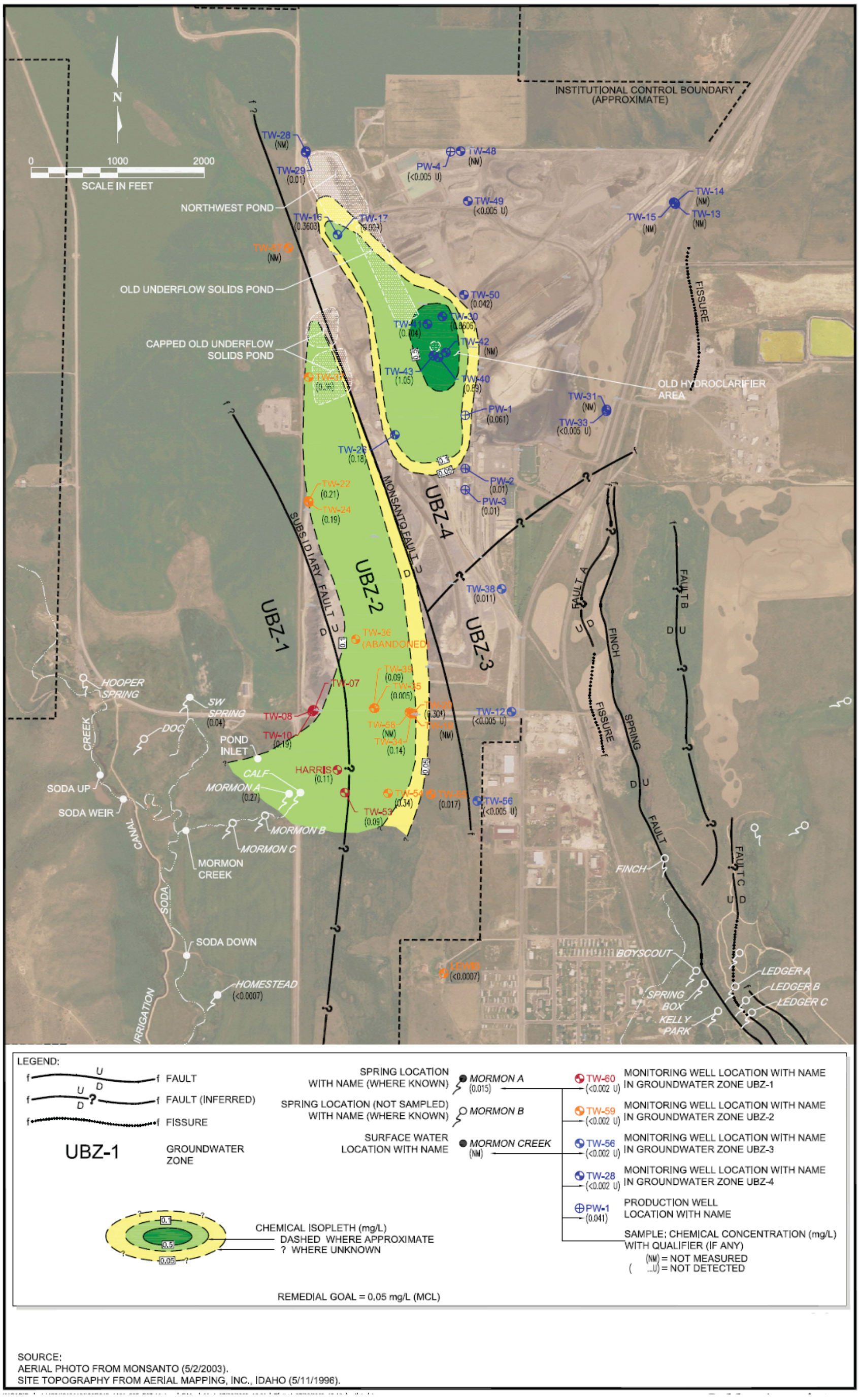
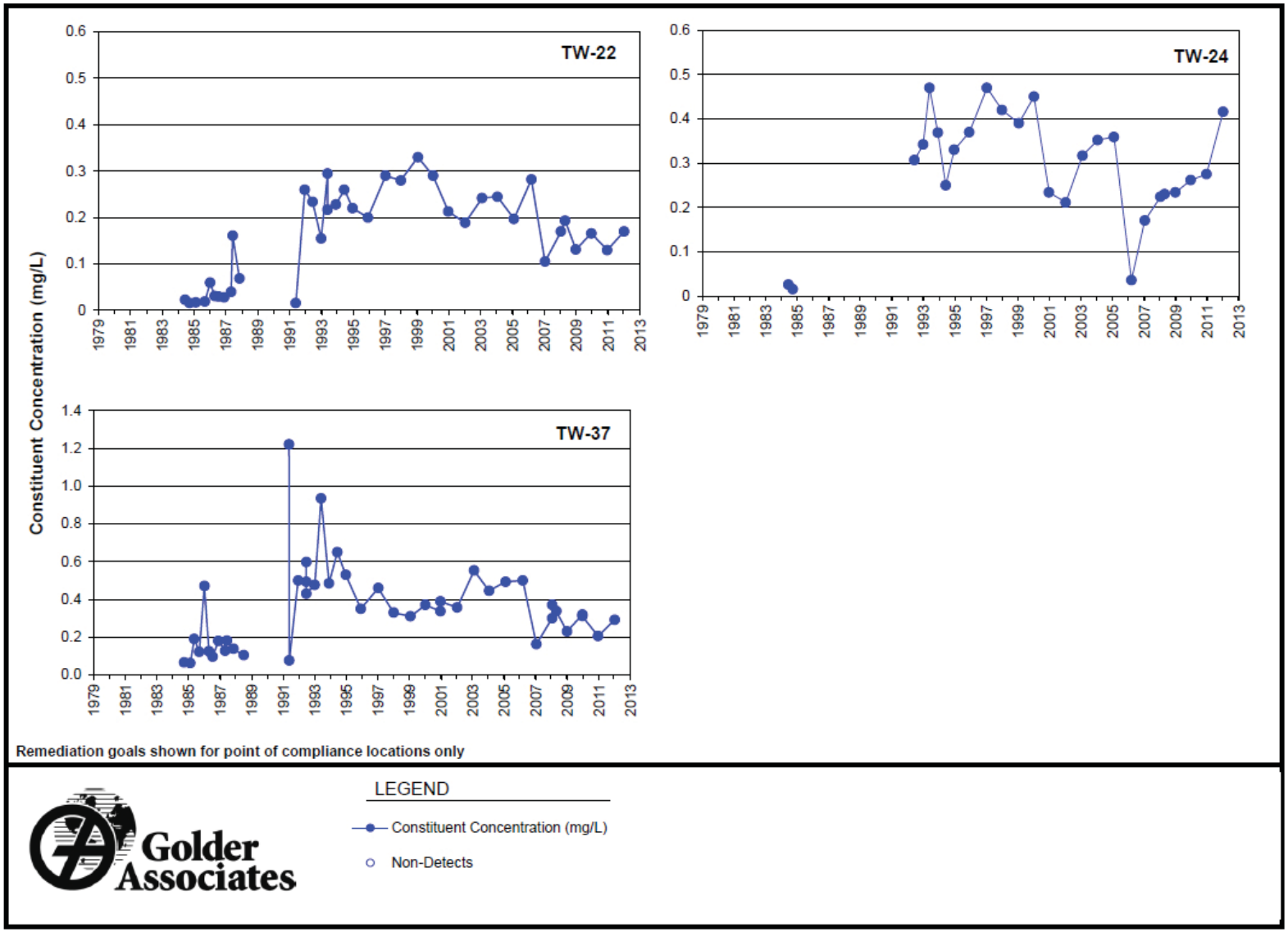


FIGURE 12
Selenium of the Upper Basalt Zone (June 2002)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: Second Five-Year Review Report for Groundwater Conditions at the Monsanto Soda Springs Plant, Soda Springs, Idaho, July 2008, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.



Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 13
Selenium in Old Underflow Solids Pond Area Wells (UBZ 2 Source Area)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

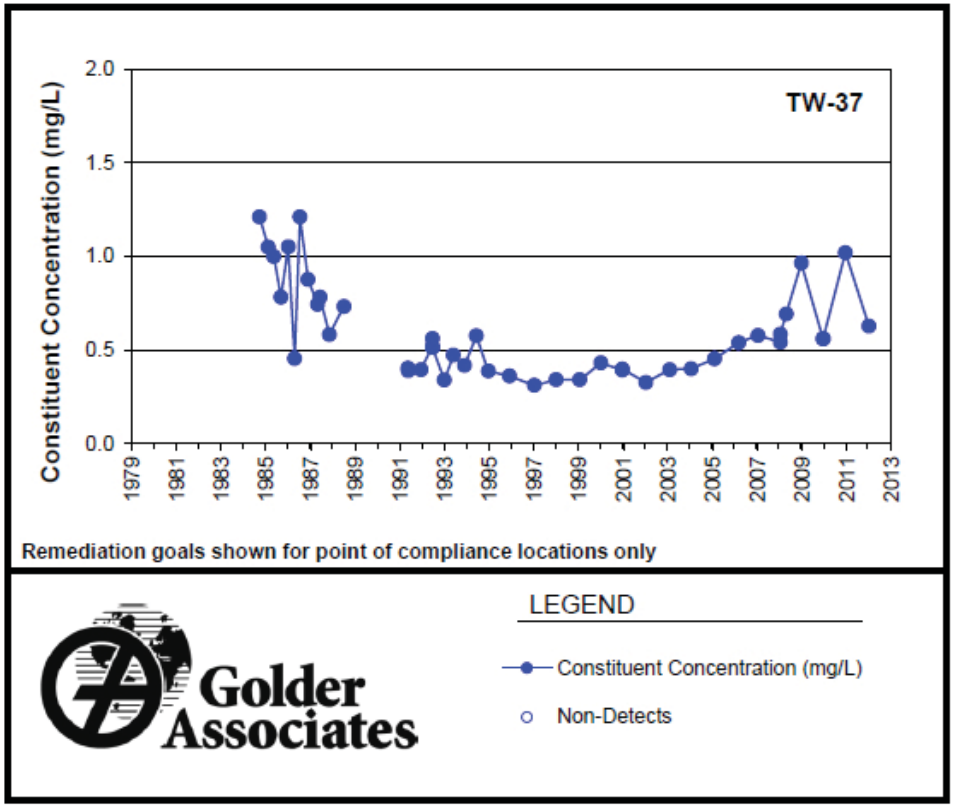
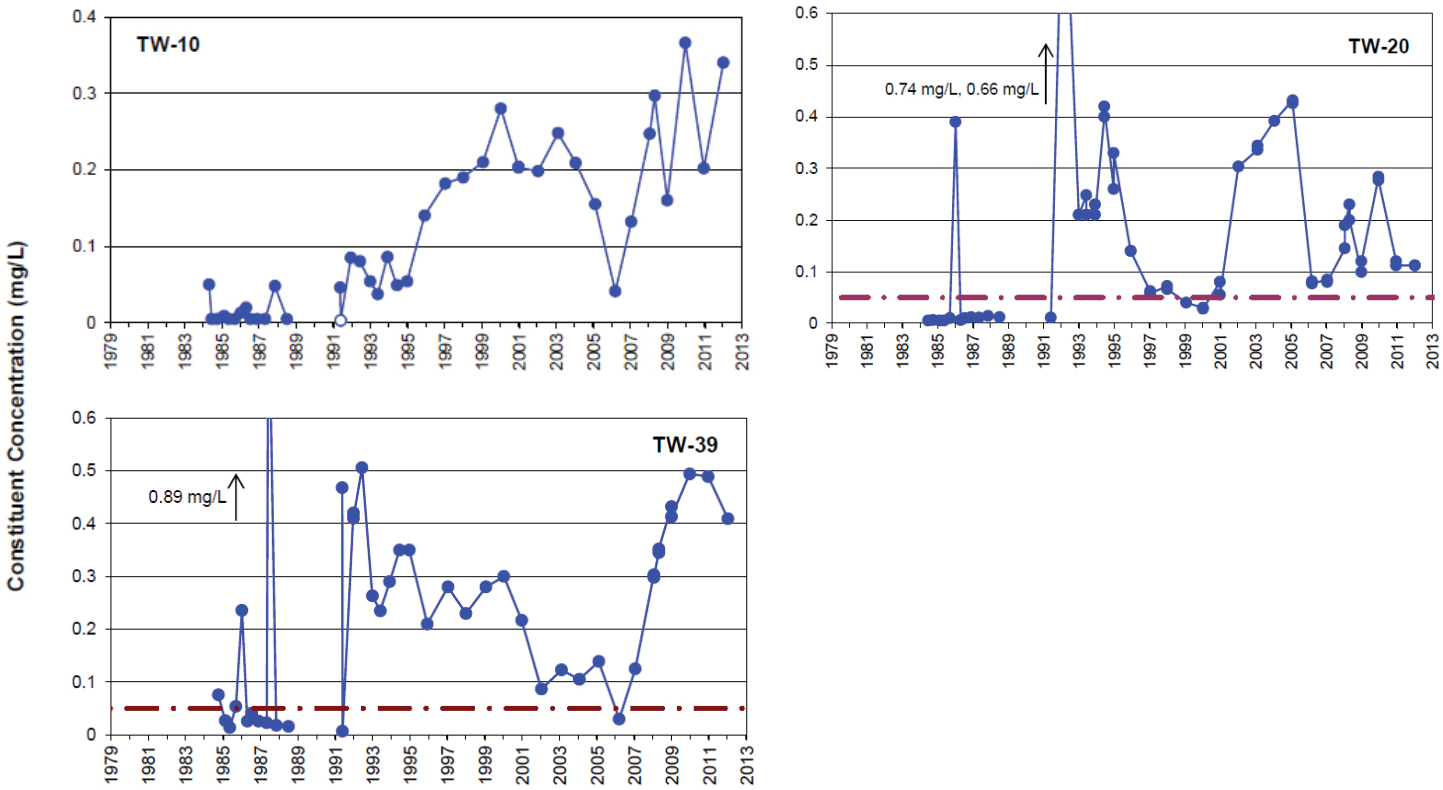


FIGURE 14
Cadmium in Old Underflow Solids Pond Area Wells (UBZ 2 Source Area)

Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.



Golder Associates

LEGEND

Constituent Concentration (mg/L)

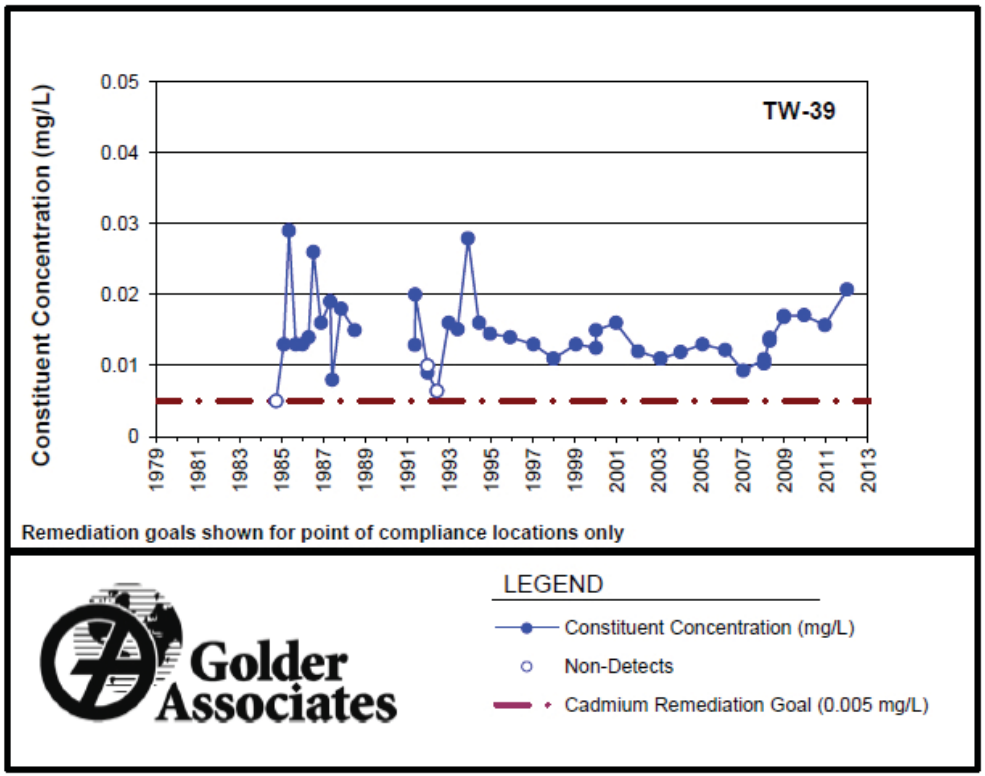
non-detects

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 15

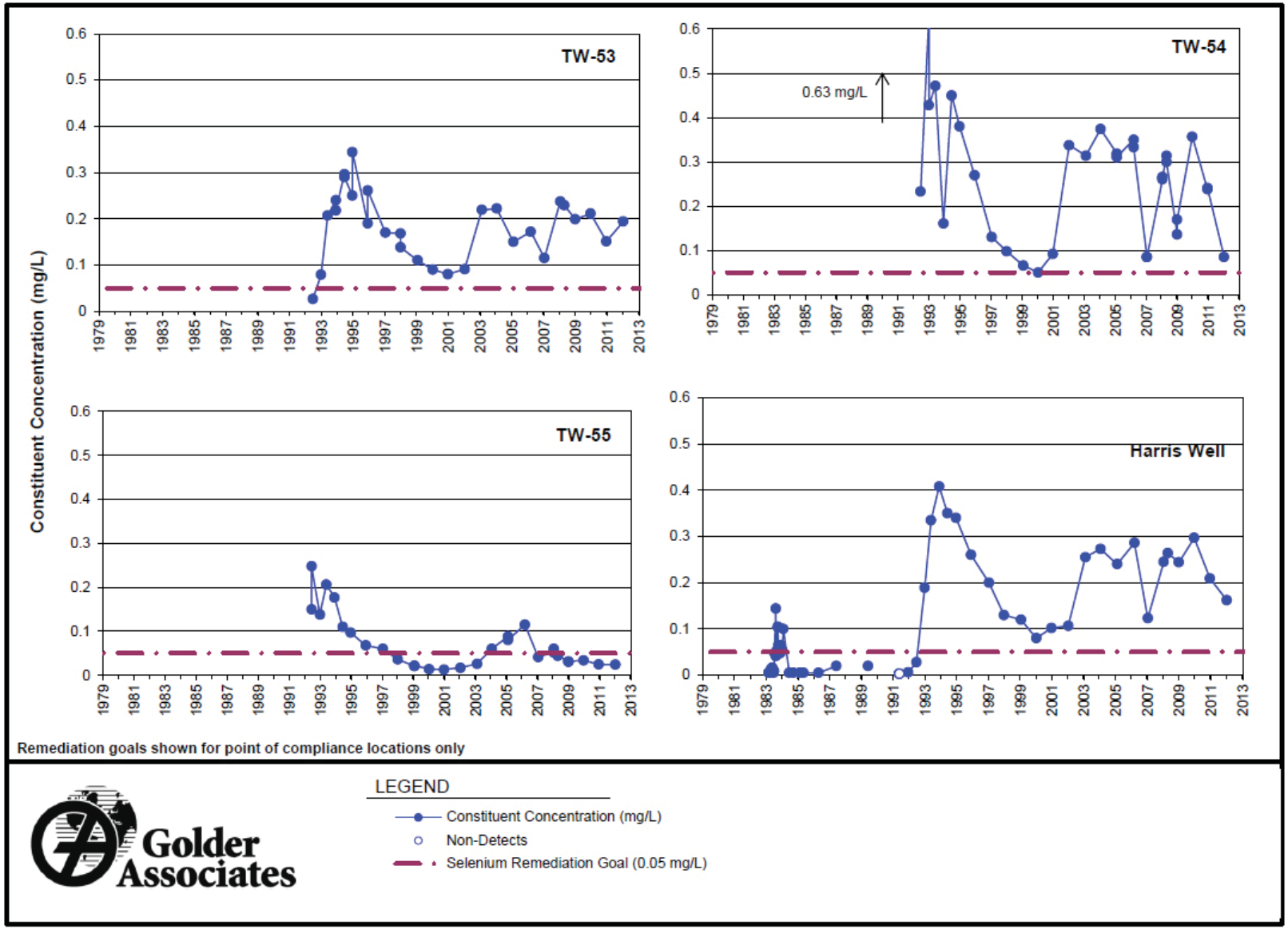
Selenium in South Fenceline and Southwest Corner Wells (UBZ-1 and 2 Downgradient)

Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



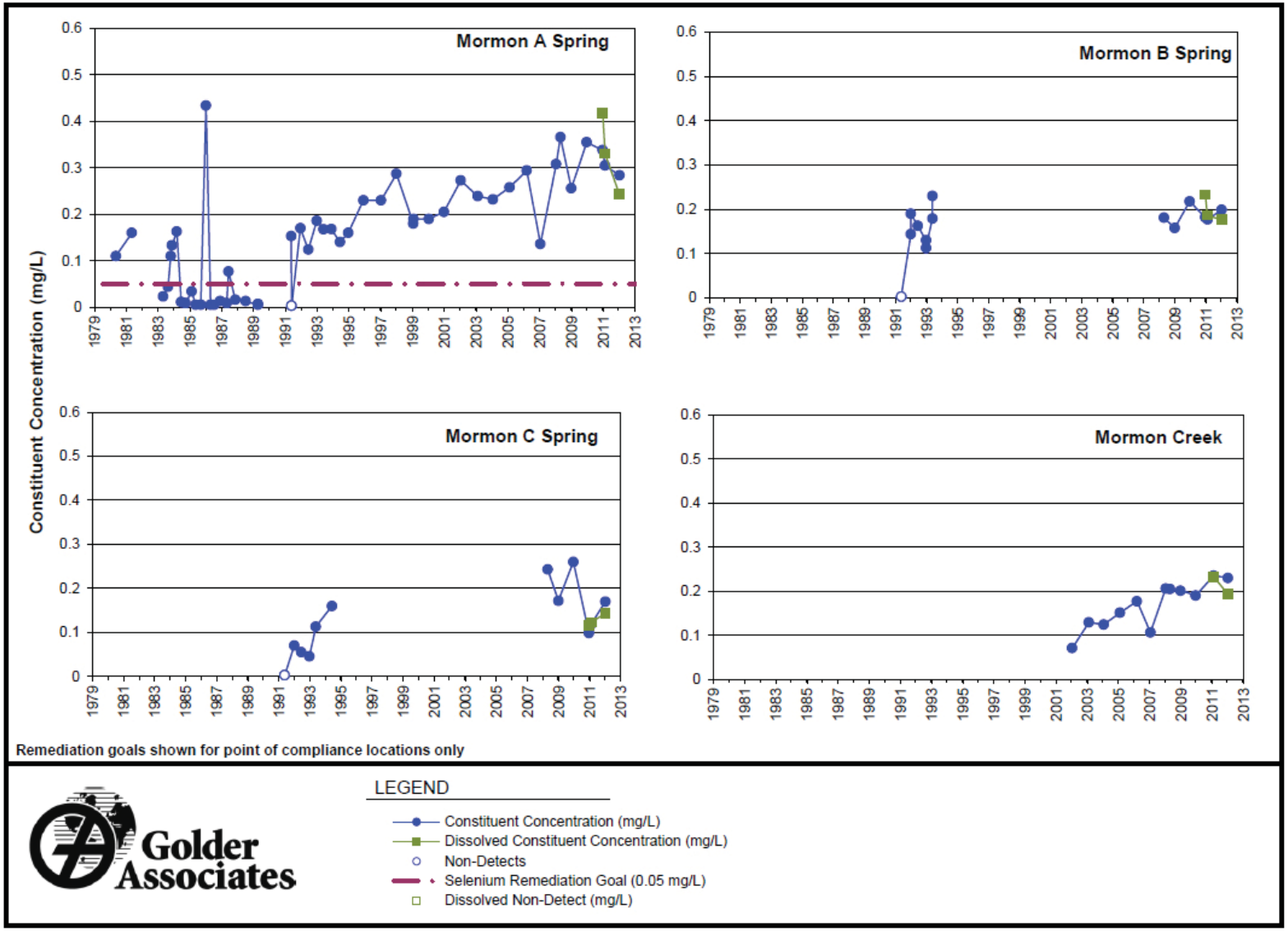
Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 16
Cadmium in South Fenceline POC Well (UBZ 2, Down-gradient)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



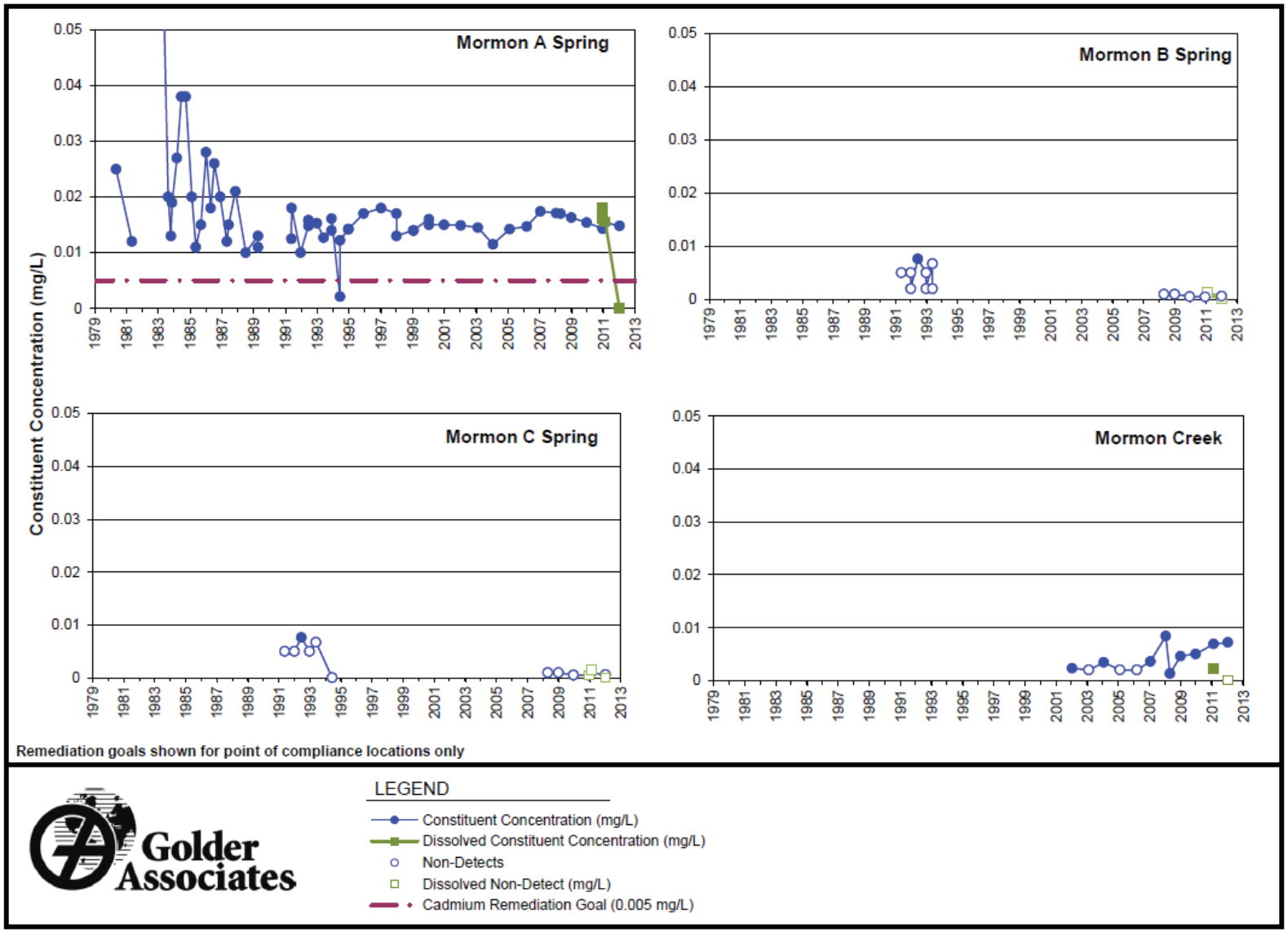
Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 17
Selenium in Southern Boundary Wells (UBZ 1/2, Down-gradient)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



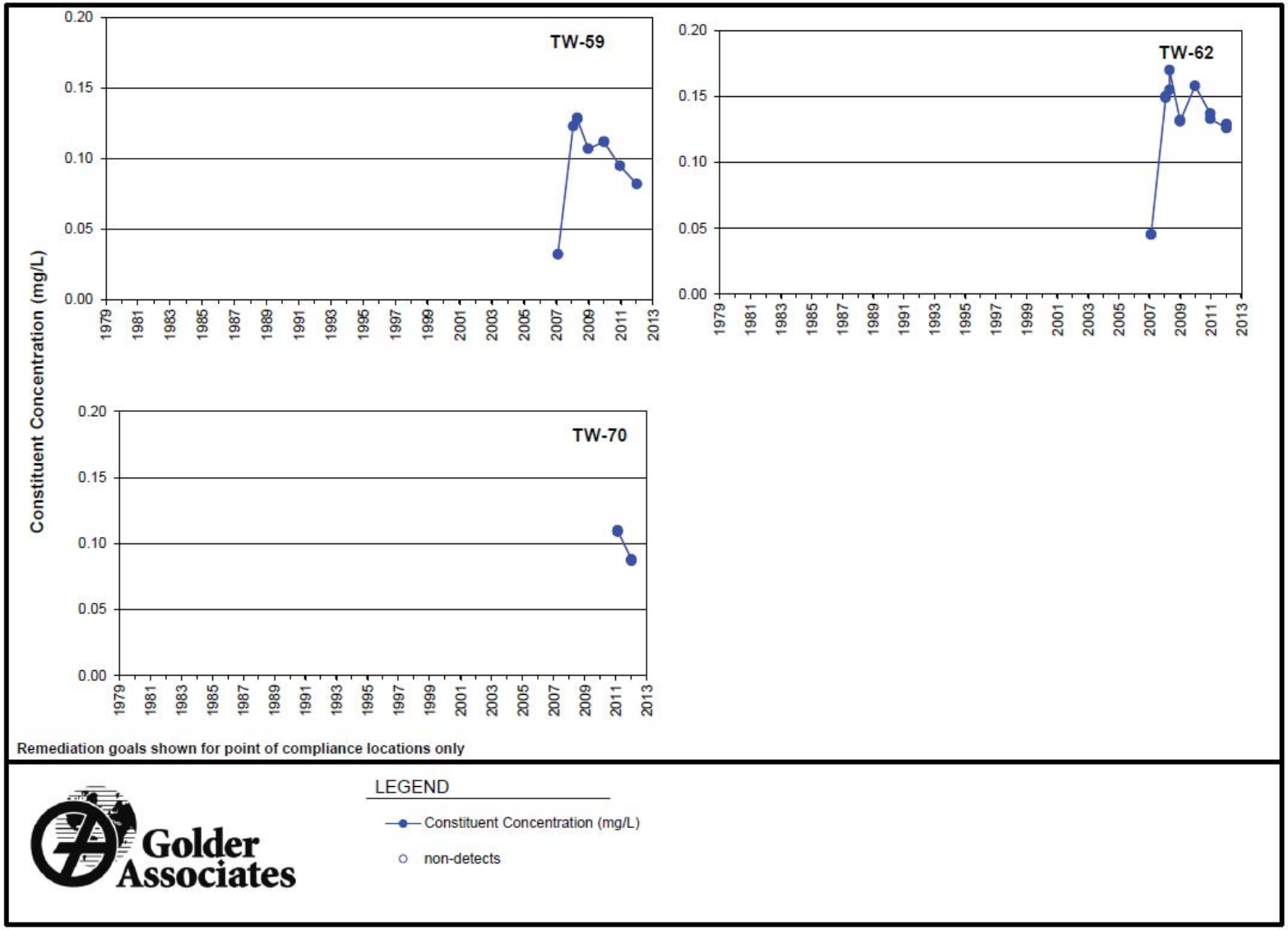
Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 18
Selenium in Mormon A, B, and C Springs and Mormon Creek (UBZ-1 and 2 Downgradient)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 19
Cadmium in Mormon A, B, and C Springs and Mormon Creek (UBZ-1 and 2 Downgradient)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 20
Selenium in UBZ-2 Wells South of Southern Boundary Wells (UBZ-1 and 2 Downgradient)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

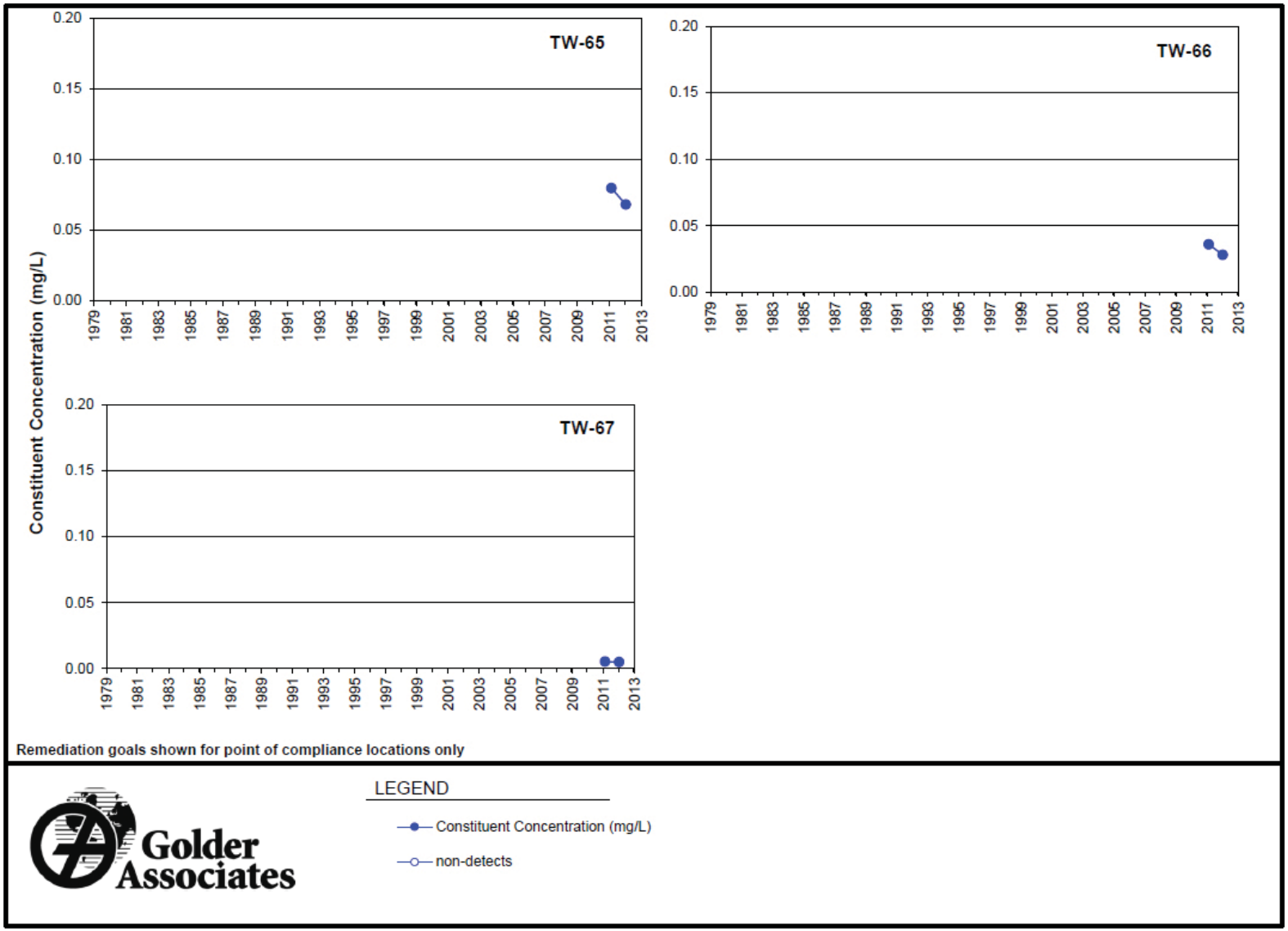


FIGURE 21
Selenium in UBZ-2 Wells at South Property Line (UBZ-1 and 2 Downgradient)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

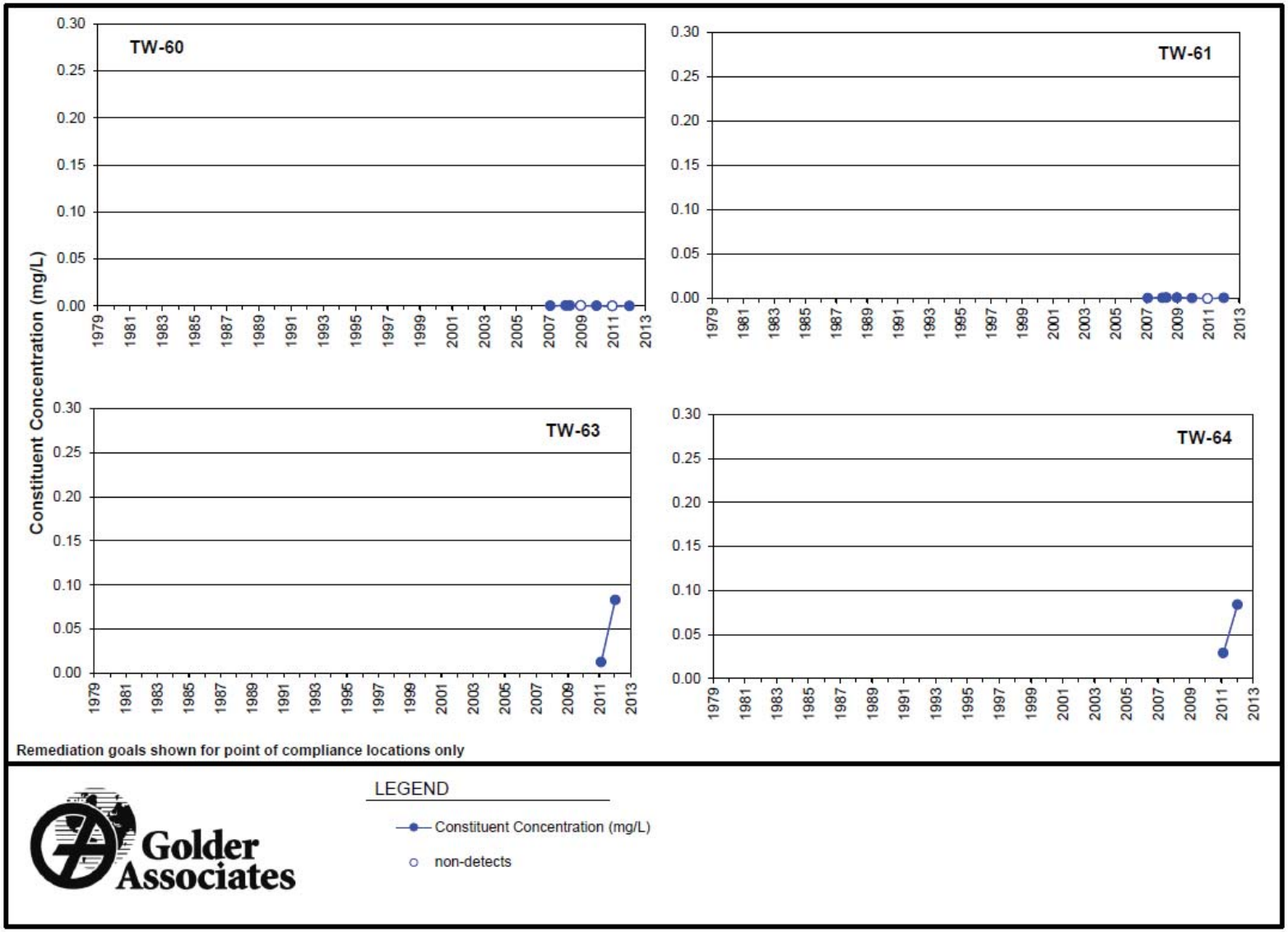
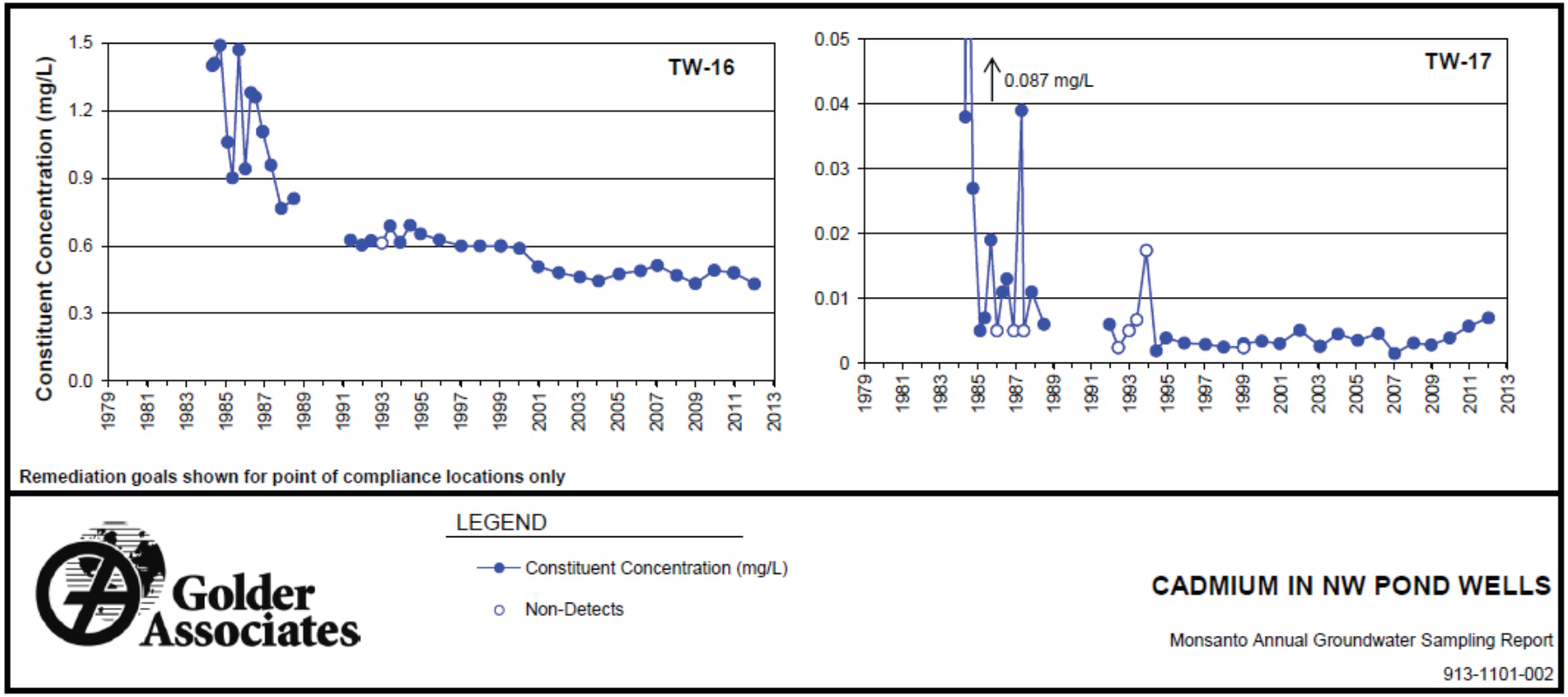


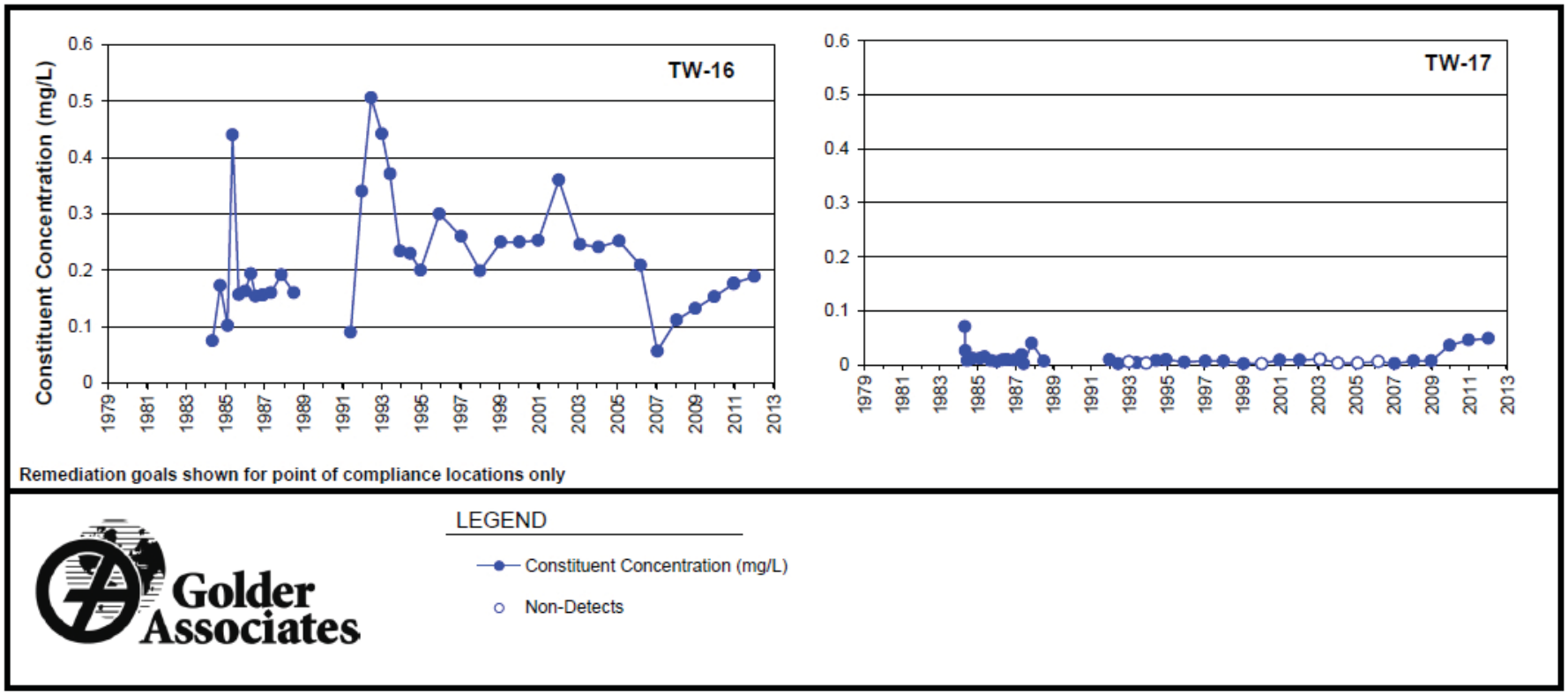
FIGURE 22
Selenium in UBZ-2 Wells Southwest of the Plant (UBZ-1 and 2 Downgradient)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: Revised 2009 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, Soda Springs, Idaho January 6, 2011, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.



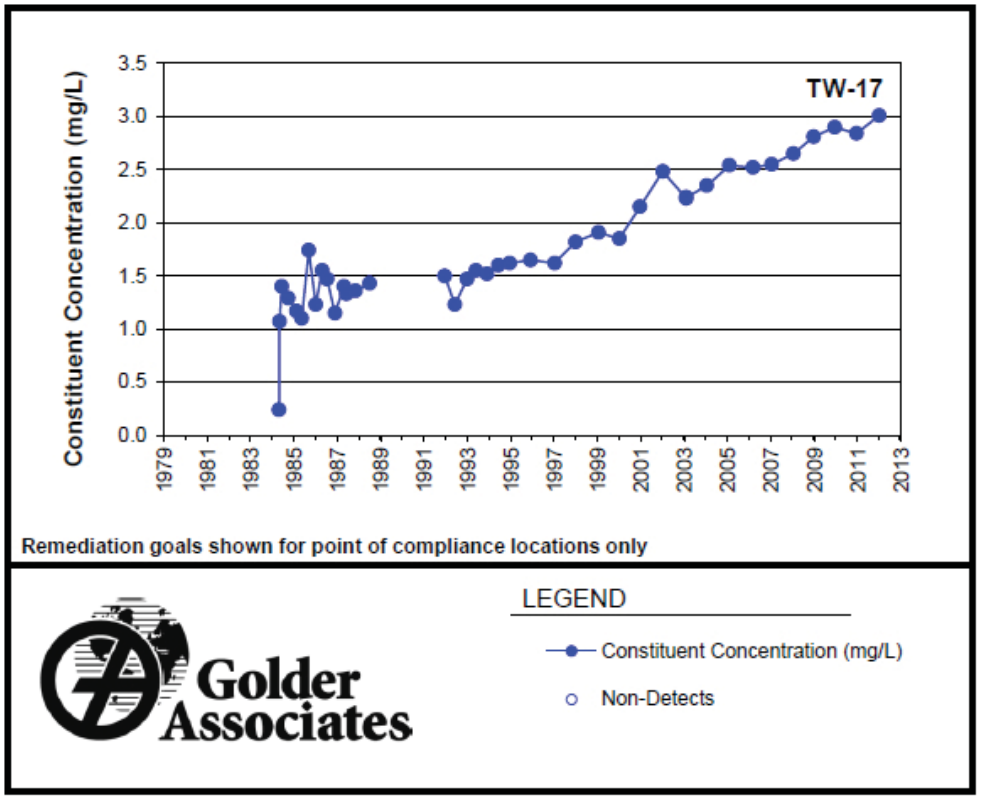
Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 23
Cadmium in Northwest Pond Wells (UBZ-4 Source Area)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



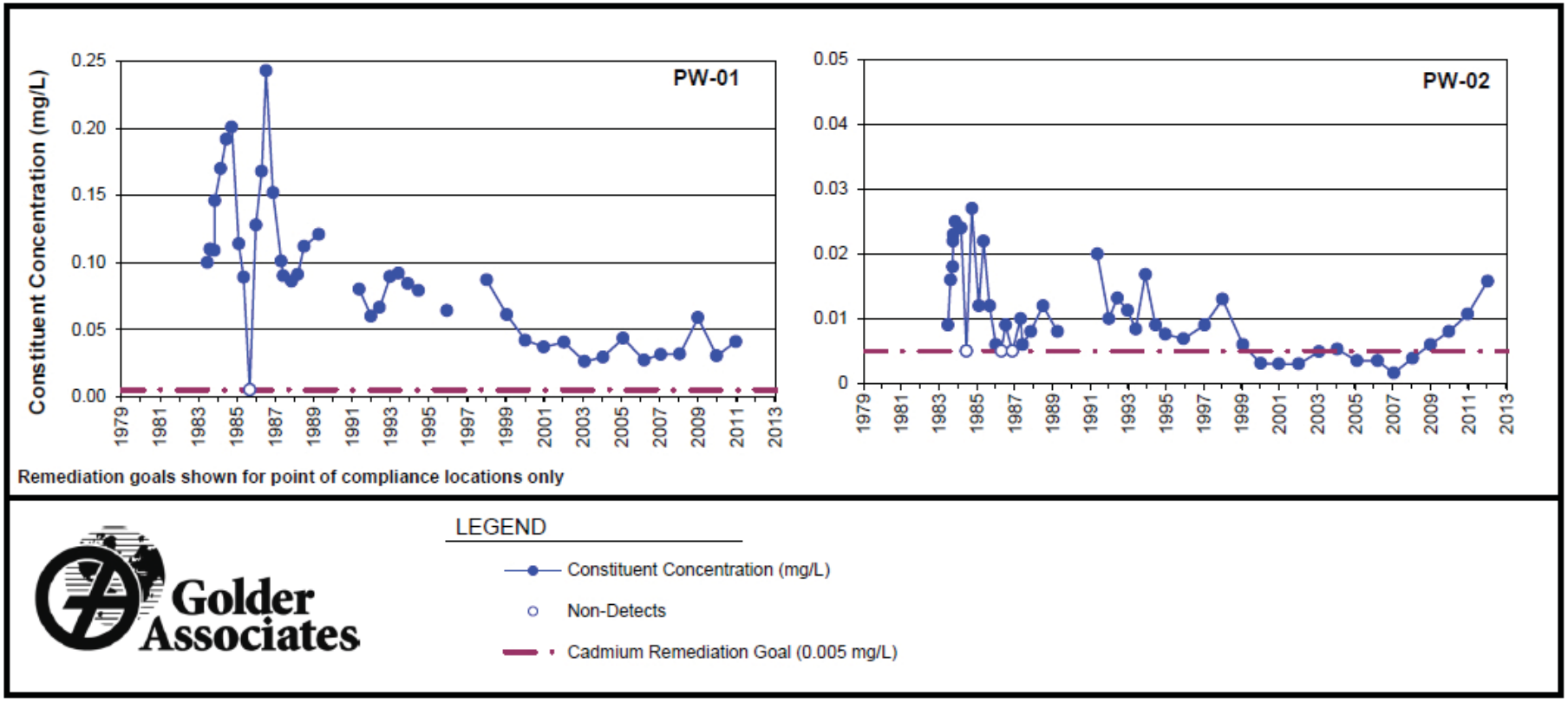
Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 24
Selenium in Northwest Pond Wells (UBZ-4 Source Area)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 25
Manganese in Northwest Pond Wells (UBZ-4 Source Area)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 26
Cadmium in Production Wells (UBZ-4 Source Area)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

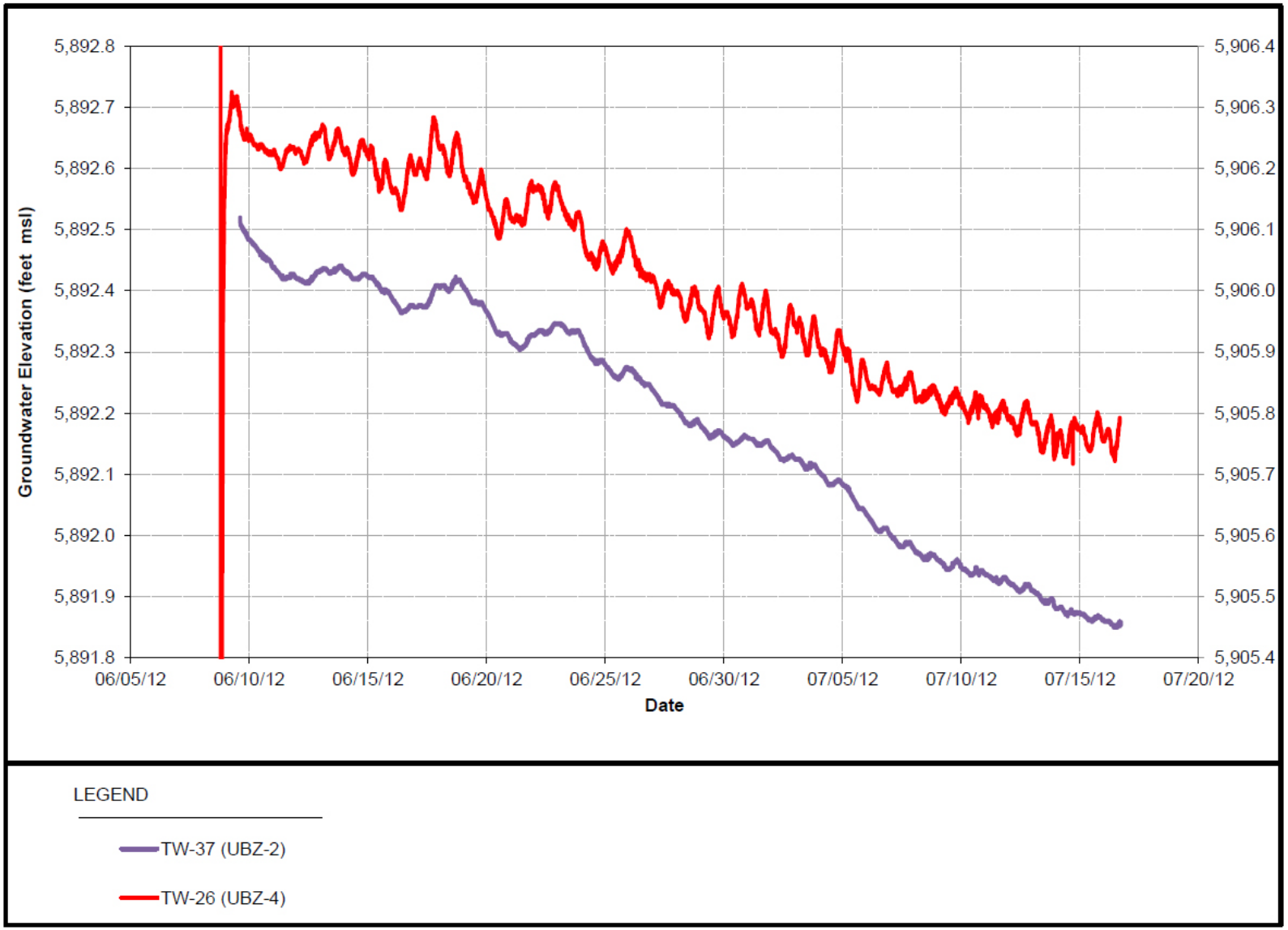
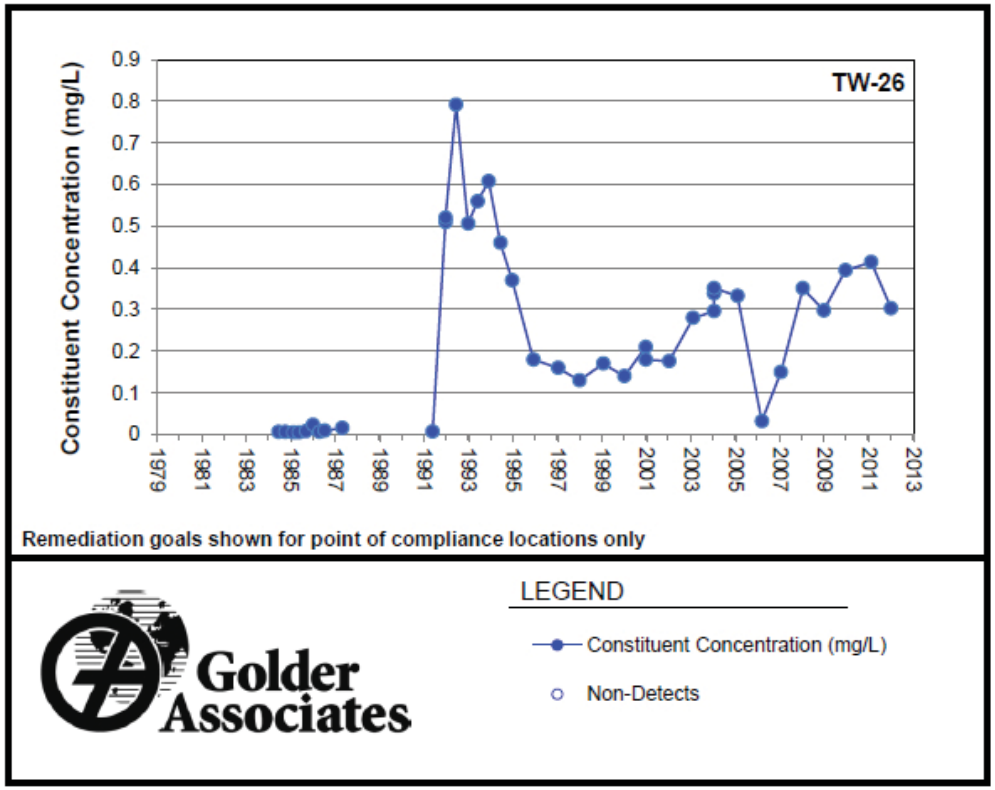


FIGURE 27
Groundwater Elevation Response to Plant Well Pumping (TW-26 and TW-37)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: Source Area Characterization - UBZ-2, Monsanto Soda Springs Idaho Plant, October 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.



Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 28
Selenium in Hydroclarifier and Plant Area Well TW-26 (UBZ-4 Downgradient)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

LEGEND:

SODA UP ● SURFACE WATER SAMPLE LOCATION WITH NAME

DOC ○ SPRING LOCATION (NOT SAMPLED) WITH NAME (WHERE KNOWN)

MORMON C ● SPRING LOCATION WITH NAME (WHERE KNOWN)

(0.0037) SAMPLE: CHEMICAL CONCENTRATION (mg/L) WITH QUALIFIER (IF ANY)

(NM) = NOT MEASURED

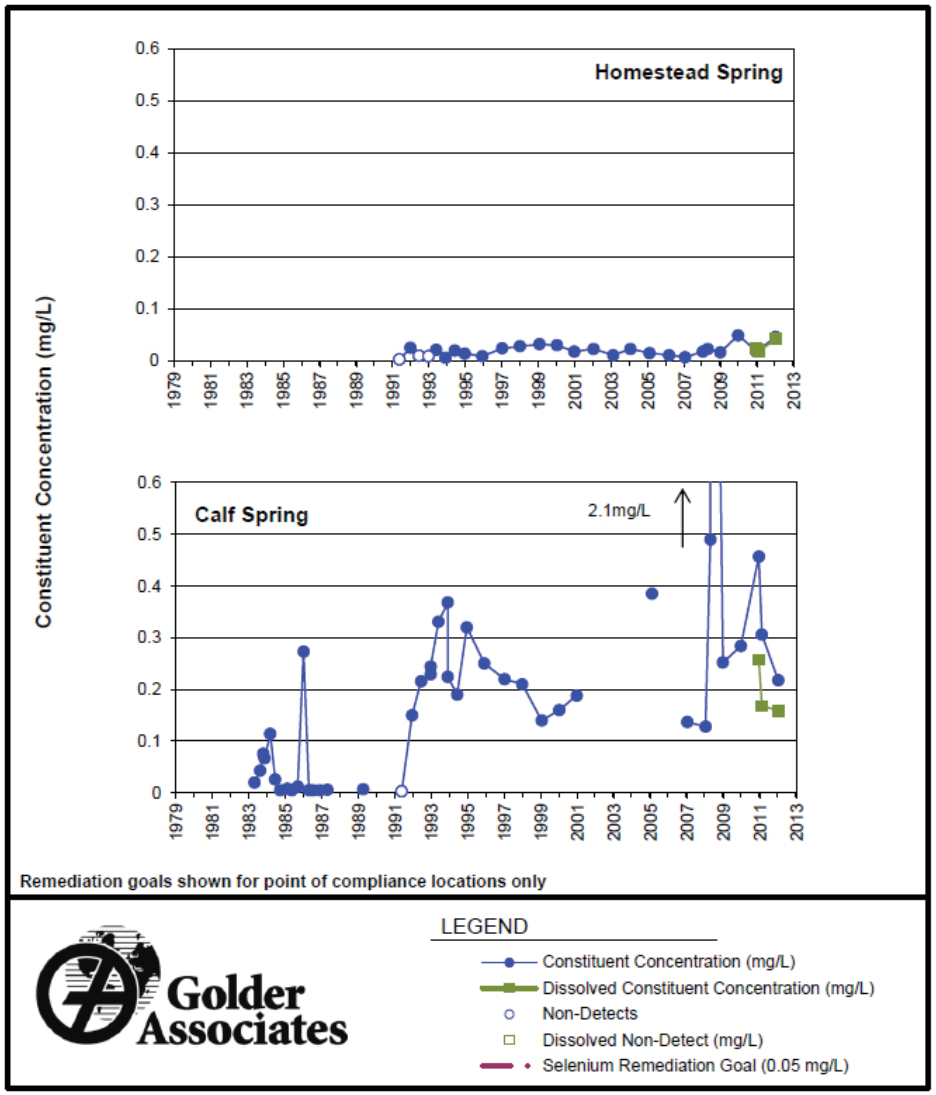
(...U) = NOT DETECTED

(...J) = ESTIMATED

SOURCE: AERIAL PHOTO FROM USDA-NATIONAL AGRICULTURAL IMAGERY PROJECT (NAIP), 2009

FIGURE 29
Selenium Concentrations in Springs and Surface Water
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.



Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 30
Selenium in Springs South of Plant (UBZ-1 and 2 Downgradient)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

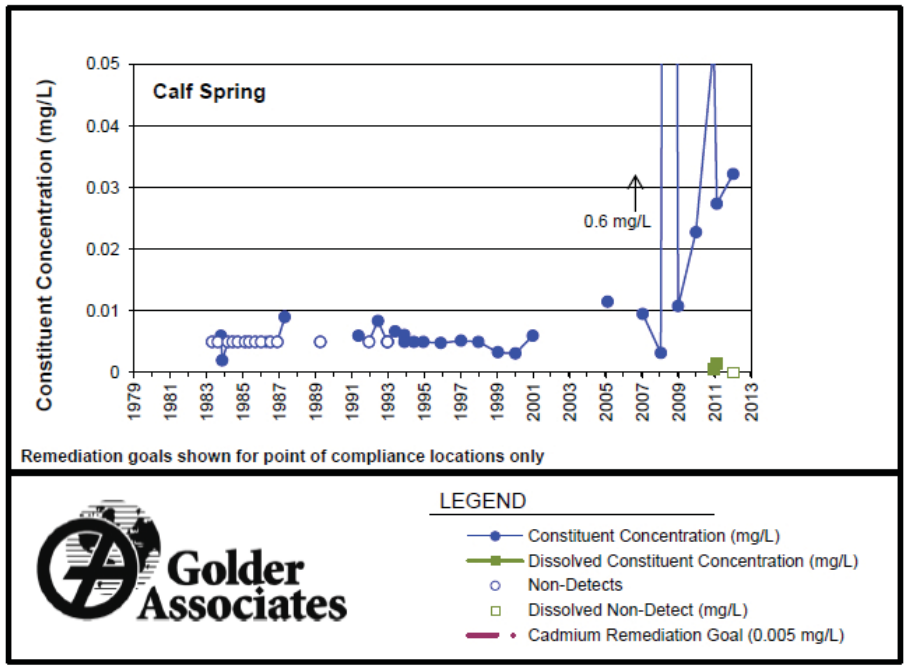
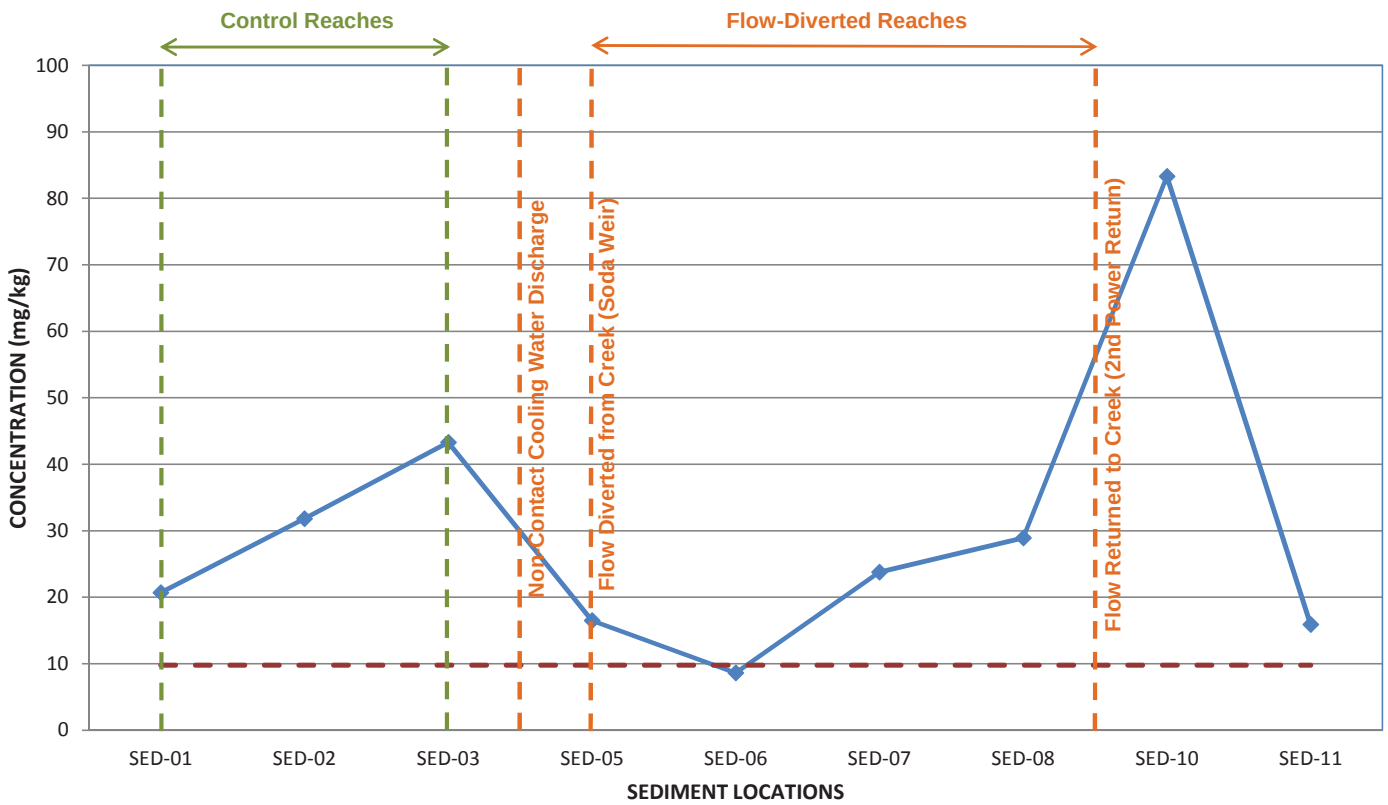


FIGURE 31
Cadmium in Springs South of Plant (UBZ-1 and 2 Downgradient)
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: 2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington.
Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 32
Locations of the Sediment Sample Reaches in Soda Creek
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: Draft Soda Creek Sediment Sampling and Analysis Third CERCLA Five-Year Review, Monsanto Soda Springs Plant, Soda Springs Idaho, December 5, 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.



Golder Associates

LEGEND

- Sediment Concentration (mg/kg)
- Non-detect
- Sediment Benchmark (mg/kg)

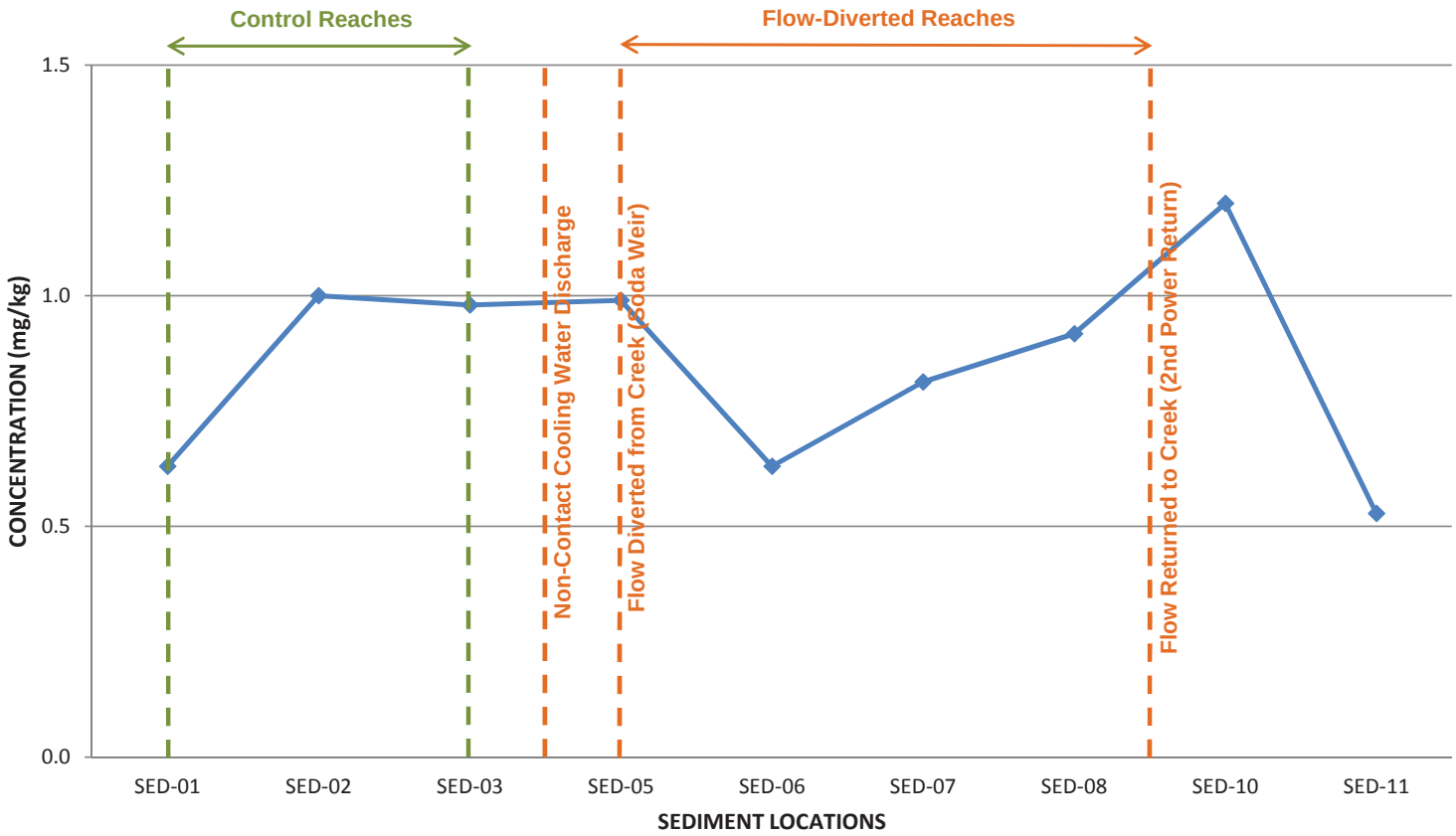
FIGURE **4-1**

ARSENIC CONCENTRATIONS IN SODA CREEK SEDIMENT

MONSANTO CERCLA FIVE-YEAR REVIEW SEDIMENT REPORT
913-1101-002

Source: Draft Soda Creek Sediment Sampling and Analysis Third CERCLA Five-year Review, Monsanto Soda Springs Plant, December 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 33
Arsenic Concentrations in Soda Creek Sediment
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



Golder Associates

LEGEND

- Sediment Concentration (mg/kg)
- Non-detect
- No Sediment Benchmark

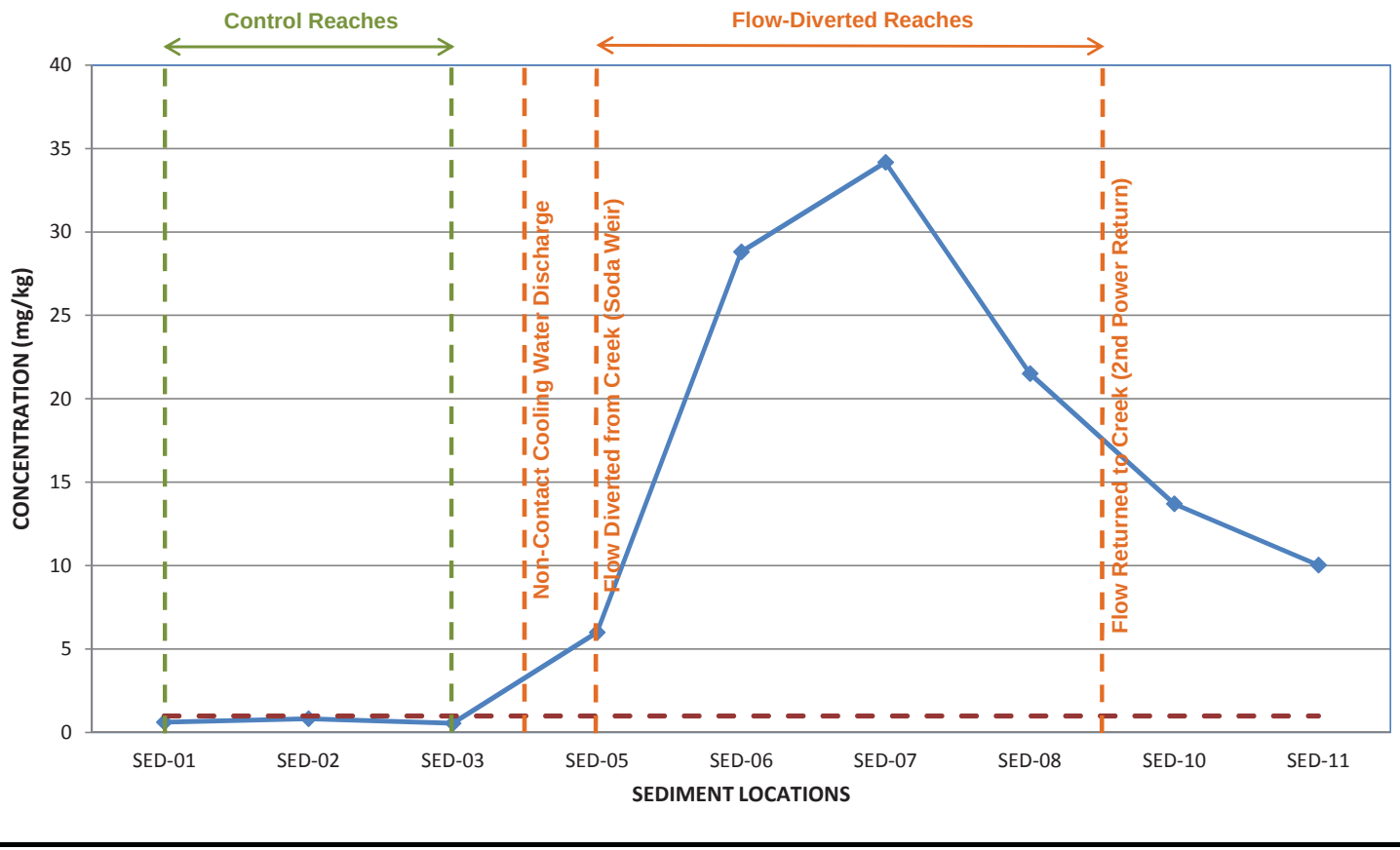
FIGURE **4-2**

BERYLLIUM CONCENTRATIONS IN SODA CREEK SEDIMENT

MONSANTO CERCLA FIVE-YEAR REVIEW SEDIMENT REPORT
913-1101-002

Source: Draft Soda Creek Sediment Sampling and Analysis Third CERCLA Five-year Review, Monsanto Soda Springs Plant, December 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 34
Beryllium Concentrations in Soda Creek Sediment
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



Golder Associates

LEGEND

- Sediment Concentration (mg/kg)
- Non-detect
- Sediment Benchmark (mg/kg)

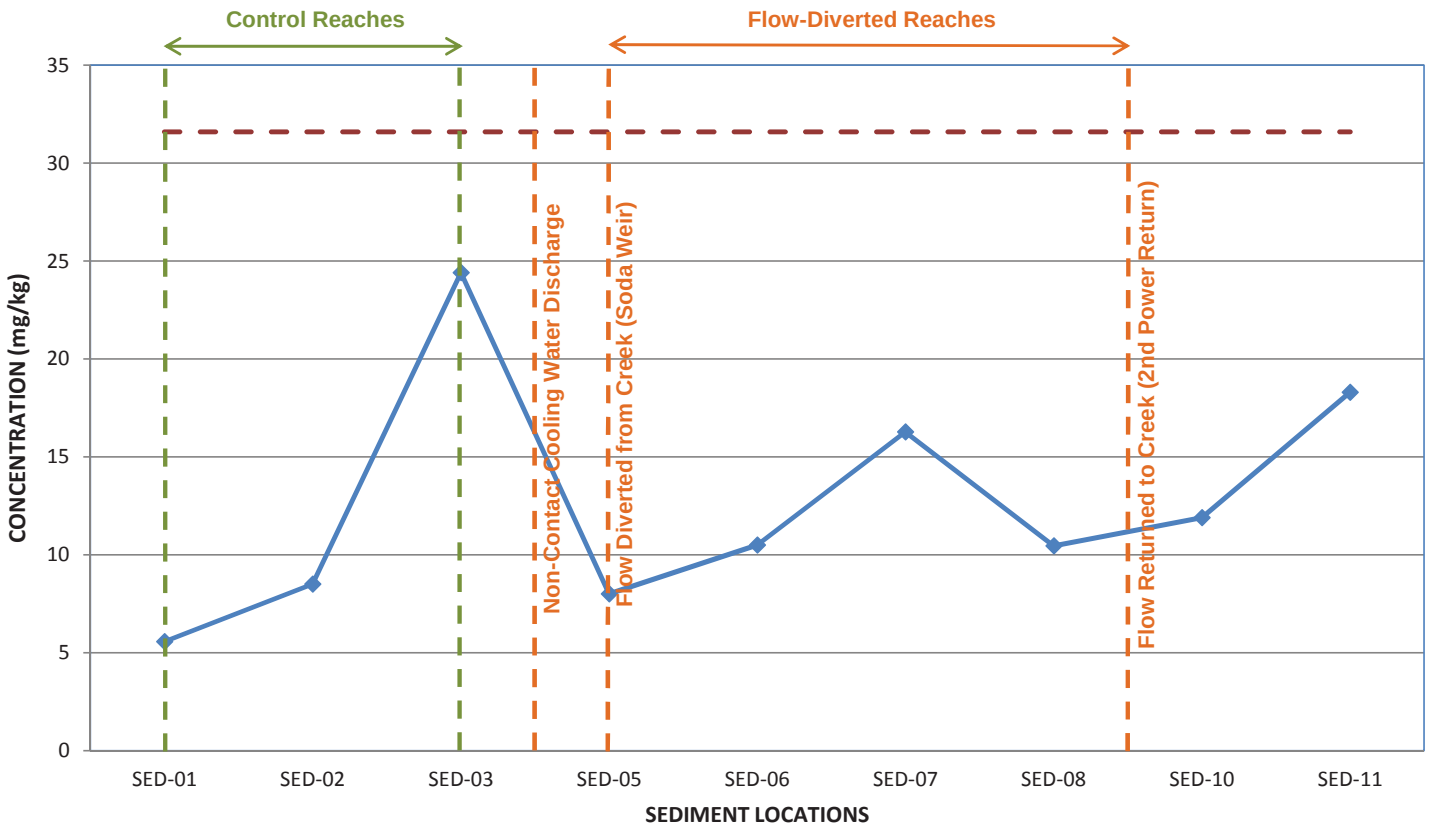
FIGURE **4-3**

CADMIUM CONCENTRATIONS IN SODA CREEK SEDIMENT

MONSANTO CERCLA FIVE-YEAR REVIEW SEDIMENT REPORT
913-1101-002

Source: Draft Soda Creek Sediment Sampling and Analysis Third CERCLA Five-year Review, Monsanto Soda Springs Plant, December 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 35
Cadmium Concentrations in Soda Creek Sediment
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



Golder Associates

LEGEND

- Sediment Concentration (mg/kg)
- Non-detect
- Sediment Benchmark (mg/kg)

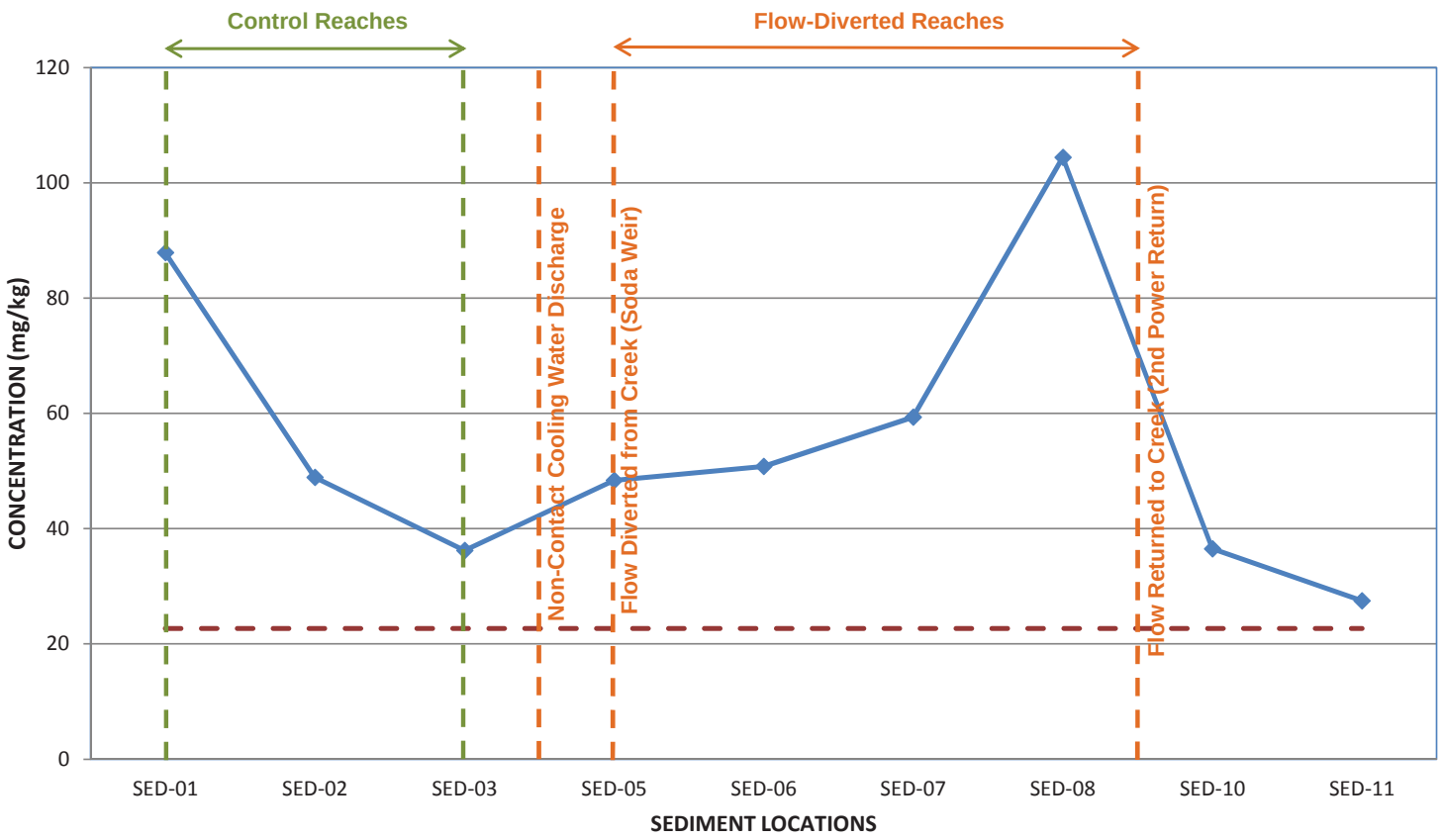
FIGURE **4-4**

COPPER CONCENTRATIONS IN SODA CREEK SEDIMENT

MONSANTO CERCLA FIVE-YEAR REVIEW SEDIMENT REPORT
913-1101-002

Source: Draft Soda Creek Sediment Sampling and Analysis Third CERCLA Five-year Review, Monsanto Soda Springs Plant, December 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 36
Copper Concentrations in Soda Creek Sediment
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



Golder Associates

LEGEND

- Sediment Concentration (mg/kg)
- Non-detect
- Sediment Benchmark (mg/kg)

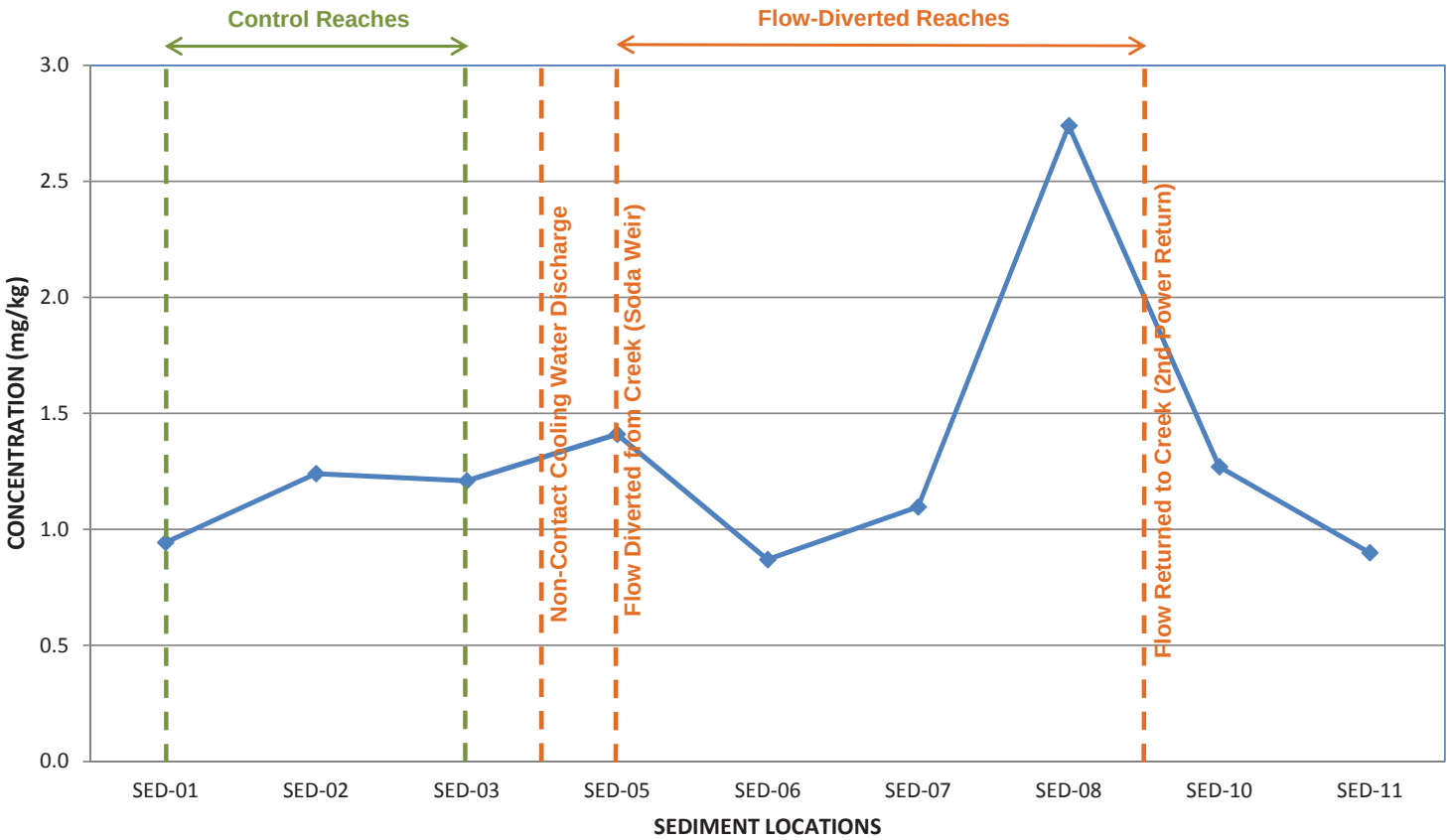
FIGURE **4-5**

NICKEL CONCENTRATIONS IN SODA CREEK SEDIMENT

MONSANTO CERCLA FIVE-YEAR REVIEW SEDIMENT REPORT
913-1101-002

Source: Draft Soda Creek Sediment Sampling and Analysis Third CERCLA Five-year Review, Monsanto Soda Springs Plant, December 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 37
Nickel Concentrations in Soda Creek Sediment
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



Golder Associates

LEGEND

- Sediment Concentration (mg/kg)
- Non-detect
- No Sediment Benchmark

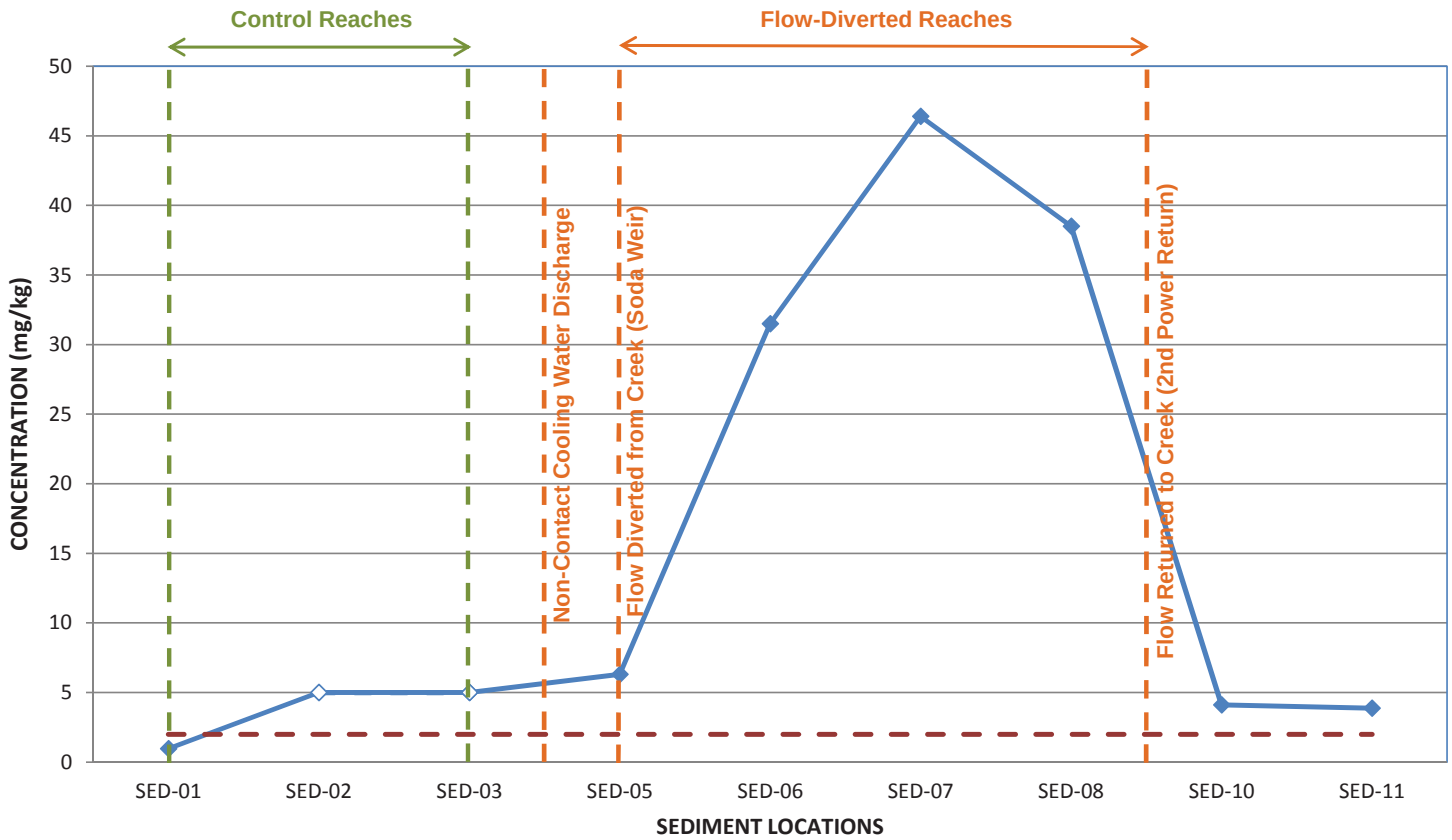
FIGURE **4-6**

POLONIUM-210 CONCENTRATIONS IN SODA CREEK SEDIMENT

MONSANTO CERCLA FIVE-YEAR REVIEW SEDIMENT REPORT
913-1101-002

Source: Draft Soda Creek Sediment Sampling and Analysis Third CERCLA Five-year Review, Monsanto Soda Springs Plant, December 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 38
Polonium-210 Concentrations in Soda Creek Sediment
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



Golder Associates

LEGEND

- Sediment Concentration (mg/kg)
- Non-detect
- Sediment Benchmark (mg/kg)

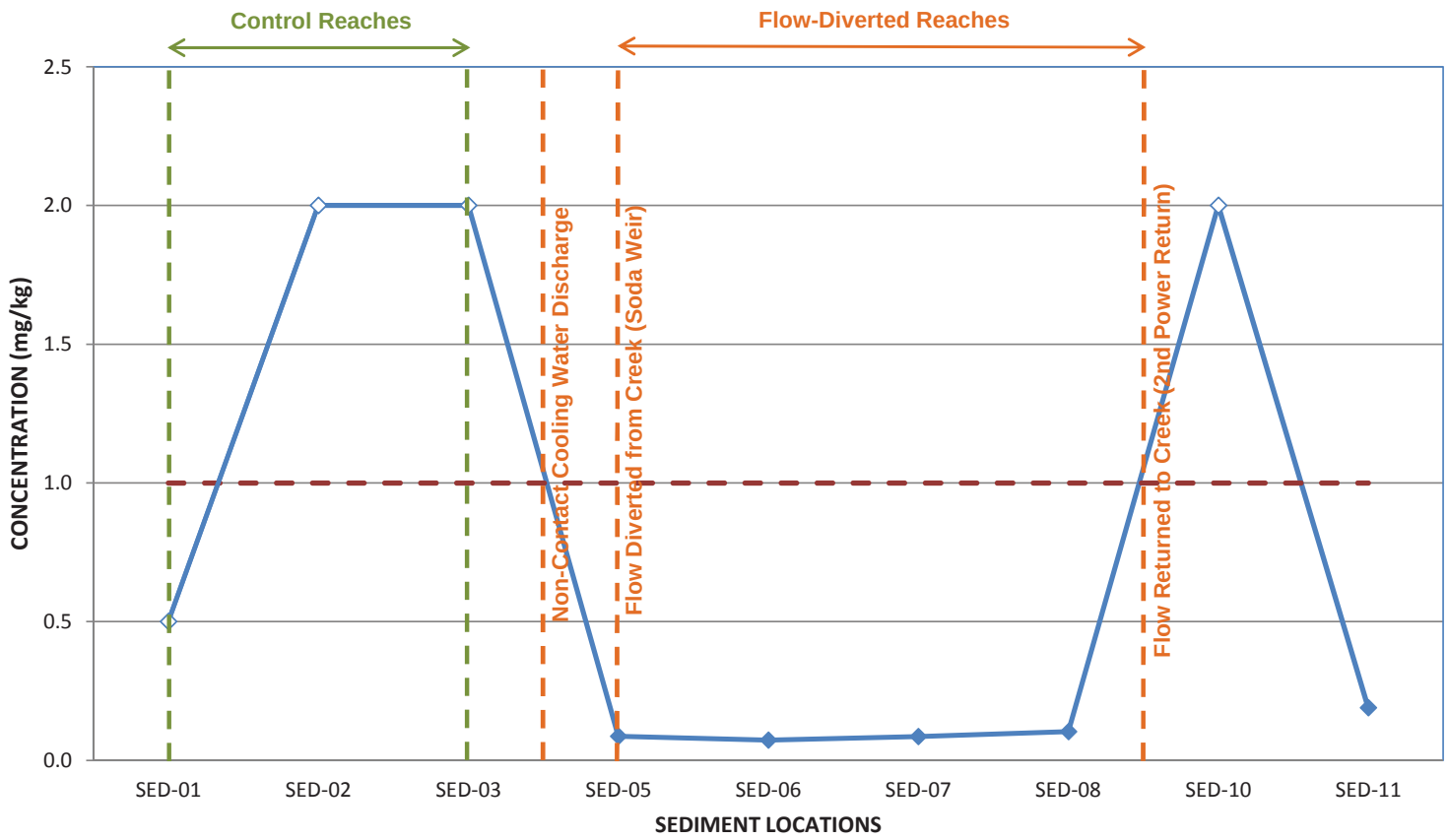
FIGURE **4-7**

SELENIUM CONCENTRATIONS IN SODA CREEK SEDIMENT

MONSANTO CERCLA FIVE-YEAR REVIEW SEDIMENT REPORT
913-1101-002

Source: Draft Soda Creek Sediment Sampling and Analysis Third CERCLA Five-year Review, Monsanto Soda Springs Plant, December 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 39
Selenium Concentrations in Soda Creek Sediment
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



Golder Associates

LEGEND

- Sediment Concentration (mg/kg)
- Non-detect
- Sediment Benchmark (mg/kg)

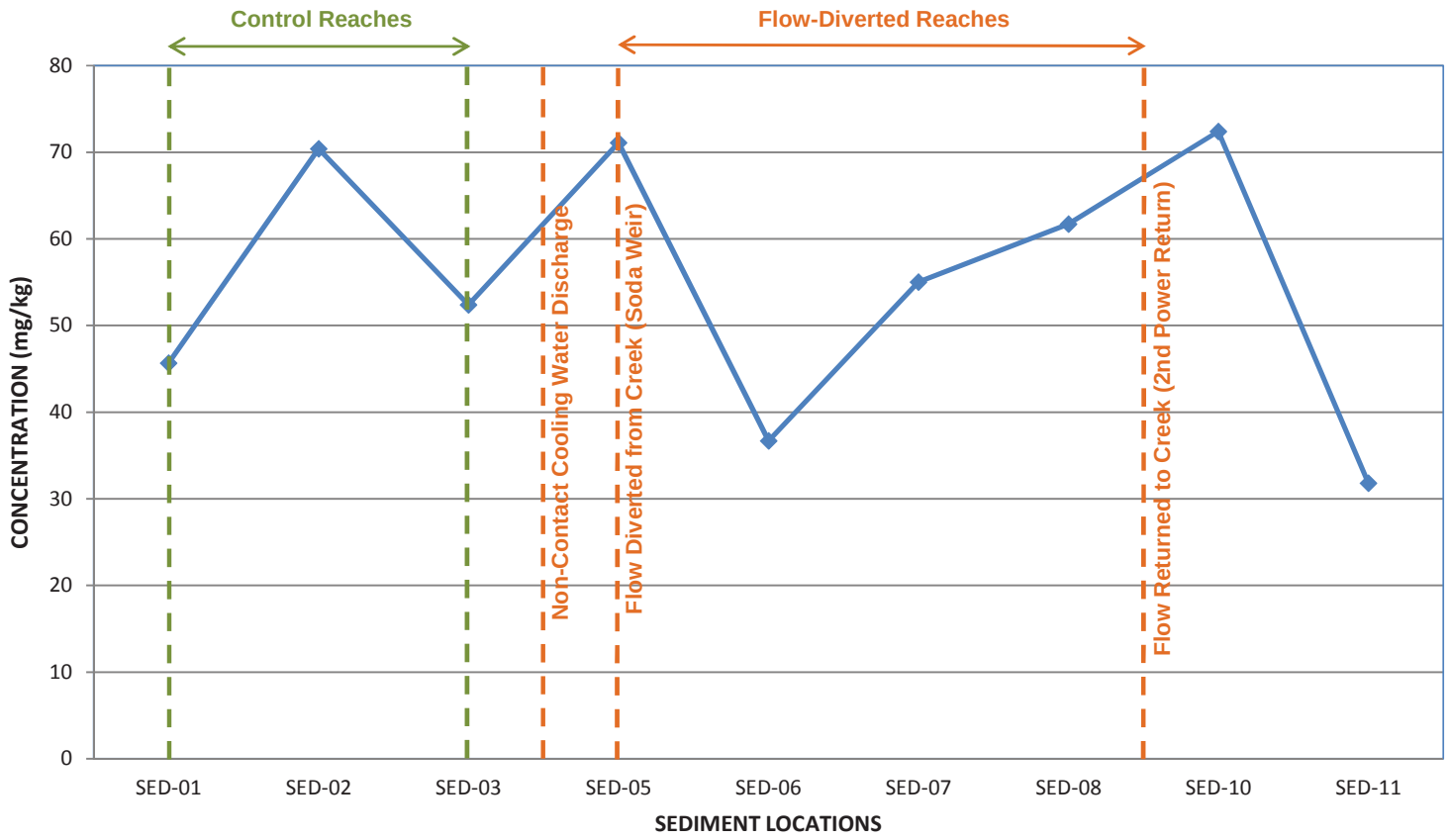
FIGURE **4-8**

SILVER CONCENTRATIONS IN SODA CREEK SEDIMENT

MONSANTO CERCLA FIVE-YEAR REVIEW SEDIMENT REPORT
913-1101-002

Source: Draft Soda Creek Sediment Sampling and Analysis Third CERCLA Five-year Review, Monsanto Soda Springs Plant, December 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 40
Silver Concentrations in Soda Creek Sediment
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



Golder Associates

LEGEND

- Sediment Concentration (mg/kg)
- Non-detect
- No Sediment Benchmark

FIGURE **4-9**

VANADIUM CONCENTRATIONS IN SODA CREEK SEDIMENT

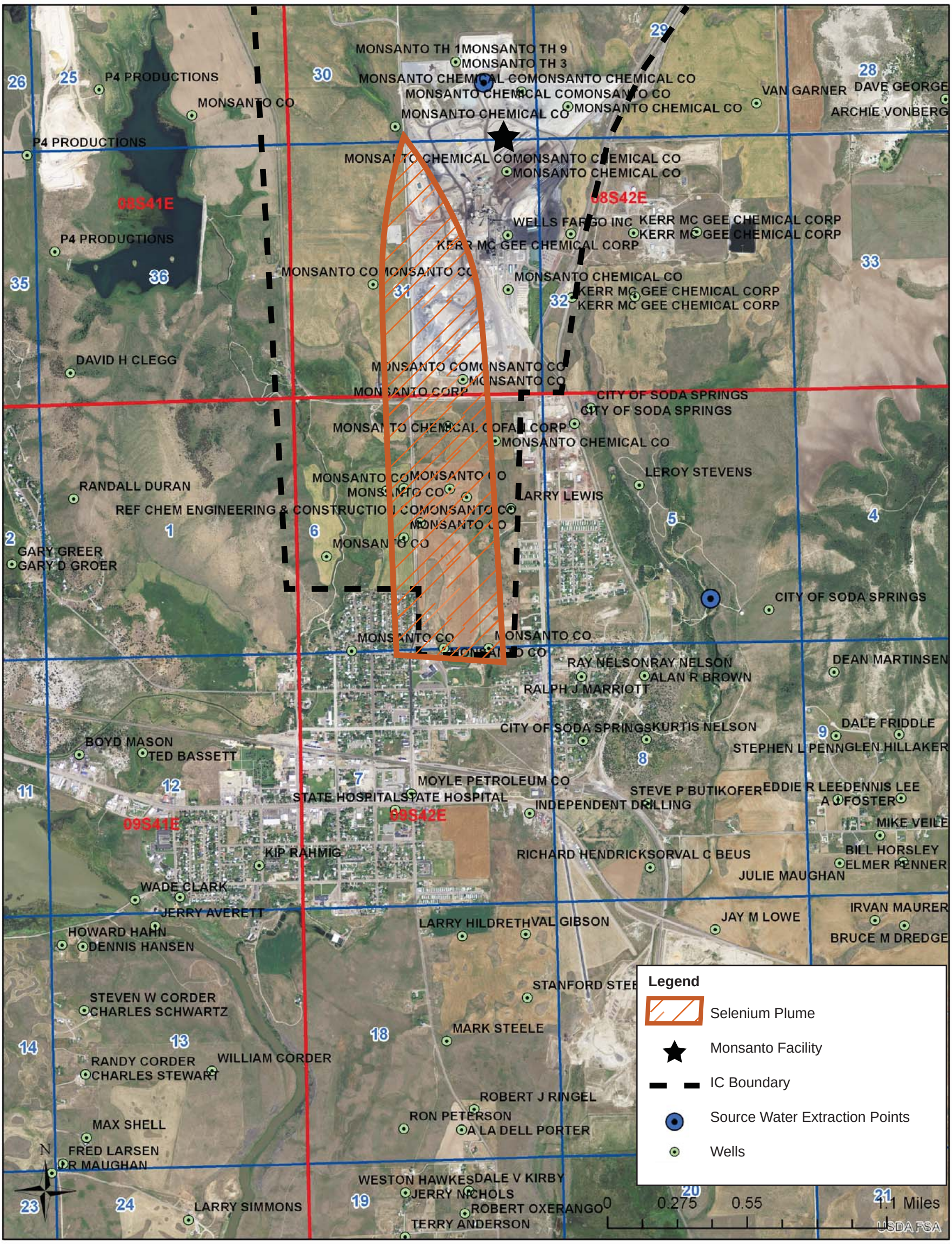
MONSANTO CERCLA FIVE-YEAR REVIEW SEDIMENT REPORT
913-1101-002

Source: Draft Soda Creek Sediment Sampling and Analysis Third CERCLA Five-year Review, Monsanto Soda Springs Plant, December 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 41
Vanadium Concentrations in Soda Creek Sediment
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

FIGURE 42
Drainage Reach 08, Station SC-4 to 2nd Power Return
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Source: Draft Soda Creek Sediment Sampling and Analysis Third CERCLA Five-year Review, Monsanto Soda Springs Plant, December 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

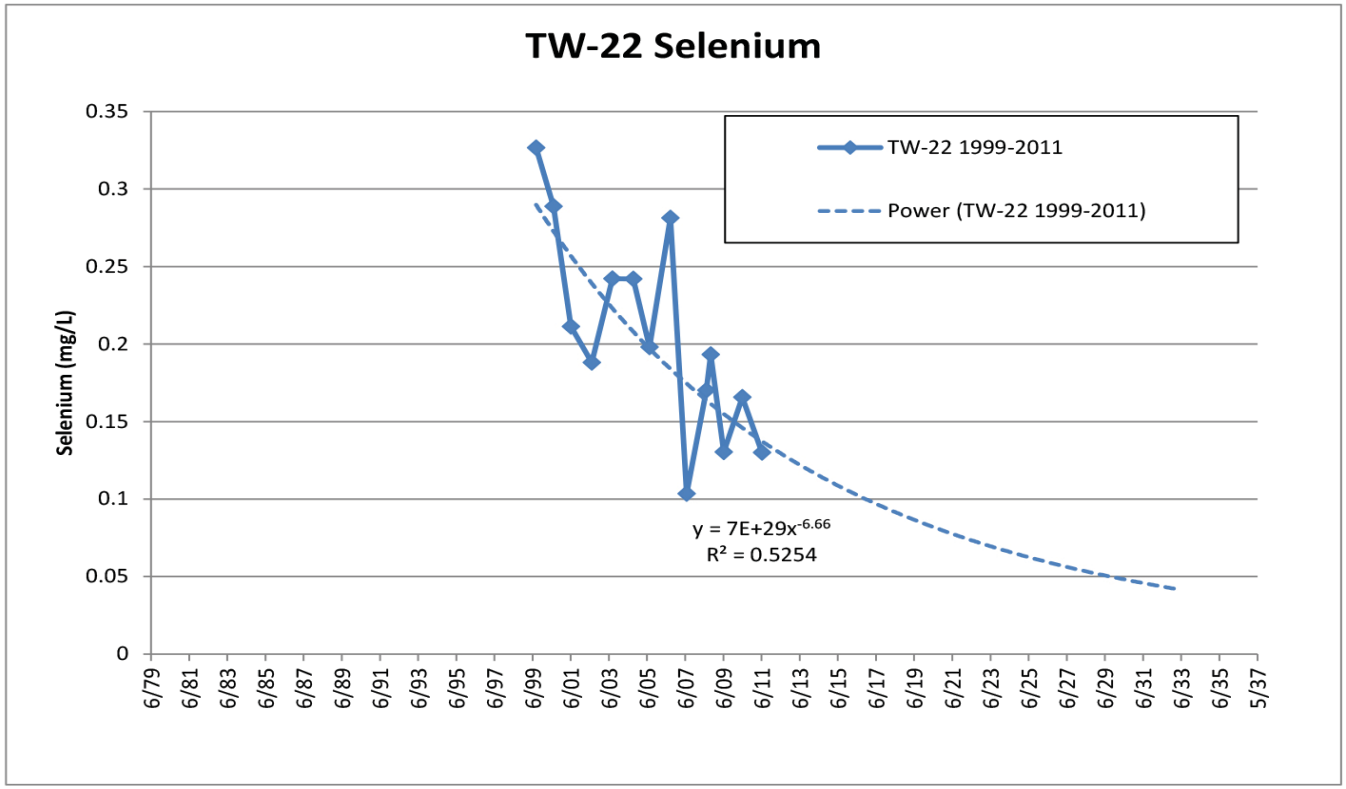


Source: Idaho Department of Water Resources (IDWR), 2013, Well Driller's Report Database, http://www.idwr.idaho.gov/apps/appswell/searchWC.asp.

FIGURE 43

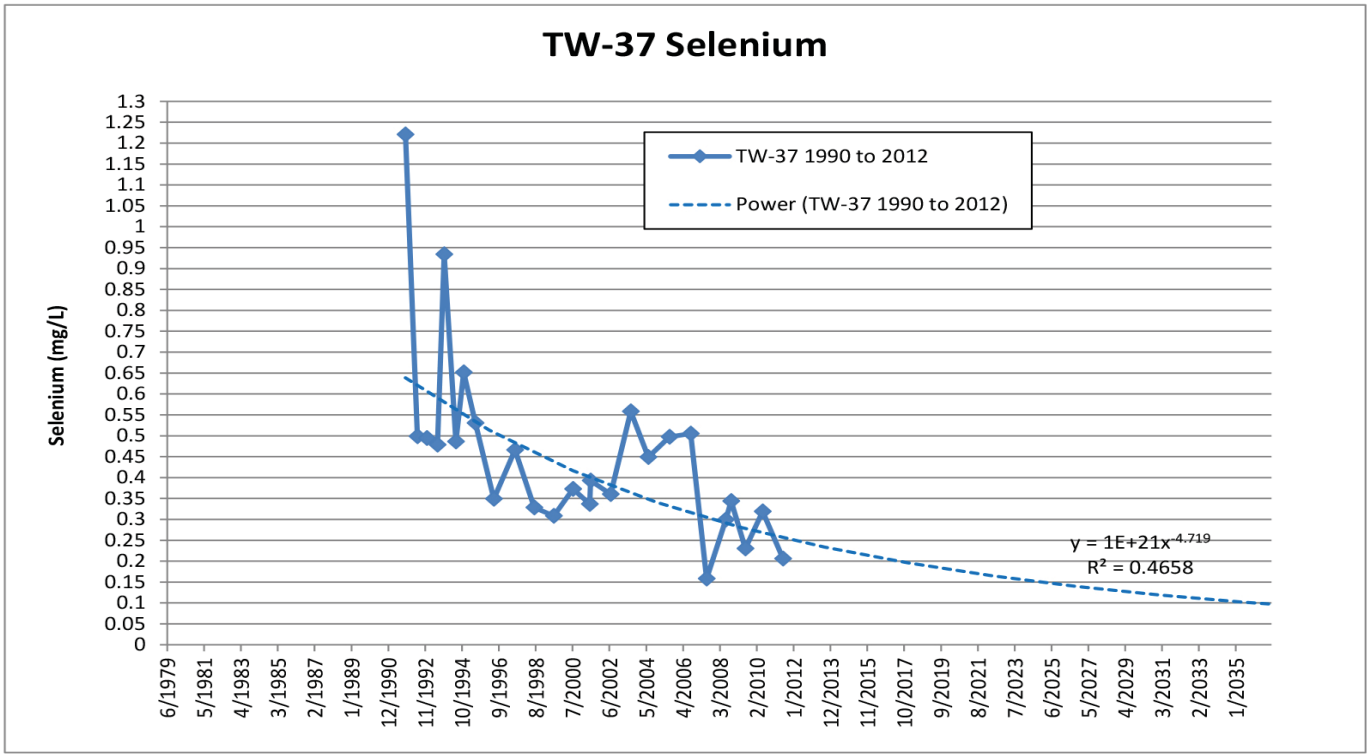
Approximate Extent of Known Groundwater Plume and Registered Wells

Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



Source: Draft Soda Creek Sediment Sampling and Analysis Third CERCLA Five-year Review, Monsanto Soda Springs Plant, December 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 44
Selenium Trend in Well TW-22
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)



Source: Draft Soda Creek Sediment Sampling and Analysis Third CERCLA Five-year Review, Monsanto Soda Springs Plant, December 2012, by Golder and Associates, Inc., Redmond, Washington. Modified by CH2M HILL with permission from Monsanto Chemical Company.

FIGURE 45
Selenium Trend in Well TW-37
Third Five-year Review Report for Monsanto Chemical Company (Soda Springs Phosphorus Plant)

Appendix A
Community Notification and Involvement

EPA to Review Cleanup at Monsanto Superfund Site in Soda Springs, Idaho

Your Input Invited through February 28

The U.S. Environmental Protection Agency is preparing the third Five-Year Review of the Monsanto plant located 1 mile north of Soda Springs, Idaho. The Five-Year Review evaluates whether the cleanup continues to protect people and the environment.

Monsanto Chemical Co. has produced elemental phosphorus for use in agricultural products at its 800-acre site since 1952. Contaminants found at the site include arsenic, cadmium, and chromium.

The Review, scheduled for completion by June 2013, will assess the effectiveness of the remedy selected in the 1997 Record of Decision. The selected remedy has included annual sampling events since 1995 to ensure that remedy is working as predicted. You can view the 1997 Record of Decision at:

http://www.epa.gov/superfund/sites/rods/fulltext/r1097049.pdf

EPA invites your participation and input during our review. If you have information that may help with the review, please contact Mark Ader, EPA Project Manager, at ader.mark@epa.gov or 800-424-4372, ext 1849 or 206-553-1849 no later than February 28, 2013.

TDD or TTY users please call the Federal Relay Service at 1-800-877-8339 and give the operator Mark Ader's phone number.

Appendix B
Documents Reviewed

CH2M HILL, 2010. Draft comments on **"***2009 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant***"**, **"***Technical Memorandum: Evaluation of Natural Attenuation Controls - Monsanto Soda Springs Site***"** and conclusions on Monitored Natural Attenuation as a remedy for the Soda Springs Site. Prepared for EPA, Region X. June.

Golder Associates, Inc. 1995. Phase II Remedial Investigation Report for the Soda Springs Elemental Phosphorus *Plant*. Prepared by Golder Associates, Inc. for the Monsanto Chemical Company. February.

Golder Associates, Inc. 2008. *Second Five-Year Review Report for Groundwater Conditions at the Monsanto Soda Springs Plant* Prepared by Golder Associates, Inc. for the Monsanto Soda Springs Plant. July.

Golder Associates, Inc. 2009. *2009 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant*. Prepared for Monsanto Soda Springs Plant. December.

Golder Associates, Inc. 2010. *2010 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant*. Prepared for Monsanto Soda Springs Plant. December.

Golder Associates, Inc. 2012a. *Draft Report on Additional Soil Sampling in Parcel 25, Third CERCLA Five-Year Review.* Prepared by Golder Associates, Inc. for the Monsanto Soda Springs Plant. November.

Golder Associates, Inc. 2012b. *Draft Soil Report, Third CERCLA Five-Year Review.* Prepared by Golder Associates, Inc. for the Monsanto Soda Springs Plant. June.

Golder Associates, Inc. 2012c. *Monitor Well Drilling and Installation, Monsanto Soda Springs Idaho Plant*. Prepared by Golder Associates, Inc. for the Monsanto Soda Springs Plant. January.

Golder Associates, Inc. 2012d. *Soda Creek Sediment Sampling and Analysis, Third CERCLA Five-Year Review.* Prepared by Golder Associates, Inc. for the Monsanto Soda Springs Plant. December.

Golder Associates, Inc. 2012e. *Source Area Characterization – UBZ-2, Monsanto Soda Springs Idaho Plant*. Prepared by Golder Associates, Inc. for the Monsanto Soda Springs Plant. October.

Golder Associates, Inc. 2012f. *2011 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant*. Prepared for Monsanto Soda Springs Plant. February.

Golder Associates, Inc. 2012g. *2012 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Plant*. Prepared for Monsanto Soda Springs Plant. December.

U.S. Environmental Protection Agency. 1997. *Record of Decision, Monsanto Chemical Co. (Soda Springs Plant).*EPA ID: IDD081830994. Region X. April.

U.S. Environmental Protection Agency. 1999. *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites.* U. S. Environmental Protection Agency Office of Solid Waste and Emergency Response Directive 9200.4-17P

U.S. Environmental Protection Agency. 2001. *Comprehensive Five-Year Review Guidance*. EPA 540-R-01-007. U.S. Environmental Protection Agency. June.

U.S. Environmental Protection Agency, 2006. Freshwater Sediment Screening Benchmarks http://www.epa.gov/reg3hwmd/risk/eco/btag/sbv/fwsed/screenbench.htm

U.S. Environmental Protection Agency. 2008. *Second Five-Year Review Report, Monsanto Chemical Co. (Soda Springs Plant)* EPA ID: IDD081830994. August.