FOURTH FIVE-YEAR REVIEW REPORT FOR MONSANTO CHEMICAL CO. (SODA SPRINGS PHOSPHOROUS PLANT) SUPERFUND SITE CARIBOU COUNTY, IDAHO

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LIST OF ABBREVIATIONS & ACRONYMS

µg/L	microgram per Liter
ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH2M	CH2M HILL, Inc.
City	City of Soda Springs
COC	contaminant of concern
CSM	Conceptual Site Model
DEQ	Idaho Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
Golder	Golder Associates, Inc.
IC	Institutional Control
IDAPA	Idaho Administrative Code
ISM	Incremental Sampling Methodology
KMCC	Kerr-McGee Chemical Corporation
LBZ	Lower Basalt Zone
MCL	maximum contaminant level
mg/L	milligrams per liter
MNA	Monitored Natural Attenuation
NCP	National Contingency Plan
NPL	National Priorities List
O&M	operation and maintenance
POC	point of compliance
PRP	potentially responsible parties
RAO	Remedial Action Objectives
RG	remedial goals
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SOP	standard operating procedure
SRI	Supplemental Remedial Investigation Report
UBZ	Upper Basalt Zone
UFS	underflow solids
WQS	water quality standards

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is, and will continue to be, protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) prepared this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 (42 U.S.C § 9621), consistent with the National Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Section 300.430(f)(4)(ii)) and considering EPA policy.

This statutory review is the fourth FYR for the Monsanto Chemical Corporation Superfund Site (Site), and its completion was triggered by the completion date of the previous FYR in 2013. FYRs are required for this Site because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. 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, Inc. (CH2M) provided support to EPA in the data analysis and overall evaluation of the remedy for this FYR.

This FYR was led by Kathryn Cerise at EPA Region 10, with assistance from the CH2M technical team including Greg Warren/Geologist, Jeff Schut/Risk Assessor, Allan Erickson/Hydrogeologist, and Margaret O'Hare/ Senior Technical Consultant. Monsanto was notified of the initiation of the FYR, which began in May 2018.

Site Background

The Site is located in Caribou County, Idaho, approximately 1 mile north of the City of Soda Springs (City) (Figure 1) (all figures are included at the end of this report). Soda Springs has a population of 3,058 (U.S. Census Bureau, 2010). Land use within the phosphorous plant boundary is industrial. The adjacent land to the north, west, and south of the phosphorous plant is primarily agricultural, including cultivation and pasture. East and southeast of the plant along Hwy 34 is a light and heavy industrial zone. Land use within the city limits is mostly residential with some commercial, agriculture, and light industrial zones.

Monsanto purchased the property in 1952 to use local phosphate-rich ore to manufacture elemental phosphorus. The Site comprises approximately 800 total acres that include the 540-acre operating area and an additional approximate 260 acres of buffer area owned partly by Monsanto and partly by various farmers. The buffer area contains contaminants of concern (COC) in offsite surface soils that originated from Site operations and is therefore part of the Site (defined by the extent of contamination). The Site is subject to Institutional Controls (IC) required by the 1997 Record of Decision (ROD) (USEPA, 1997) and 1998 Consent Decree. ICs are nonengineered 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 industrial chemical manufacturing facility originally owned by Kerr-McGee Chemical Corporation (KMCC) is directly east of the Site, across State Route 34.

The Site is located at approximately 6,000 feet above mean sea level in elevation in a broad, relatively flat valley. 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 and enters Alexander Reservoir, south and west of the City. The major river in the vicinity is the Bear River, located approximately 2 miles south southwest of the Site. The Bear River also flows into Alexander Reservoir.

The regional groundwater flow is generally north to south, with a more westerly component under Soda Springs. 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. Groundwater is the main source of drinking water in the area, with Formation Spring and Ledger Spring complex serving as the sources of drinking water for the City. The Monsanto Plant has constructed four production wells to supply process water to the plant. Additionally, domestic water wells may be located in the Site vicinity.

Groundwater is found within two primary hydrostratigraphic zones beneath the 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 natural hydrogeological controls such as fault boundaries, and also production well pumping that alters groundwater flow, and groundwater quality (UBZ-1 through 4 and LBZ-1 through 4). Groundwater contamination plumes are primarily within the UBZ. The UBZ-1 and UBZ-2 discharge to springs and surface water south and southwest of the plant boundary (Figure 2).

The ROD concluded that no floodplain zones, endangered species, or historical or archeological sites are known to exist in the immediate vicinity of the Site. The Canada lynx is the only species on the threatened list for Caribou County (IDFG, 2018), although habitat at or surrounding the Site is not suitable to support lynx.

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; land use was designated industrial once the plant was built and is expected to remain industrial for the reasonably anticipated future.

FIVE-YEAR REVIEW SUMMARY FORM

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

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA
Author name: Kathryn Cerise
Author affiliation: EPA Region 10
Review period: 5/29/2018 – 8/19/2018
Date of site inspection: 6/6/2018
Type of review: Statutory
Review number: 4
Triggering action date: 9/10/2013
Due date *(five years after triggering action date)*: 9/10/2018

II. RESPONSE ACTION SUMMARY

The following sections provide a summary of the response actions conducted at the Site.

Basis for Taking Action

The basis for taking action was the complaint from a landowner immediately south of the Site that livestock drinking water from several nearby springs experienced problems related to excess fluoride exposure. In 1984, Monsanto hired Golder Associates, Inc. (Golder) to characterize groundwater impacts from past and current operations.

The pre-CERCLA investigation showed that groundwater under the Site contained elevated levels of fluoride, cadmium, selenium, and sulfate in monitoring and production wells at the Site. As a result of potential human health and environmental exposures from contaminated groundwater flowing south from the Site towards Soda Springs, and also because of documented environmental and likely human exposures to excess fluoride from at least one local well, EPA listed the Site on the National Priorities List (NPL) in 1990.

Pursuant to a March 19, 1991, Administrative Order on Consent issued by EPA, Monsanto completed a Remedial Investigation/Feasibility Study (RI/FS) under EPA oversight between March 1991 and April 1996. The Remedial Investigation included groundwater, soil, source materials, surface water, air, biota, and sediments.

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

The final ecological assessment concluded that ecological impacts were unlikely and that ecological risk-based cleanup levels should not be used to set remediation goals, however, potential aquatic effects in Soda Creek were noted.

Response Actions

Monsanto performed Site improvements and initial response actions to reduce the threats to groundwater prior to EPA signing a ROD in 1997. These included the following (Golder, 2008):

- August 1985. Removal of the Old Hydroclarifier suspected of impacting groundwater and replacement with a new unit.
- 1986. Replaced four underground fuel storage tanks with aboveground 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 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. Pumping ceased in the spring of 1989 and was never resumed.
- 1993. Connected plant sewage evaporation ponds to municipal wastewater system.
- 1995. Began pilot scale projects and engineering controls to reduce fugitive dust from on-site source piles.
- 2012. In response to recommendations made in the third FYR, Monsanto conducted a Phase I source area characterization to identify if sources of COCs remained buried in ponds and could be affecting MNA progress (Golder, 2013).

EPA signed a ROD for the 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 ultimate goal is to eliminate groundwater contamination sources and restore, through natural attenuation (within 5 to 30 years), the groundwater aquifers affected by past releases from the Site.

Remedial Action Objectives

The remedial action objectives (RAO) for the Site as specified in the ROD (EPA, 1997) are as follows:

- Prevent human ingestion of, inhalation of, or direct contact with groundwater at levels exceeding the maximum contaminant level (MCL) defined under the Safe Drinking Water Act for cadmium, fluoride, nitrate, and selenium, or risk-based concentrations for manganese
- Prevent external exposure to radionuclides in soils at levels that pose cumulative estimated risks above 3 x 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 x 10-4, or metals (arsenic, beryllium) at levels posing cumulative estimated carcinogenic risks exceeding 1 x 10-5.

Remedy Components

The remedy selected in the ROD addressed six media at the Site: groundwater, offsite soils, source piles, air, sediments, and surface water.

Groundwater

The selected remedy for groundwater is 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 a level lower than 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. In addition, it was believed that the old ponds suspected as source areas (UFS Pond and Northwest Pond) had been closed and lined with impermeable material to eliminate ongoing COC sources which would allow natural attenuation to occur.

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 within 30 years. The ROD states "if groundwater recovery appears to significantly differ from model projections, the model and the need for additional groundwater remedial actions should be re-evaluated."

The ROD established groundwater remedial goals (RG) for the COCs. These are the MCLs for cadmium, fluoride, nitrate, and selenium, and a risk-based concentration for manganese. Table 1 provides a summary of the groundwater COCs and RGs. The ROD also established points of compliance (POC) for groundwater RG monitoring. The POCs generally downgradient and are highlighted in yellow on Figures 2 and 3.

Table 1. Concentrations of COCs and Remedial Goals for Groundwater and Soil

COC	Groundwater RG (mg/L)	Regulatory Source	Highest Concentration from RI/FS to Present (mg/L), Year, Location[a]	June 2017 Highest Concentration (mg/L) (Percent Decrease)
Cadmium	0.005	MCL	70.4, 1985, TW-40	2.67 (-96)
Fluoride	4	MCL	16, 1997, TW-37	9.55 (-40)
Nitrate as NO_3/Nitrate as N	44/10	MCL	20.7, 2006, TW-20	19.9 (-4)
Selenium	0.05	MCL	0.935, 1993, TW-37	0.220 (-76)

COC	Groundwater RG (mg/L)	Regulatory Source	Highest Concentration from RI/FS to Present (mg/L), Year, Location[a]	June 2017 Highest Concentration (mg/L) (Percent Decrease)
Manganese	0.18	Risk-Based Concentration	3.17, 2013, TW-17	3.08 (-3)
	Soil RG (pCi/g)			
Radium-226	3.7	Risk-Based Concentration	---	---

Note:
[a] Highest concentrations listed are based on 2017 Water Quality Report, Table 14 (Golder, 2018a)
mg/L = milligram per Liter
pCi/g = picoCuries per gram

Surface Water

The remedy for surface water is NFA, and no surface water RGs were established under the ROD. However, Soda Creek was identified as a POC location because the plants effluent is discharged into Soda Creek. Several sample locations have been established to monitor and evaluate discharges of groundwater to surface water, and effects of discharges on surface water quality.

When the ROD was finalized in 1997, there was no aquatic surface water quality standard for selenium in effect. In 2003, the State of Idaho established an aquatic chronic standard for selenium of 0.005 mg/L. (IDAPA 58.01.02.210).

Source Piles

The selected remedy for source piles (on-plant solid waste piles that consist of underflow solids and tailings) and materials within the plant is No Further Action, because Monsanto's past cleanup actions, institutional and engineering controls (fugitive dust emissions) have reduced potential sources of worker exposure and contaminant migration to surrounding soils to acceptable levels. However, the source piles are comprised of fine-grained soil-like particles that have migrated off-site via wind transport and impacted surrounding soils, e.g. the "offsite soils". Therefore, the offsite soils have ICs and are required to be sampled every five years (see following section).

Offsite Soils

The solid waste on-site piles have in the past been sources of contaminant migration to off-Plant soils. The remedy for offsite soils is Institutional Controls (IC) in the form of land use restrictions placed in deeds. ROD specifies the offsite soil sampling be conducted at least every 5 years to determine the concentration of COCs for that year, and to verify that engineering controls used for the source piles are effectively preventing spread of soils from the source piles, and/or recontamination of offsite soils and that the remedy remains protective.

The Remedial Goal for offsite soils is 3.7 picocuries per gram for Radium-226 (Table 1). Upon receipt of results from the FYR 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.

Air

The ROD concluded that No Further Action (NFA) was necessary for air emissions under CERCLA.

Sediments

The ROD concluded that No Further Action (NFA) was necessary for sediments. However, the ROD specified that sediments should be sampled in Soda Creek in support of each FYR to confirm whether COC concentrations in the sediments are decreasing (as predicted), increasing, or remaining stable. Thus, sediment sampling in Soda

Creek is required every 5 years. The ROD states: "If sediment concentrations are shown to be increasing or evidence of health impacts are identified, the protectiveness of the remedy should be re-evaluated."

Status of Implementation

Remedial actions include groundwater, surface water, sediment, and off-site soil monitoring.

Groundwater and Surface Water Monitoring include:

- Execution of annual groundwater, springs, and Soda Creek surface water quality sampling to assess the extent of contamination relative to applicable regulatory levels, remediation goals, and groundwater plume boundaries with respect to RGs selected for the Site, RAOs, and groundwater MNA modeling projections.
- Assessment of contaminant trends in groundwater and surface water to determine if COC levels are declining at an acceptable rate. As stated in the ROD, 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.

Sediment Sampling includes:

- Collection of sediment samples every 5 years using Incremental Sampling Methodology (ISM) to obtain representative samples over a given reach of the creek to support each FYR assessment of whether sediment contaminant concentrations are stable or declining as predicted.

Off-Site Soil Sampling includes:

- Because the fine-grained material in the on-site source piles are known to have migrated to offsite soils via wind transport, soil sampling is conducted every five years on surrounding off-site soils to measure concentrations of COCs in order to verify that source control [of the on-site source piles] is effectively preventing the further spread of site contaminants. Monsanto continues to test engineering controls such as plot-testing cover materials to replant the source piles.
- Confirming that ICs are in place for all soil grids surrounding the Site that contain Radium-226 concentrations greater than the remediation goal of 3.7 picocuries per gram and 15 millirems per year for radionuclides, based on a statistically valid sampling program. Evaluate need to implement additional ICs or removal actions and identify possible recontamination of soils from on-site source piles or spread to additional areas through ground disturbance and airborne dispersal.

Maintenance and Operation include:

- 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 COC concentrations in off-site soils to ensure that engineering controls on the source piles (on-site soils) are preventing spread to offsite soils.

Table 2. Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support Unlimited Use and Unrestricted Exposure based on current conditions	ICs Needed	ICs called for in Decision Documents	Impacted Parcels	IC Objectives	Title of IC Instrument Implemented and Date (or planned)
Soils	YES	YES	Offsite Soils surrounding Monsanto Plant (see Figure 26)	Prevent Ingestion and inhalation of radionuclides	Environmental Protection Easements and Declaration of Restrictive Covenants; 1998, 1999, and 2002.

Media, engineered controls, and areas that do not support Unlimited Use and Unrestricted Exposure based on current conditions	ICs Needed	ICs called for in Decision Documents	Impacted Parcels	IC Objectives	Title of IC Instrument Implemented and Date (or planned)
Groundwater	YES	YES	Domestic Wells potentially located in Soda Springs	Prevent ingestion and use of contaminated groundwater for drinking purposes until groundwater recovers by enacting legally enforceable prohibitions on drinking water	Not implemented.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last five-year review as well as the recommendations from the last five-year review and the current status of those recommendations. The remedy for the Site was identified as **not protective** during the third FYR (USEPA, 2013) conducted in 2013. That protectiveness statement is as follows:

Table 3. Protectiveness Determinations/Statement from the 2013 FYR

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Not Protective	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.

Table 4 includes the issues, recommendations, and status of recommendations from the third FYR. Table 4 lists also additional work conducted to fill data gaps identified during annual review of submittals (EPA 2017), testing aquifer properties, and selenium removal pilot testing.

Table 4. Status of Recommendations from the Third FYR

Issue	Recommendations/ Follow-up Actions	Current Status	Current Implementation Status Description	Completion Date (if applicable)
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.	Ongoing	Focused RI in progress. This has included, through 2018: Monsanto installed wells at southwest property line in 2018 to define the full southwestern extent of selenium plume. Monsanto is presently (2017 to 2018) conducting pumping tests and treatability pilot studies to evaluate capture of plume near the plant boundary and selenium removal from effluent. This is anticipated to continue Monsanto installed monitoring wells in 2018 to evaluate groundwater COCs east of monitoring wells and evaluate groundwater capture zone and potential migration to UBZ-3. Monsanto also installed wells on the east side of Primary Fault to evaluate hydraulic boundary conditions near groundwater pumping capture zone. Currently Monsanto is evaluating data for draft Remedial Investigation report. Awaiting submittal of data to EPA.	In Progress
Registered and possibly unregistered domestic and irrigation wells downgradient of the Monsanto Site may be exposed to the COCs that exceed the RGs.	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 COCs have migrated beyond current southern property boundary.	Completed	Completed April 2015 – Monsanto conducted an offsite well survey and located four domestic wells and one spring in a residential basement. Sample results from these wells and spring indicated that concentrations of all constituents of concern were below the respective Monsanto remediation goals. No progress on IC plan.	Well Survey Completed on April 31, 2015 (Monsanto, 2015)

Issue	Recommendations/ Follow-up Actions	Current Status	Current Implementation Status Description	Completion Date (if applicable)
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.	Complete	Monsanto investigated potential source areas by installing wells, excavating test pits, and conducting leaching and mobility analyses during 2013 through 2015. This investigation positively identified remaining sources of COCs in the plant boundaries with potential to release into groundwater. Therefore, the updated CSM indicates that the assumptions made in the current remedy are not appropriate.	Source Area Report submitted in 2016 (Golder, 2016)
Concentrations of contaminants in sediments in Soda Creek are elevated downstream of facility in the flow-diverted reaches.	Continued monitoring of sediments to compare results against new sampling protocol and determine if remedial action may be needed.	Complete	Sediment sampling has been conducted every 5 years as part of the FYR. For this fourth FYR, sampling was performed in July 2017. The 2017 sampling was the second event using ISM. In this FYR report, results are compared against the 2012 sample results. The third ISM sample will be conducted in 2022, after which trends in concentrations may be observed.	Complete (Golder 2018b)

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

EPA published a notice announcing the performance FYR for the Site in the *Caribou County Sun* on June 7, 2018. This announcement stated there was a five-year review underway, and invited the public to submit any comments to the EPA project manager. As of the date of this report, no comments from the community had been received. A copy of the public notice is included as Appendix B to this FYR report.

CH2M HILL interviewed the Monsanto O&M project manager as part of the FYR process. The interview was 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 third FYR.

The following individual was interviewed:

1. **Jason Maughan, Regulatory Specialist, Monsanto Chemical Company, Soda Springs, Idaho.**
   Mr. Maughan is Monsanto's CERCLA/O&M 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. He also stated that the remedial actions coincide with the objectives of Monsanto – soil migration from on-site source piles is being minimized through engineering controls and plot testing, off-site soil 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. Monsanto is conducting the additional Focused RI based on recommendations from last FYR, including constructing additional wells, characterizing source areas, and conducting ongoing aquifer pump testing to evaluate groundwater capture and water quality changes. Several supplemental RI activities have been completed, and some are ongoing such as the pumping test/groundwater capture evaluation. These data will steer decisions for a focused Feasibility Study.

Data Review

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

Table 1 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 2003 by reference to the National Toxics Rule. Figures 2 and 3 show the locations of groundwater monitoring wells, groundwater flow directions, springs, and surface water sampling locations. Discussions of individual COC trends in each medium are provided in the following sections. Figures and tables, adapted from data reports prepared by Golder for Monsanto are included to illustrate data trends.

Groundwater Quality

In accordance with the 1997 ROD (USEPA, 1997), "*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, monitoring results show that groundwater concentrations of COCs have decreased at most monitoring locations in the time since implementation of the source control actions performed by Monsanto in the mid-1980s and 1990s. However, over the last decade in some wells the downward trends have stabilized at concentrations above RGs, and, at other locations, concentrations of COCs have been increasing near and downgradient of source areas during the last review period. COCs are thus not declining at rates predicted during the ROD preparation. The selenium plume has expanded above RGs at the southern IC boundary.

Based on long-term monitoring, COC concentrations in the deeper LBZ aquifers are generally stable and below RGs, which indicates that the deeper groundwater is currently not significantly impacted by source areas at the 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, UBZ-2, UBZ-3, and UBZ-4. Data for COC concentrations and trends are available through 2017.

Source Area Wells, COC Distribution

UBZ-1 and 2 Source Areas

The suspected primary source areas for the UBZ-1 and 2 groundwater plumes are the old UFS and Tailings Ponds, on the west-northwest side of the plant (Figure 2). COCs in the near-source groundwater plumes include cadmium, fluoride, manganese, nitrate, and selenium. The groundwater also contains elevated levels of non-COC monitored analytes chloride, molybdenum, and sulfate that are monitored to evaluate water quality and used as indicator constituents.

In general, the groundwater plumes in UBZ-1 and 2 travel southward. However, the downgradient extent of each constituent varies as a result of varying mobilization and transport mechanisms (such as source intensity, subsurface geochemical/retardation processes), and structural controls (such as faulting of the basalt flows).

UBZ-3 and 4 Source Areas

The suspected source areas for the UBZ-3 and 4 Plumes include the former Northwest Pond and the Old Hydroclarifier (Figure 2). COCs in these plumes also include cadmium, fluoride, nitrate, manganese, and selenium. Elevated levels of chloride, molybdenum, and sulfate have also been detected in these plumes.

Each COC exceeds its RG within at least some portions of UBZ-3 and 4. 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 Site. However, groundwater with elevated COCs within the UBZ-4 plume is largely captured by the plant production wells that supply industrial water for the plant. In addition, the Primary fault separates UBZ-2 from UBZ-4 (Figure 2) and is interpreted to be a hydraulic barrier that prevents migration of COCs from UBZ-4 to UBZ-2. It is uncertain how the plume might migrate if the production wells were to be shut down for any length of time.

Because the UBZ-4 plume is generally contained by the plant production wells, no monitoring wells have been constructed within the southern portion of UBZ-4, near the boundary with UBZ-3. However, in 2017, data gaps were identified east of the production wells and in the southern part of UBZ-4 and northern part of UBZ-3 (EPA, 2017). At the request of the EPA, monitoring wells were installed to delineate plumes east and south of the production wells.

Elevated concentrations of molybdenum and vanadium in groundwater have been identified along the east and southeast sides of the plant. Elevated molybdenum has also been identified in springs within Soda Springs south of the plant (Big Springs and City Park Spring, Figure 2). These areas of elevated molybdenum and vanadium in the shallow groundwater and springs originate from source areas at the former Kerr-McGee plant on the east side of Highway 34.

Source Area Well COC Distribution

The 2017 distributions of each of COC in groundwater (plume maps) are illustrated in Figures 4 through 8, respectively. COCs including fluoride and manganese exceed RGs in plant area wells near the suspected source areas (NW pond and UFS ponds) but generally do not extend beyond the south fenceline and are limited to the plant area (Figures 5 and 6).

Nitrate as N is detected above the RG of 10 mg/L in the immediate vicinity of source areas including the old UFS ponds and Old Hydroclarifier, and also southwest of the plant (Figure 7) Note that on Figure 7, elevated nitrate concentrations in wells southeast of the Plant appear to originate from source area(s) outside the Plant based on groundwater flow directions and the absence of any source areas in the UBZ-3 on the Plant (Golder, 2018a). Elevated nitrate levels in wells TW-63 and TW-64 and Homestead Spring are attributed to agricultural fertilizer applications in the area south of the plant and west of Government Dam Road (Golder, 2017a).

In the POC plant production wells PW-01, -02, and -03, cadmium is detected above the RG of 0.005 mg/L, with a maximum concentration of 0.0669 at PW-01 (Figure 4 shows cadmium concentrations). Selenium increased to above the RG of 0.05 mg/L in PW-01 at a concentration of 0.0992 mg/L (Figure 8 shows selenium concentrations).

In the Northwest Pond wells, cadmium is above the RG in TW-16 and 17 at concentrations of 0.484 mg/L and 0.0134 mg/L, respectively. Selenium is above the RG in these two wells at concentrations of 0.279 mg/L and

0.206 mg/L, respectively. In Old Hydroclarifier wells TW-40 and 43, cadmium is above the RG at concentrations of 2.16 and 1.73 mg/L. Selenium is above the RG in these two wells at concentrations of 0.897 and 0.727 mg/L, respectively. In UFS Pond wells TW-22, 24 and 37, cadmium concentrations are above the RG in these three wells at concentrations of 0.0391 mg/L, 0.352 mg/L, and 0.514 mg/L, respectively

Newer monitoring wells drilled near suspected source areas in 2014 (since the last FYR) include TW-70 through TW-76. All of these wells exceed the RGs for cadmium except for TW-76. TW-71 is the highest in cadmium at a concentration of 0.949 mg/L. Selenium is above the RG in these three wells at concentrations of 0.219 mg/L, 0.314 mg/L, and 0.220 mg/L, respectively. Selenium also exceeded the RG in all of the newer monitoring wells (TW-70 through TW-76). TW-76 shows the highest selenium at a concentration of 0.64J mg/L (estimated value).

South Fenceline POC Wells COC Distribution

POC wells TW-20, 34, 35, and 39 are located along the plant's southern fenceline (Figure 2). All COCs except manganese are above RGs in well TW-39. Selenium exceeds the RG in wells TW-20 and 39, with a maximum concentration of 0.364 mg/L (Figure 8). TW-10 is not a POC well, but is located at the southwest corner of the plant and exceeds the RG for selenium at a concentration of 0.089 mg/L.

South of Plant POC Wells COC Distribution

POC wells TW-53, 54, 55 and the Harris Well are located south of the south fenceline. These are largely free of COCs above the RGs, except for selenium, which was detected in 2017 at concentrations above the RGs in all four of these wells, with a maximum concentration of 0.179 mg/L at TW-54 (Figure 8).

Source Area and Point-of-Compliance Wells, COC Trends since the last FYR

The trends of COCs observed since the last FYR are discussed in this subsection, and are based on a visual interpretation of time-concentration graphs and interpretations presented in the annual water quality report (Golder, 2018a). Table 5, excerpted from the Golder summary report on groundwater conditions (2018a), shows the short-term (since the last FYR) constituent concentration trends at POC wells and surface water sites. Table 5 (Golder, 2018a) shows the short-term constituent concentrations at other wells and springs, generally grouped by location at the Site. Figures 9 through 15 provide time-concentration history graphs of COCs that are of importance because of exceedences of RGs, and either stable or increasing trends. These largely focus on cadmium and selenium. As noted previously, fluoride, manganese, and nitrate appear to be largely stable and limited in extent to within the plant area. Exceptions are noted below.

Source Area Well COC Trends:

Figure 9 shows the time concentration history of cadmium and selenium in POC plant production wells PW-01 and 02. It appears that these COC have been increasing in these two wells since 2015. Figure 10 shows the time-concentration history of cadmium, selenium, and manganese in the Northwest Pond wells TW-16 and TW-17. The selenium in TW-16 and 17 has been increasing since 2007; the most notable increased has occurred in TW-17, which was non-detect for site COCs prior to 2007. Manganese has been increasing in TW-17 since the early 1990s. Cadmium has been increasing in TW-17 since a low level in approximately 2010. In the Old Hydroclarifier wells TW-40 and 43, cadmium and selenium concentrations exhibit stable trends.

Figure 11 shows the time concentration history of selenium and cadmium in the old UFS and Tailings Pond source area wells (TW-22, TW-24, and TW-37). The selenium concentrations have been increasing in TW-22 and 24 since low levels in 2007, and stable in TW-37. Concentrations in these wells are all above the RGs. Cadmium is decreasing in TW- 37 since a high in 2011, but remains well above RGs. In new wells near the old UFS ponds TW-70 through 76), selenium is increasing in TW-71 and 76, but decreasing in wells TW-72, and 73. Cadmium concentrations are increasing in TW-71, 75, decreasing in wells TW-72 and 73.

South Fenceline and South of Plant Wells COC Trends

POC wells TW-20, 34, 35, and 39 exhibit generally stable trends for COCs, with some fluctuations over the years (Figure 12). However, cadmium has shown a steady increase since approximately 2007 in TW-39 (Figure 12). Selenium levels declined in TW-20 and 39 over the past 5 years but are above the RGs. Nitrate appears to be increasing in TW-20 and 39 after a low concentration in 2015. As Table 5 illustrates, POC wells TW-53, 54, and the Harris Well show primarily stable or decreasing COC trends since about 2015, with the exception of a slight increase of selenium in TW-55 to above the RG. Nitrate concentrations have decreased in TW-53, but exhibited a sharp increase in TW-54.

Table 5. Short-term Constituent Concentration Trend at Point-of-Compliance Wells and Soda Creek

Location	Formation	Constituents of Concern				
		Cadmium	Fluoride	Manganese	Nitrate as N	Selenium
Groundwater						
Production Wells						
PW-01	UBZ,LBZ-4	⇧ N	⇩ Y	⇔ Y	⇧ Y	⇧ N
PW-02	UBZ,LBZ-4	⇔ N	⇩ Y	⇔ Y	⇧ Y	⇔ Y
PW-03	UBZ,LBZ-4	⇔ N	⇔ Y	⇔ Y	⇧ Y	⇧ Y
Southern Plant Fence Line						
TW-20	UBZ-2 γ4	⇔ Y	⇔ Y	⇔ Y	⇧ N	⇔ N
TW-34	UBZ-2 γ3	⇔ Y	⇔ Y	⇔ Y*	⇔ Y	⇔ Y
TW-35[b]	UBZ-2 γ3	⇔ Y	⇔ Y	⇔ Y*	⇔ Y	⇔ Y
TW-39	UBZ-2 γ4	⇧ N	⇔ N	⇔ Y	⇧ N	⇔ N
South of Plant (Former Harris Property)						
TW-53	UBZ-1 γ5	⇔ Y	⇩ Y	⇔ Y	⇩ Y	⇩ N
TW-54	UBZ-2 γ4	⇔ Y	⇔ Y	⇔ Y	⇧ N	⇩ N
TW-55	UBZ-2 γ3	⇔ Y	⇔ Y	⇔ Y	⇧ Y	⇧ N
Mormon A Spring[c]	UBZ-1 γ5?	⇔ Y	⇔ Y	⇔ Y	⇧ N	⇩ N
Harris Well	UBZ-2 γ4	⇔ Y	⇩ Y	⇔ Y	⇔ Y	⇩ N
Soda Creek						
Soda Up Station (SC-01)	-	⇔ Y	⇔ Y	⇔ Y*	⇔ Y	⇔ Y
Soda Down Station (SC-04)	-	⇔ Y	⇩ Y	⇔ Y	⇔ Y	⇔ Y
Non-Contact Cooling Water Discharge[d]						
Non-Contact Cooling Water Discharge	-	⇔ Y	⇩ Y	⇔ Y	⇧ Y	⇧ Y

Notes:

a. Constituents included for illustrative purposes only, no remediation goal
b. Proposed alternative point of compliance for Harris Well
c. Not a Point of Compliance location
d. TW-35 could not be sampled, short-term trend is 2012 to 2016
* Natural background for manganese

⇔	Concentrations relatively stable overall in the past 5 years (2013 to 2017)
⇩	Concentrations decreased overall in the past 5 years (2013 to 2017)
⇧	Concentrations increased overall in the past 5 years (2013 to 2017)
Y	Equal to or less than EPA Remediation Goal in June 2017
N	Greater than EPA Remediation Goal in June 2017

Source: Golder, 2018a

Table 6. Short-term Constituent Concentration Trends at Other Wells and Springs

Location	Formation	Constituents of Concern				
		Cadmium	Fluoride	Manganese	Nitrate as N	Selenium
NW Pond						
TW-29 (background)	UBZ-4 γ3	⇔	⇔	⇔	⇧	⇔
TW-16	UBZ-4 γ3	⇔	⇔	⇔	⇧	⇧
TW-17	UBZ-4 γ3	⇧	⇔	⇔	⇧	⇧
TW-18	LBZ-4	⇔	⇔	⇧	⇔	⇔
Old UFS Ponds						
TW-57 (background)	UBZ-2 γ5?	⇔	⇔	⇔	⇩	⇔
TW-37	UBZ-2 γ4	⇩	⇧	⇩	⇔	⇔
TW-45	LBZ-2 γ2	⇔	⇔	⇔	⇔	⇔
TW-71	UBZ-2 γ4	⇧	⇔	⇧	⇧	⇧
TW-72	UBZ-2 γ4	⇩	⇔	⇩	⇧	⇩
TW-73	UBZ-2 γ4	⇩	⇧	⇩	⇔	⇩
TW-77	UBZ-4 γ2	⇔	⇩	⇔	⇔	⇔
TW-78	UBZ-4 γ3	⇧	⇧	⇧	⇩	⇩
Tailings Pond						
TW-22	UBZ-2 γ4?	⇧	⇔	⇩	⇔	⇧
TW-24	UBZ-2 γ4	⇔	⇔	⇔	⇔	⇧
TW-75	UBZ-2 γ4a	⇧	⇔	⇩	⇧	⇔
TW-76	UBZ-2 γ4a	⇔	⇔	⇩	⇧	⇧
UFS Piles						
TW-48	UBZ-4 γ3	⇔	⇔	⇔	⇧	⇔
TW-49	UBZ-4 γ3	⇔	⇩	⇔	⇧	⇔
TW-50	UBZ-4 γ3	⇔	⇔	⇧	⇩	⇔
Old Hydroclarifier and Plant Area Wells						
TW-30	UBZ-4 γ3	⇔	⇔	⇔	⇧	⇧
TW-40	UBZ-4 γ3	⇔	⇔	⇔	⇔	⇔
TW-41	UBZ-4 γ3	⇔	⇔	⇔	⇔	⇔
TW-43	UBZ-4 γ3	⇔	⇔	⇔	⇔	⇔
TW-26	LBZ-4	⇔	⇔	⇔	⇔	⇔
TW-44	LBZ-4	⇔	⇔	⇔	⇔	⇔

Location	Formation	Constituents of Concern				
		Cadmium	Fluoride	Manganese	Nitrate as N	Selenium
Southwest Corner Wells						
TW-07	UBZ-1 γ4	⇔	⇩	⇔	⇔	⇔
TW-08	UBZ-1 γ3	⇔	⇔	⇔	⇔	⇔
TW-10	UBZ-1 γ5	⇔	⇩	⇔	⇔	⇩
TW-87	UBZ-1 γ4	⇔	⇔	⇧	⇔	⇔
TW-88	UBZ-1 γ5	⇔	⇔	⇩	⇔	⇔
East Side and Southeast Corner Wells						
TW-15 (background)	UBZ-4 flow V	⇔	⇔	⇔	⇧	⇔
TW-11	LBZ-3 γ2	⇔	⇔	⇔	⇔	⇔
TW-12	UBZ-3 γ3	⇔	⇔	⇩	⇧	⇔
TW-33	UBZ-4 γ4	⇔	⇔	⇔	⇧	⇔
TW-38	UBZ-3 γ3	⇔	⇔	⇔	⇧	⇔
TW-56	UBZ-3 γ3	⇔	⇔	⇔	⇔	⇔
Monitoring Wells South and Southwest of Plant						
TW-59	UBZ-2 γ4	⇔	⇩	⇔	⇧	⇧
TW-60	UBZ-1 γ4	⇔	⇔	⇩	⇔	⇔
TW-61	UBZ-1 γ4	⇔	⇩	⇔	⇔	⇔
TW-62	UBZ-2 γ4	⇔	⇩	⇔	⇧	⇧
TW-70	UBZ-2 γ3	⇔	⇔	⇔	⇔	⇧
TW-85	UBZ-1 γ5	⇔	⇩	⇩	⇧	⇩
TW-86	UBZ-1 γ5	⇔	⇩	⇔	⇧	⇩
Property Line Wells						
TW-65	UBZ-2 γ4	⇔	⇔	⇔	⇔	⇔
TW-66	UBZ-2 γ3	⇔	⇔	⇩	⇔	⇔
TW-67	UBZ-2 γ4/γ3	⇔	⇔	⇔	⇧	⇔
Wells West of Plant						
TW-68	UBZ-1 γ5	⇔	⇔	⇔	⇧	⇔
TW-69	UBZ-1 γ5	⇔	⇔	⇔	⇧	⇩
TW-84	UBZ-1 γ4	⇧	⇩	⇔	⇩	⇩
Springs						
Homestead Spring	UBZ-1 γ5?	⇔	⇔	⇔	⇧	⇔
Mormon A Spring	UBZ-1 γ5?	⇔	⇔	⇔	⇧	⇩
Mormon B Spring	UBZ-1 γ5?	⇔	⇩	⇔	⇧	⇩
Mormon C Spring	UBZ-1 γ5?	⇔	⇩	⇔	⇧	⇩
Calf Spring[a]	UBZ-1 γ5?	⇧	⇔	⇧	⇩	⇔

Notes:

a. Calf Spring has been dry from 2013 to 2016, reflects trend from 2008 to 2012.

⇔ Concentrations relatively stable overall in the past 5 years (2013 to 2017)

⇩ Concentrations decreased overall in the past 5 years (2013 to 2017)

⇧ Concentrations increased overall in the past 5 years (2013 to 2017)

Source: Golder, 2018a

Downgradient Wells, COC Distribution

In general, COCs including cadmium, manganese, and fluoride were not detected above RGs south of the plant fenceline. Two interpreted nitrate plumes are identified south and southwest of the plant, with maximum concentrations at TW-85 at a concentration of 34.8 mg/L (Figure 7). Most of the other wells in these plumes have nitrate concentrations between 10 and 20 mg/L; compared with the RG of 10 mg/L (Figures 4 through 7).

Figure 8 indicates that selenium is the only COC that exceeds its RG outside of the southern Monsanto property boundary, at TW-65 with a 2017 concentration of 0.059 mg/L. Selenium was detected in TW-66, the deeper well adjacent to TW-65, at a concentration of 0.028 mg/L, below the RG. The selenium plume has migrated southward past the southern and property line (IC boundary) within the UBZ-1 and 2 aquifers. This plume appears to be following a southerly preferential flow path in the three shallowest water-bearing zones beneath the Site (gamma zones 3, 4, and 5). As reported in the 2017 water quality report (Golder, 2018a), data from downgradient monitoring wells installed by Kerr McGee show that selenium concentrations appear to be very low south of the southern property line and TW-65 (i.e. further downgradient), ranging from 0.0028 mg/L at KM-46, and 0.0017 at KM-39.

The next upgradient shallow wells from the south property line, TW-59, 62 and 64, have selenium concentrations above the RGs at 0.084, 0.147, and 0.084J mg/L, respectively. Additional monitoring wells installed in 2018 should define the southwest extent of the selenium plume west of Government Dam Road.

Downgradient Wells, COC Trends

Selenium concentrations in southern property line wells TW-65 and TW-66 are stable overall (Figure 13, Table 6) although the selenium concentration has decreased slightly since 2011 in TW-65. However, selenium concentrations are interpreted to be increasing in the next upgradient wells TW-59, 62, and 70 (Table 6).

Surface Water Quality

Figure 3 shows the principal surface water bodies affected at the site including Soda Creek (downstream from the effluent discharge) and Mormon Creek (fed by discharging impacted groundwater). EPA requested that Monsanto analyze surface water discharges to Soda Creek for hazardous substances at a level of detail consistent with ongoing groundwater data reporting. Thus, upstream and downstream sample locations were added to Soda Creek in 2001, and Mormon Creek sampling was added in 2002 (EPA, 2008).

Surface Water - Springs

Total recoverable selenium has exceeded the chronic WQS of 0.005 mg/L at several springs during the monitoring period beginning in 1980. Mormon A, B, and C Springs (Figure 14) are groundwater discharge from UBZ-1 and 2. Selenium has historically exceeded the groundwater RG and surface water chronic WQS (0.005 mg/L). In 2017, the selenium concentration in Mormon A Spring (alternate POC location) was 0.228 mg/L. The concentrations of total recoverable selenium in Mormon B and C springs ranged from 0.136J mg/L to 0.08 mg/L in 2017.

At Mormon A, B and C springs, the selenium concentrations are above the groundwater RG, but have exhibited decreasing trends in the short-term since approximately 2014-2015 (Table 6, Figure 15). Nitrate is above the groundwater RG and increasing in Homestead and Mormon A, B, and C springs in the short-term. Other COCs (including fluoride, and manganese) are below the groundwater RGs and are interpreted to be stable.

Cadmium concentrations have been stable above the groundwater RG of 0.005 mg/L and surface water chronic WQS of 0.0006 mg/L in alternate POC location Mormon A Spring. The cadmium concentrations in Mormon A Spring have decreased from peaks in the 1980s but appear to have stabilized since the 1990s at concentrations around 0.015 mg/L. Cadmium was detected at SW spring above its confluence with Soda Creek at a concentration of 0.0083 mg/L.

At Southwest and Homestead springs, total recoverable selenium concentrations (0.019 mg/L and 0.039 mg/L, respectively) are below the groundwater RG of 0.05 mg/L, but above the chronic WQS of 0.005 mg/L.

Surface Water – Creeks

Soda Creek

Fifteen surface water sampling stations have been established on Soda Creek (Golder, 1998; EPA, 2008), from upstream of the Site to approximately 2 miles downstream where Soda Creek intersects US Highway 30 (Figure 3). 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). In 2017, the flow ranged from 67 cubic feet per second (cfs) at the diversion weir (SC-2) down to less than 1 cfs below the diversion. The flow increased to approximately 3.2 cfs in the diverted reach because of inflow from Southwest and Mormon springs, and other base flow, and then was measured at 62 cfs below the power return (SC-7).

Of significance in the flow-impaired reach of Soda Creek is that the springs and seeps that feed this reach are surface water expressions of groundwater discharging from the UBZ-1 and UBZ-2 aquifers. Also of significance is that a majority of the flow is diverted upstream then returned downstream, and thus the COC concentrations in the flow-impaired portion of Soda Creek are more pronounced.

Station SC-01 is upstream of the spring inflow into the flow-impaired section, and SC-04 is downstream. In the flow-impaired reach, total recoverable selenium exceeded the chronic aquatic standard (IDAPA 58.01.02) of 0.005 mg/L at Soda Creek sample stations SC-4, SC-6 and SC-7 in 2017, with concentrations of 0.0121J, 0.124J and 0.0130J, respectively (Figure 14). However, below the power canal return, at Stations SC-08 through SC-11, dilution from the return flow results in the downstream selenium concentrations to drop below the Idaho chronic criteria. In addition, the selenium concentrations at stations SC-04 and SC-06 have decreased since 2010 (Golder, 2018a, Figure E-7). The noncontact cooling water discharge sampling location on Soda Creek has exhibited an increase in nitrate and selenium concentrations in the short-term.

Cadmium levels were above the WQS of 0.0006 mg/L in the flow-diverted reach at Stations SW Spring, SC-3, SC-4, SC-6 and SC-7 at concentrations of between 0.0012 and 0.008 mg/L). However, below the power canal return flow, cadmium is non-detect due to dilution.

Mormon Creek

Mormon Creek is a tributary to Soda Creek that is fed by discharge from the UBZ-1 and 2 aquifers (Mormon A, B, and C Springs, Calf Spring, and diffuse groundwater seepage). Flow in Mormon Creek was measured at 0.4 cfs in 2017. The sampling station on Mormon Creek (MC-1) is located immediately above its confluence with Soda Creek. Selenium concentrations at MC-1 have exceeded the groundwater RG and chronic WQS of 0.005 mg/L since monitoring at this station began in 2002, with a 2017 estimated concentration of 0.172J mg/L. Cadmium concentrations in Mormon Creek were 0.0101 mg/L in 2017.

However, selenium concentrations decreased between 2014 and 2015 at the three Mormon Springs sampling stations that feed Mormon Creek, likely in response to reduced flows and groundwater capture during aquifer pilot testing upstream. The selenium concentration at Station MC-1 dropped between 2011 and 2015, then increased from 2015 to 2017 (Figure 15).

As identified in the ROD, Soda Creek is the only natural stream which is nearby and potentially affected by the Site. Exceedances of selenium and cadmium WQS were noted within the flow impaired reaches of Soda Creek and upgradient surface water expressions (i.e., springs). The upper portions of Soda Creek do not support a fisheries resource due to naturally-occurring carbon dioxide concentrations in the water. The lower reach of Soda Creek, just above its confluence with the Alexander Reservoir, provides suitable conditions to support fisheries. Exceedances of selenium and cadmium WQS have not been observed in these lower reaches.

Sediments in Soda Creek and Alexander Reservoir

During the Phase I and Phase II or the RI, sediments were sampled in Soda Creek upstream and downstream of the plant outfall, and the non-contact cooling water was also sampled and analyzed. Statistical analyses were performed on the water and sediment data to determine which downstream parameters were elevated with respect to upstream concentrations (Golder, 2018b). Sediments collected from Soda Creek downstream of the Soda Weir were found to contain elevated levels of arsenic, cadmium, copper, nickel, selenium, silver, vanadium, and polonium-210. Each elevated constituent was subjected to a preliminary risk-based screening to identify the constituents of potential concern (COPCs) in sediment. Additional sediment sampling was conducted and included toxicity testing on benthic invertebrates. The results of the toxicity testing results on the sediments were inconclusive.

The ROD did not specify a remedy for sediments, but required sediment sampling in Soda Creek every five years to evaluate if concentrations of COCs are increasing, decreasing, or stable. Monsanto conducted sediment sampling in 2017 to support the fourth FYR (Golder, 2018b) using Incremental Sampling Methodology (ISM). Figure 16 shows the locations of the Sediment Sample Reaches in Soda Creek. Figures 17 through 25 show the

constituent concentrations in sediment and variations in concentrations from upstream to downstream in the 11 reaches sampled. Both the 2017 and previous 2012 ISM data are shown for comparison to observed increases or decreases.

The following text provides a summary of the apparent changes (increases/decreases) since 2012 in each COC throughout the system (note that Reach 10 was not sampled in 2017 because of high flows). The changes are based on visual interpretations of the concentrations between 2012 and 2017 and also interpretations provided in Golder (2017b).

- Arsenic: No apparent trend with time except a higher concentration at Control Reach 01 since 2012 (Figure 17).
- Beryllium: Very slight increase since 2012 in reaches 01, 05, 06, 07, and 11 (Figure 18).
- Cadmium: Slightly higher concentrations since 2012 in reaches 07, 08, and 11 (Figure 19).
- Copper: No apparent trend with time except slightly lower concentrations in reach 07 and Region 11, also called the Soda Creek Arm (Figure 20).
- Nickel: No apparent trend with time in nickel concentration, except for higher concentration in reach 01, and lower concentration in Reach 08 (Figure 21).
- Polonium 210: Slightly higher concentrations than 2012 in reaches 01, 02, 05, 07, and Soda Creek Arm. However, the highest concentration overall was upgradient in Reach 01 (Figure 22).
- Selenium: Slightly higher than 2011 in Reaches 02, 05 and 07, but same as 2011 in Soda Creek Arm (Figure 23).
- Silver: Higher than 2012 in the flow-diverted reaches (05 through 08), but similar to upstream reaches and non-detect in the Soda Creek Arm (Figure 24).
- Vanadium: Slight decrease in concentrations between 2012 and 2017 (Figure 25).

Overall, in the downstream reaches, cadmium concentrations decrease from Reach 07 to the Soda Creek Arm, but are slightly higher than the upstream control reaches. Concentrations of arsenic, beryllium, cadmium, nickel, selenium, silver, and vanadium all decrease from Reach 08 (in the flow-diverted portion of Soda Creek) to the Soda Creek Arm (Region 11). The copper concentration in sediments is slightly higher in the Soda Creek Arm than in Reaches 05, 06, 07, and 08. COC concentrations are lower than observed in the upstream control reaches except for cadmium and copper.

The ISM results are compared to Freshwater Sediment Screening Benchmarks (EPA, 2006), which are based on ecological risk. These are not legally enforceable but are used to guide decisions regarding site specific investigations for ecological risk.

Cadmium concentrations exceed the sediment screening benchmark of 0.99 mg/Kg in reach 05 through 11. Selenium concentrations exceed the sediment screening benchmark of 2 mg/kg in all reaches in Soda Creek, at concentrations between 4.2 and 57 mg/kg. Arsenic, nickel, and silver concentration exceed sediment screening benchmarks in almost all reaches. Copper concentrations are below screening benchmarks in all reaches. Beryllium, polonium-210, or vanadium do not have sediment screening benchmarks. In summary, in the flow-diverted reaches, cadmium and selenium concentrations increase markedly in reaches 06 and 07. It is interpreted that cadmium and selenium enter Soda Creek from Mormon Creek and baseflow of groundwater from UBZ-1 and 2. However, concentrations of these two COCs in sediment decline downstream from Reach 08, when the power return flow enters Soda Creek.

The constituent concentrations in Soda Creek sediments appear to be generally stable and did not increased markedly between 2012 and 2017. The third sediment ISM sample will be conducted in 2022. The results of this sample event will enable evaluation of trends in sediment concentrations.

Offsite Soils

As required by the ROD, Monsanto collected offsite soil samples for the fourth FYR to determine the concentrations of COCs in soil grids surrounding the plant. Soil sampling results indicated that offsite soils were all below the remediation goal of 3.7 picocuries per gram for Radium-226, except in Parcels 1, 2, and 6 (these parcels had concentrations of 4.41, 3.82, and 4.1 picocuries per gram, respectively) (Figure 26). These parcels are on the southeast side of the plant and Radium-226 concentrations from these parcels exceeded the RG in the third FYR. These parcels have previously been identified as exceeding the RGS, and those parcels are under appropriate

ICs (Golder, 2018c). Because no new areas with RG exceedances were identified, no title or other searches will be conducted as no new ICs are needed.

Decision Units 21, 22 and 25, located northeast of the plan, showed Radium-226 concentrations above the RG during the third FYR. However, samples from these decision units had Radium-226 concentrations below the RG during the fourth FYR.

Site Inspection

The FYR site inspection was conducted on June 6, 2018. Jason Maughan of Monsanto and Greg Warren of CH2M (representative of EPA) were in attendance. The purpose of the inspection was to visually assess the protectiveness of the remedy and ongoing Site O&M, including the condition and sampling of the monitoring wells, and engineering controls of the source piles.

No significant findings were observed during the inspection. The monitoring wells inside and outside of the plant were all in acceptable condition. Monsanto continues fugitive dust control on plant roads, and has been plot-testing cover materials for plants on the on-site source piles. The checklist is included in Appendix C and provides additional details regarding the condition and performance of the remedy.

V. TECHNICAL ASSESSMENT

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

Question A Summary:

No. The ROD (1997) indicates that modeling predicted that "without further action concentrations of constituents in groundwater at the southern Plant boundary will be restored to background levels within 5 to 30 years" (depending on the contaminant and it rate of degradation). In addition, the combination of source control and remedial actions and natural attenuation "is projected to restore the groundwater to [contaminant] levels which allow for unrestricted use and exposure within 30 years". Finally, the ROD states "If groundwater recovery appears to significantly differ from model projections, the model and the need for additional groundwater remedial actions should be re-evaluated".

Based on a review of current groundwater data and source area conditions, the groundwater remedy (MNA) is not performing as intended. Groundwater monitoring data reveal that after initially decreasing, some COC concentrations have been increasing over the last several years in some of the monitoring locations, and at some locations appear relatively stable above the RGs. In addition, the COC selenium has been detected at the southern property boundary in monitoring well TW-65 at concentrations that exceeded its RG. Monitoring wells upgradient from the southern property line are interpreted to be increasing in the short-term (Figure 8; Table 6; Golder, 2018a). These trends indicate the selenium is not attenuating at the previously-estimated rate.

The RI concluded that remaining source areas such as the Northwest Pond and UFS Ponds had been adequately controlled by taking the ponds out of service and lining them with impermeable barriers to prevent any contaminant migration. However, investigations conducted since the last FYR (Golder, 2016) revealed that more than 40,000 tons of source materials are estimated to remain in the UFS and Tailing Ponds. Moreover, these potential source areas are covered with crushed slag and other permeable materials that allow infiltrated precipitation to flow vertically downward and reach the groundwater aquifer; thus contributing to ongoing contamination in groundwater.

Attenuation rates have proved to be slower than originally predicted, for selenium in particular. These issues raise the uncertainty of the ability of the implemented remedy of MNA to achieve the goal of groundwater restoration within the 5- to 30- year timeframe. Groundwater cleanup performance standards have not been achieved as of 2017, and data suggest that those standards will not be achieved in the foreseeable future, particularly now that leaching from remaining COC sources has been positively identified.

Uncertainties in the Conceptual Site Model have been identified (Golder, 2016). Data gaps were identified at the southwest property line along Government Dam Road where the selenium plume has not been completely delineated; and east and southeast of the plant production wells, where the extent of groundwater capture and the relationship to the Kerr-McGee plume has not been fully characterized. Monitoring wells were installed in 2018 to address these data gaps, but at the time of this report preparation, these data are not available. Other unknowns include the full extent and thickness of the UFS source materials remaining buried on site, the spatial distribution of precipitation infiltration, the source of elevated chloride that could result in increased cadmium leaching, the source of nitrate and manganese within the UBZ-2 area that results in groundwater concentrations above the RG, and the potential for COC transport downgradient of UBZ-4 outside control by production wells.

A domestic well survey and sampling event was conducted in 2015 (Golder, 2015) to investigate the presence of domestic wells and current usage. The area of the study included all areas where wells that could have been potentially impacted by the plume from the Site. No drinking water wells were discovered to exceed the RGs for any site COCs (Golder, 2015). However, no specific safeguards or legally enforceable restrictions are in place to prevent use of groundwater in locations where site-related COCs exceed RGs within Soda Springs, south of Monsanto's property line.

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

Question B Summary:

Yes. Exposure assumptions, ARARs, RGs, and RAOs used at the time of the remedy are still valid. Changes to toxicity factors and EPA guidance are not significant enough to affect the remedy or require additional monitoring. The narrative below describes changes that have occurred since the remedy was selected, and whether those changes affect the validity of the remedy.

Changes in Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBCs) Criteria

The 1997 ROD did not identify Idaho surface water quality standards as ARARs. Monitoring data indicates that total recoverable selenium has exceeded the current Idaho chronic WQS of 0.005 mg/L in areas where contaminated groundwater discharges to springs and creeks. EPA should consider whether a decision document is needed to incorporate the Idaho WQS as an ARAR and the selenium WQS as an RG. No other changes were identified for ARARs or TBCs.

New Contaminants or Contaminant Sources

No new contaminants have been identified at the Site.

Changes in Toxicity and Other Contaminant Characteristics

Human health toxicity factors for several contaminants evaluated during the risk assessment have changed since the time of remedy selection, although the changes to these toxicity factors were minor. The inhalation toxicity factors used during the risk assessment are outdated because guidance for estimating risk from the inhalation pathway has changed since the time of the risk assessment (EPA, 2009). The impact of these changes on baseline risk is unknown, although these methodology changes are unlikely to affect the remedy because exposures via the dust inhalation pathway are much less than through ingestion.

Changes in Risk Assessment Methods

EPA has published many new risk assessment guidance documents since the ROD. No new guidance documents that would affect the assessment of risks at this site have been issued in the last five years. The methodology used during the human health and ecological risk assessments was sufficient to evaluate risk in those areas of the Site that were evaluated at that time. Methodology changes provided in new or updated guidance documents are not anticipated to be significant enough to result in changes to RGs or to affect the validity of previous remedial action decisions at the Site.

Changes in Exposure Pathways and Land Use

Since the last FYR, domestic well survey and water quality sampling reports were completed for the Soda Springs area south (downgradient) of the Site, where the plume may have migrated (Golder, 2015). The survey identified only four domestic wells and one spring that are operational in the study area. Three of the wells are used for drinking water, while the fourth well is used for irrigation and stock watering. Sample results collected in 2015 (Golder, 2015) from the four domestic wells identified showed that COC concentrations are all below the RGs identified in Table 1. Additionally, potable water is provided by the City for the citizens of Soda Springs. Considering this, along with the results of the well survey and water quality sampling report, groundwater contamination related to the Site is not believed to pose an unacceptable risk under the current conditions.

Changes in Remedial Action Objectives

There have been no changes to the existing RAOs, and the RAOs remain valid.

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

No.

VI. ISSUES/RECOMMENDATIONS

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): N/A	**Issue Category:** Remedy Performance			
	Issue: Concentrations of COCs in groundwater exceed RGs 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.			
	Recommendation: Complete the supplemental focused Remedial Investigation and 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 annually to observe changes in COC concentrations.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	3/13/2020

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): N/A	**Issue Category:** Institutional Controls			
	Issue: No restrictions are in place to prevent installation and/or use of domestic or irrigation wells downgradient of the Monsanto Site where COCs exceed the RGs.			
	Recommendation: Develop an institutional control plan for areas where groundwater COCs have migrated beyond current property boundary. Enact enforceable restrictions on groundwater use beyond southern property boundary to prevent exposure where plume has migrated to Soda Springs.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/6/2019

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: Fully define the extent of remaining on-site sources and address leaching of COCs into groundwater.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	9/6/2019

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 are elevated based on statistical analyses and relative to ecological risk benchmarks downstream of facility in the flow-diverted reaches.			
	Recommendation: Continue monitoring the sediments every five years. Consider whether remedial action is necessary to address ecological risks due to elevated contaminant concentrations in sediments.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	8/18/2023

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): N/A	**Issue Category:** Remedy Performance			
	Issue: Concentrations of surface water in location where groundwater discharges to several streams and creeks exceed Idaho WQS.			
	Recommendation: Continue monitoring surface water annually. Execute a ROD amendment or ESD to add surface water RAOs, ARARs, and RGs, and require any necessary remedial action.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA	8/18/2023

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): N/A	**Issue Category**: Remedy Performance			
	Issue: Uncertainties have been identified in the CSM that raise questions to the appropriateness of the remedy.			
	Recommendation: Execute the recommendations from the focused supplemental RI and source area characterization (Golder, 2016) to fully characterize source materials, COC transport mechanism, evaluate chloride, nitrate and manganese sources, and evaluate water quality data from wells installed in 2018.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA	3/13/2020

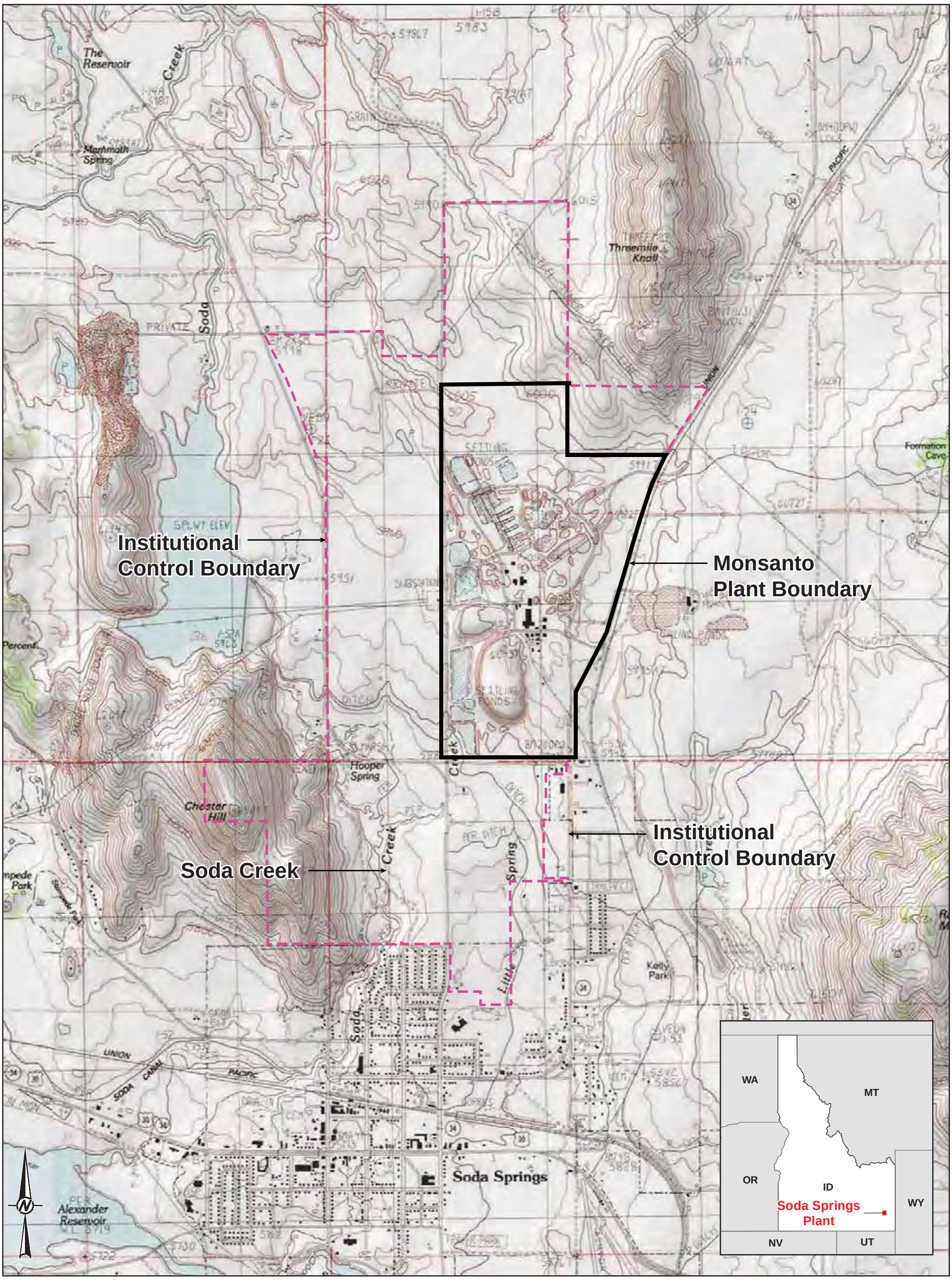
VII. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement
Protectiveness Determination: Not Protective
Protectiveness Statement: The remedy for the Monsanto Site is not protective because concentrations of surface water in locations where groundwater discharges to several streams and creeks exceed Idaho WQS. The following actions need to be taken to ensure protectiveness: execute a ROD Amendment or ESD to add surface water RAOs, ARARs, and RGs, and require any necessary remedial action. In addition, the following issues need to be taken in order to ensure long-term protectiveness: Complete the supplemental focused Remedial Investigation and 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, sediments, and surface water to observe changes in COC concentrations. Fully define the extent of remaining on-site sources and address leaching of COCs into groundwater. Develop and implement an institutional control plan for areas where groundwater COCs have migrated beyond current property boundary.

VIII. NEXT REVIEW

The next FYR report for the Site is required 5 years from the completion date of this review.

Figures



LEGEND

Institutional Control Boundary

Monsanto Plant Boundary

REFERENCE(S)

1. SERVICE LAYER CREDITS: COPYRIGHT:© 2013 NATIONAL GEOGRAPHIC SOCIETY, I-CUBED

0 1,250 2,500 5,000

FEET

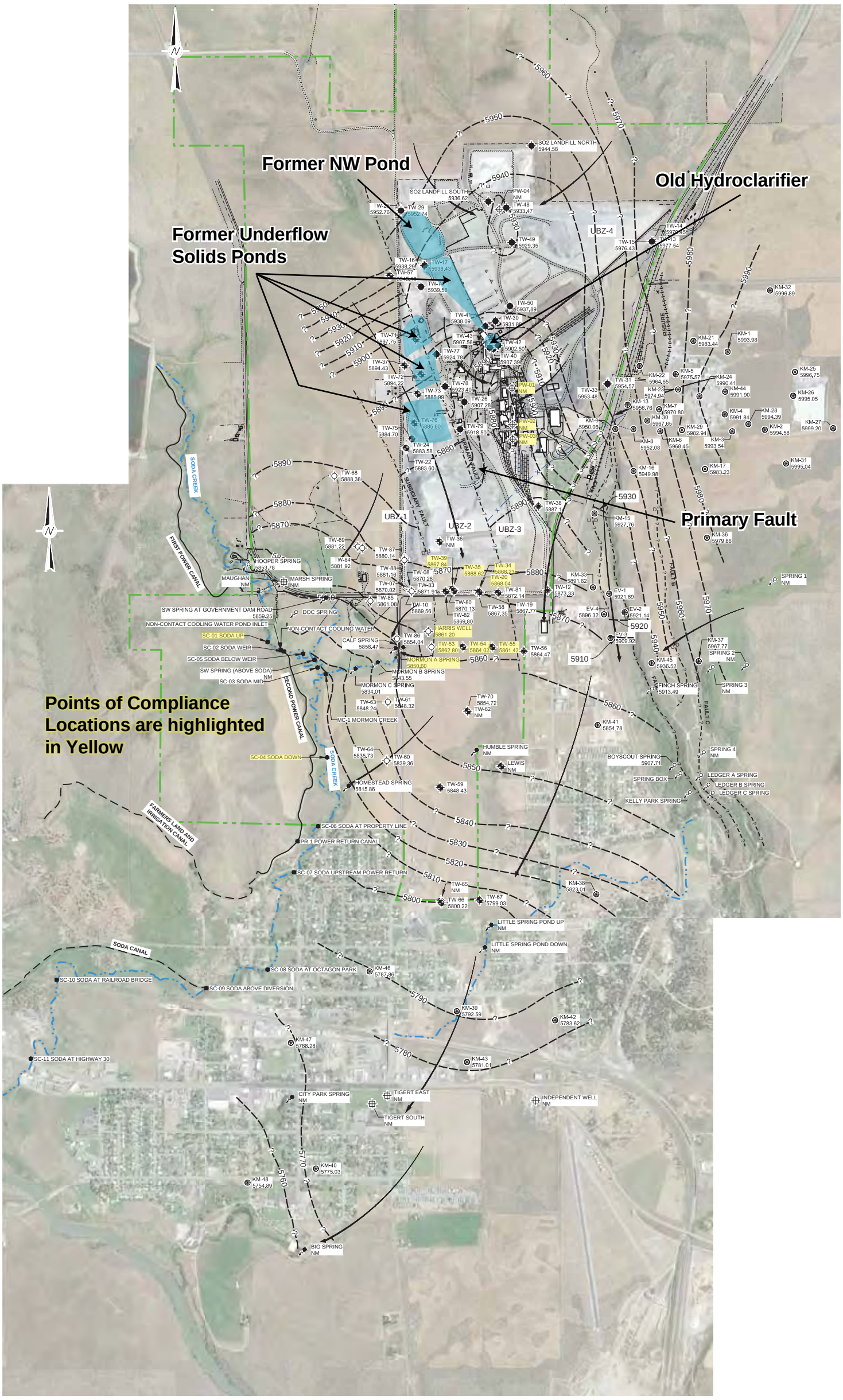
FIGURE 1

Monsanto Plant Vicinity Map

Monsanto Site 2018 Fourth Five-Year Review

Caribou County, Idaho

Source: Golder Associates Inc. 2017. *2017 Off-site Soil Sampling Report, Fourth CERCLA Five-Year Review, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company.



LEGEND

MORMON A	SPRING LOCATION WITH NAME (WHERE KNOWN)	TW-60	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-1
DOC	SPRING LOCATION (NOT SAMPLED) WITH NAME (WHERE KNOWN)	TW-59	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-2
MORMON CREEK	SURFACE WATER LOCATION WITH NAME	TW-56	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-3
(NM)	WELL LOCATION IN SODA SPRINGS WITH NAME	TW-28	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-4
	GROUNDWATER FLOW DIRECTION	PW-1	PRODUCTION WELL LOCATION WITH NAME
5840	GROUNDWATER CONTOUR (10 FOOT INTERVAL)	KM-1	TRONOX WELL LOCATION WITH NAME IN UBZ

U D	FAULT
	FISSURE
UBZ-1	GROUNDWATER ZONE
	INSTITUTIONAL CONTROL BOUNDARY
	CREEK
	POWER CANAL
	IRRIGATION CANAL
	GROUNDWATER FLOW REGION BOUNDARY

NOTES

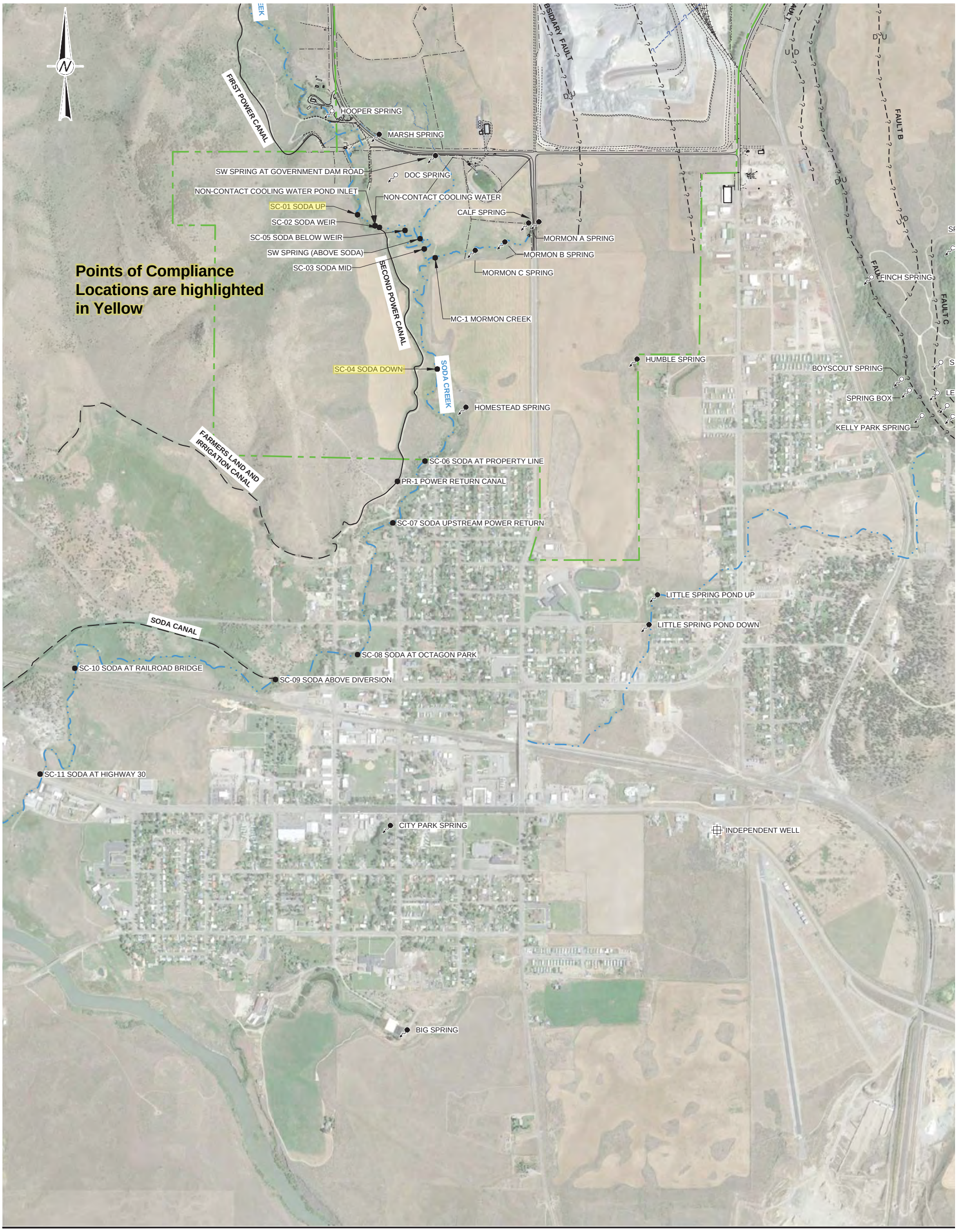
1. NAD83 IDAHO STATE PLANES, EAST ZONE, US FOOT.
2. AERIAL PHOTO FROM GOOGLE EARTH (8/2/2013).

FIGURE 2

Monitoring Well Locations, Springs, Groundwater Elevation and Flow Direction in the Upper Basalt Zone (June 2017)

Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

Source: Golder Associates Inc. 2018. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



LEGEND

MORMON A	SPRING LOCATION WITH NAME (WHERE KNOWN)
DOC	SPRING LOCATION (NOT SAMPLED) WITH NAME (WHERE KNOWN)
MORMON CREEK	SURFACE WATER LOCATION WITH NAME
(NM)	WELL LOCATION IN SODA SPRINGS WITH NAME

FAULT	
FISSURE	
UBZ-1	GROUNDWATER ZONE
	INSTITUTIONAL CONTROL BOUNDARY
	CREEK
	POWER CANAL
	IRRIGATION CANAL
	GROUNDWATER FLOW REGION BOUNDARY

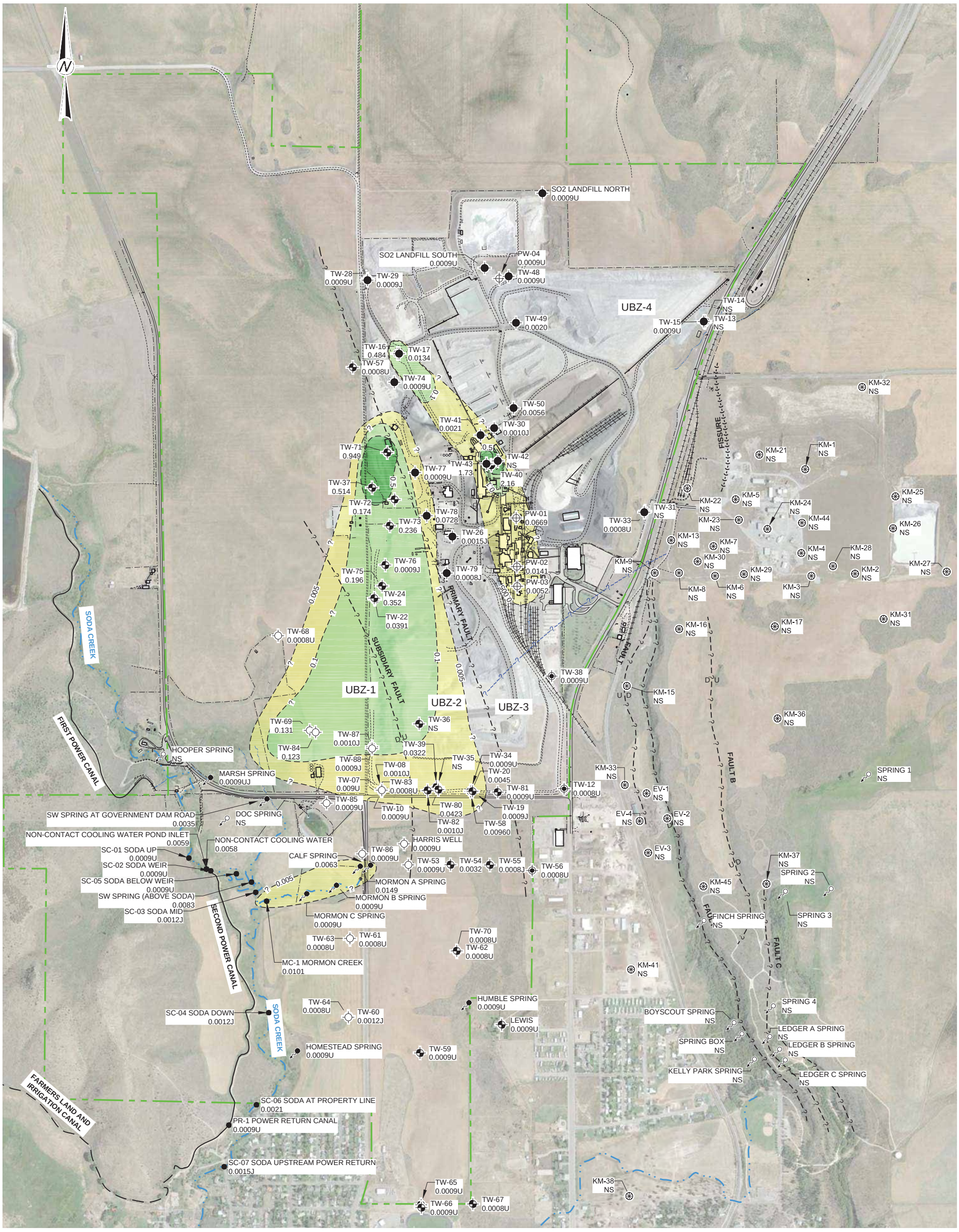
0 600 1200
1" = 600' FEET

NOTES

1. NAD83 IDAHO STATE PLANES, EAST ZONE, US FOOT.
2. AERIAL PHOTO FROM GOOGLE EARTH (8/2/2013).

FIGURE 3
Soda Creek and Springs Sample Locations
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

Source: Golder Associates Inc. 2018. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



LEGEND

- MORMON A (0.015) — SPRING LOCATION WITH NAME (WHERE KNOWN)
- DOC — SPRING LOCATION (NOT SAMPLED) WITH NAME (WHERE KNOWN)
- MORMON CREEK — SURFACE WATER LOCATION WITH NAME
- (NM) — WELL LOCATION IN SODA SPRINGS WITH NAME
- (<0.041) — SAMPLE: CHEMICAL CONCENTRATION (mg/L) WITH QUALIFIER (IF ANY)
  (...U) = NOT MEASURED
  (...J) = ESTIMATED
  (J+) = ESTIMATED WITH HIGH BIAS
- CHEMICAL ISOPLETH (mg/L) DASHED WHERE APPROXIMATE
- ? WHERE UNKNOWN
- TW-60 (<0.002 U) — MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-1
- TW-59 (<0.002 U) — MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-2
- TW-56 (<0.002 U) — MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-3
- TW-28 (<0.002 U) — MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-4
- PW-1 (<0.041) — PRODUCTION WELL LOCATION WITH NAME
- KM-1 — TRONOX WELL LOCATION WITH NAME IN UBZ
- FAULT
- FISSURE
- UBZ-1 — GROUNDWATER ZONE
- INSTITUTIONAL CONTROL BOUNDARY
- CREEK
- POWER CANAL
- IRRIGATION CANAL
- GROUNDWATER FLOW REGION BOUNDARY

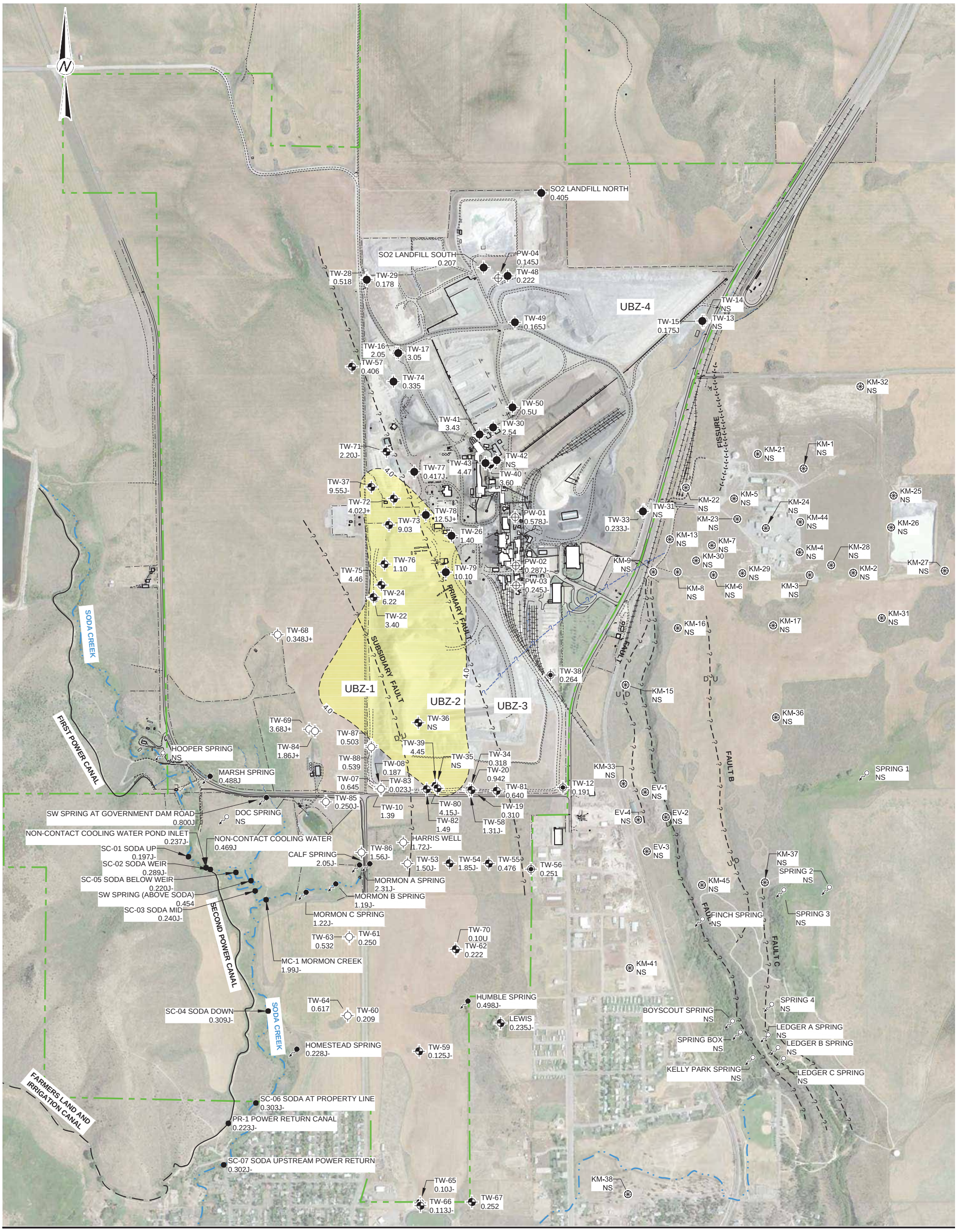
0 600 1200
1" = 600' FEET

NOTES

1. NAD83 IDAHO STATE PLANES, EAST ZONE, US FOOT.
2. AERIAL PHOTO FROM GOOGLE EARTH (8/2/2013).
3. **YELLOW/GREEN SHADED AREAS EXCEED CADMIUM RG OF 0.005 MG/L.**

FIGURE 4
Cadmium Concentrations in the Upper Basalt Zone (June 2017)
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

Source: Golder Associates Inc. 2018. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



LEGEND

- MORMON A (0.015) — SPRING LOCATION WITH NAME (WHERE KNOWN)
- DOC — SPRING LOCATION (NOT SAMPLED) WITH NAME (WHERE KNOWN)
- MORMON CREEK — SURFACE WATER LOCATION WITH NAME
- INDEPENDENT — WELL LOCATION IN SODA SPRINGS WITH NAME
- (<0.041) — SAMPLE: CHEMICAL CONCENTRATION (mg/L) WITH QUALIFIER (IF ANY)
  (...U) = NOT MEASURED
  (...J) = ESTIMATED
  (J+) = ESTIMATED WITH HIGH BIAS
- CHEMICAL ISOPLETH (mg/L) DASHED WHERE APPROXIMATE
- ? WHERE UNKNOWN
- TW-60 (<0.002 U) — MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-1
- TW-59 (<0.002 U) — MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-2
- TW-56 (<0.002 U) — MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-3
- TW-28 (<0.002 U) — MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-4
- PW-1 (<0.041) — PRODUCTION WELL LOCATION WITH NAME
- KM-1 — TRONOX WELL LOCATION WITH NAME IN UBZ
- FAULT
- FISSURE
- UBZ-1 — GROUNDWATER ZONE
- INSTITUTIONAL CONTROL BOUNDARY
- CREEK
- POWER CANAL
- IRRIGATION CANAL
- GROUNDWATER FLOW REGION BOUNDARY

0 600 1200
1" = 600' FEET

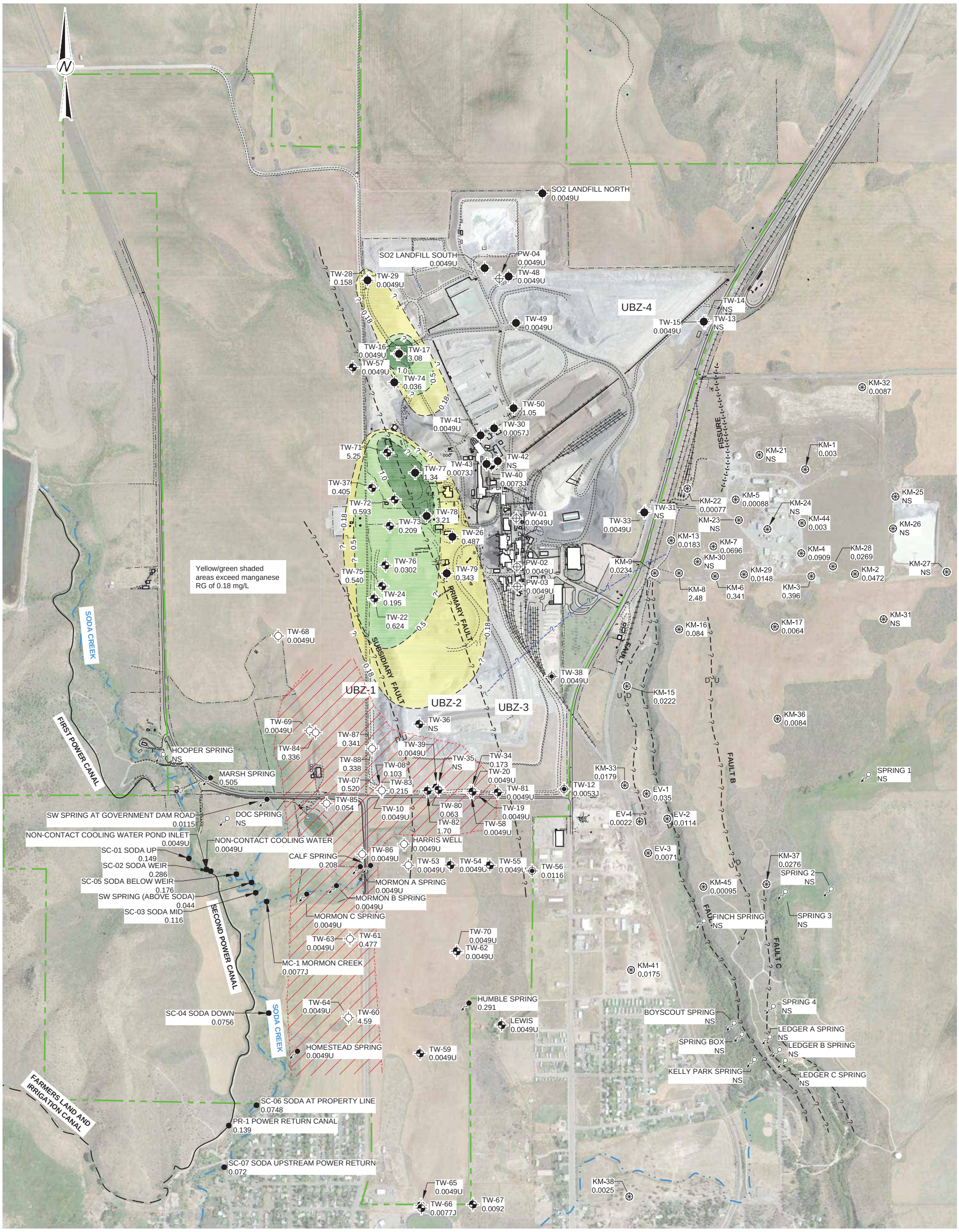
CLIENT

NOTES

1. NAD83 IDAHO STATE PLANES, EAST ZONE, US FOOT.
2. AERIAL PHOTO FROM GOOGLE EARTH (8/2/2013).
3. YELLOW-SHADED AREA EXCEEDS FLUORIDE RG OF 4.0 MG/L.

FIGURE 5
Fluoride Concentrations in the Upper Basalt Zone (June 2017)
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

Source: Golder Associates Inc. 2018. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



LEGEND

- MORMON A (0.015) — SPRING LOCATION WITH NAME (WHERE KNOWN)
- DOC — SPRING LOCATION (NOT SAMPLED) WITH NAME (WHERE KNOWN)
- MORMON CREEK — SURFACE WATER LOCATION WITH NAME
- INDEPENDENT — WELL LOCATION IN SODA SPRINGS WITH NAME
- (<0.041) — SAMPLE: CHEMICAL CONCENTRATION (mg/L) WITH QUALIFIER (IF ANY)
  (...U) = NOT MEASURED
  (...J) = ESTIMATED
  (J+) = ESTIMATED WITH HIGH BIAS
- CHEMICAL ISOPLETH (mg/L) DASHED WHERE APPROXIMATE
- ? WHERE UNKNOWN
- TW-60 (<0.002 U) — MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-1
- TW-59 (<0.002 U) — MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-2
- TW-56 (<0.002 U) — MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-3
- TW-28 (<0.002 U) — MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-4
- PW-1 (<0.041) — PRODUCTION WELL LOCATION WITH NAME
- KM-1 — TRONOX WELL LOCATION WITH NAME IN UBZ
- FAULT
- FISSURE
- UBZ-1 — GROUNDWATER ZONE
- INSTITUTIONAL CONTROL BOUNDARY
- CREEK
- POWER CANAL
- IRRIGATION CANAL
- GROUNDWATER FLOW REGION BOUNDARY
- AREA OF UPWARD COMPONENT TO VERTICAL HYDRAULIC GRADIENT

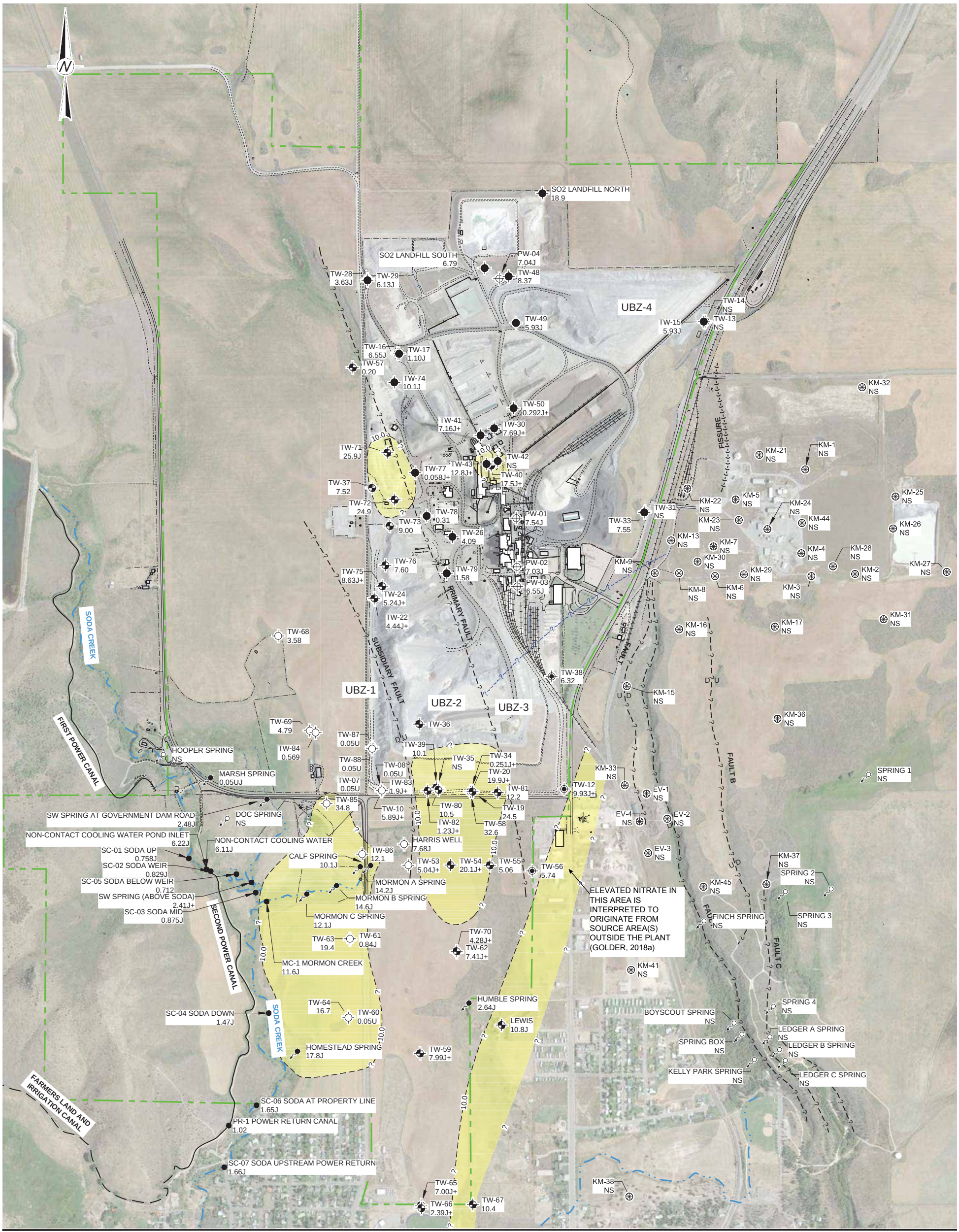
0 600 1200
1" = 600' FEET

NOTES

1. NAD83 IDAHO STATE PLANES, EAST ZONE, US FOOT.
2. AERIAL PHOTO FROM GOOGLE EARTH (8/2/2013).
3. YELLOW/GREEN SHADED AREAS EXCEED MANGANESE RG OF 0.18 MG/L.

FIGURE 6
Manganese Concentrations in the Upper Basalt Zone (June 2017)
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

Source: Golder Associates Inc. 2018. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



LEGEND

MORMON A (0.015)	SPRING LOCATION WITH NAME (WHERE KNOWN)	TW-60 (<0.002 U)	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-1	FAULT	
DOC	SPRING LOCATION (NOT SAMPLED) WITH NAME (WHERE KNOWN)	TW-59 (<0.002 U)	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-2	FISSURE	
MORMON CREEK	SURFACE WATER LOCATION WITH NAME	TW-56 (<0.002 U)	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-3	UBZ-1	GROUNDWATER ZONE
INDEPENDENT	WELL LOCATION IN SODA SPRINGS WITH NAME	TW-28 (<0.002 U)	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-4	INSTITUTIONAL CONTROL BOUNDARY	
(<0.041)	SAMPLE: CHEMICAL CONCENTRATION (mg/L) WITH QUALIFIER (IF ANY) (...U) = NOT MEASURED (...J) = ESTIMATED (J+) = ESTIMATED WITH HIGH BIAS	PW-1 (<0.041)	PRODUCTION WELL LOCATION WITH NAME	CREEK	
		KM-1	TRONOX WELL LOCATION WITH NAME IN UBZ	POWER CANAL	
				IRRIGATION CANAL	
				GROUNDWATER FLOW REGION BOUNDARY	

CHEMICAL ISOPLETH (mg/L) DASHED WHERE APPROXIMATE

? WHERE UNKNOWN

0 600 1200

1" = 600' FEET

NOTES

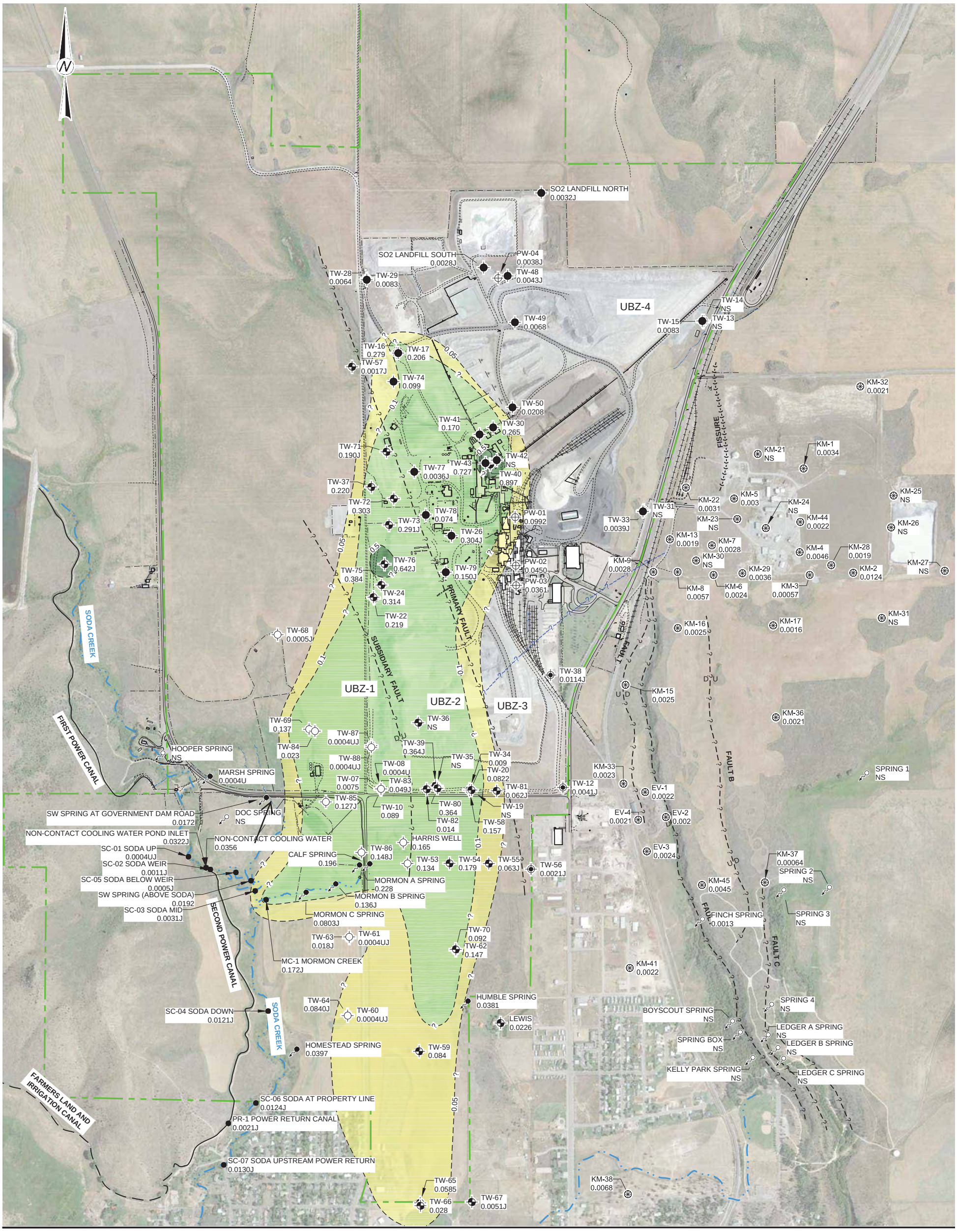
1. NAD83 IDAHO STATE PLANES, EAST ZONE, US FOOT.
2. AERIAL PHOTO FROM GOOGLE EARTH (8/2/2013).
3. **YELLOW-SHADED AREAS EXCEED NITRATE (AS N) RG OF 10.0 MG/L.**

FIGURE 7

Nitrate Concentrations in the Upper Basalt Zone (June 2017)

Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

Source: Golder Associates Inc. 2018. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



LEGEND

MORMON A (0.015)	SPRING LOCATION WITH NAME (WHERE KNOWN)
DOC	SPRING LOCATION (NOT SAMPLED) WITH NAME (WHERE KNOWN)
MORMON CREEK	SURFACE WATER LOCATION WITH NAME
INDEPENDENT	WELL LOCATION IN SODA SPRINGS WITH NAME
(<0.041)	SAMPLE: CHEMICAL CONCENTRATION (mg/L) WITH QUALIFIER (IF ANY) (...U) = NOT MEASURED (...J) = ESTIMATED (J+) = ESTIMATED WITH HIGH BIAS
0.05 / 0.5 / 0.10	CHEMICAL ISOPLETH (mg/L) DASHED WHERE APPROXIMATE
?	? WHERE UNKNOWN
TW-60 (<0.002 U)	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-1
TW-59 (<0.002 U)	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-2
TW-56 (<0.002 U)	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-3
TW-28 (<0.002 U)	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-4
PW-1 (<0.041)	PRODUCTION WELL LOCATION WITH NAME
KM-1	TRONOX WELL LOCATION WITH NAME IN UBZ
FAULT	
FISSURE	
UBZ-1	GROUNDWATER ZONE
	INSTITUTIONAL CONTROL BOUNDARY
	CREEK
	POWER CANAL
	IRRIGATION CANAL
	GROUNDWATER FLOW REGION BOUNDARY

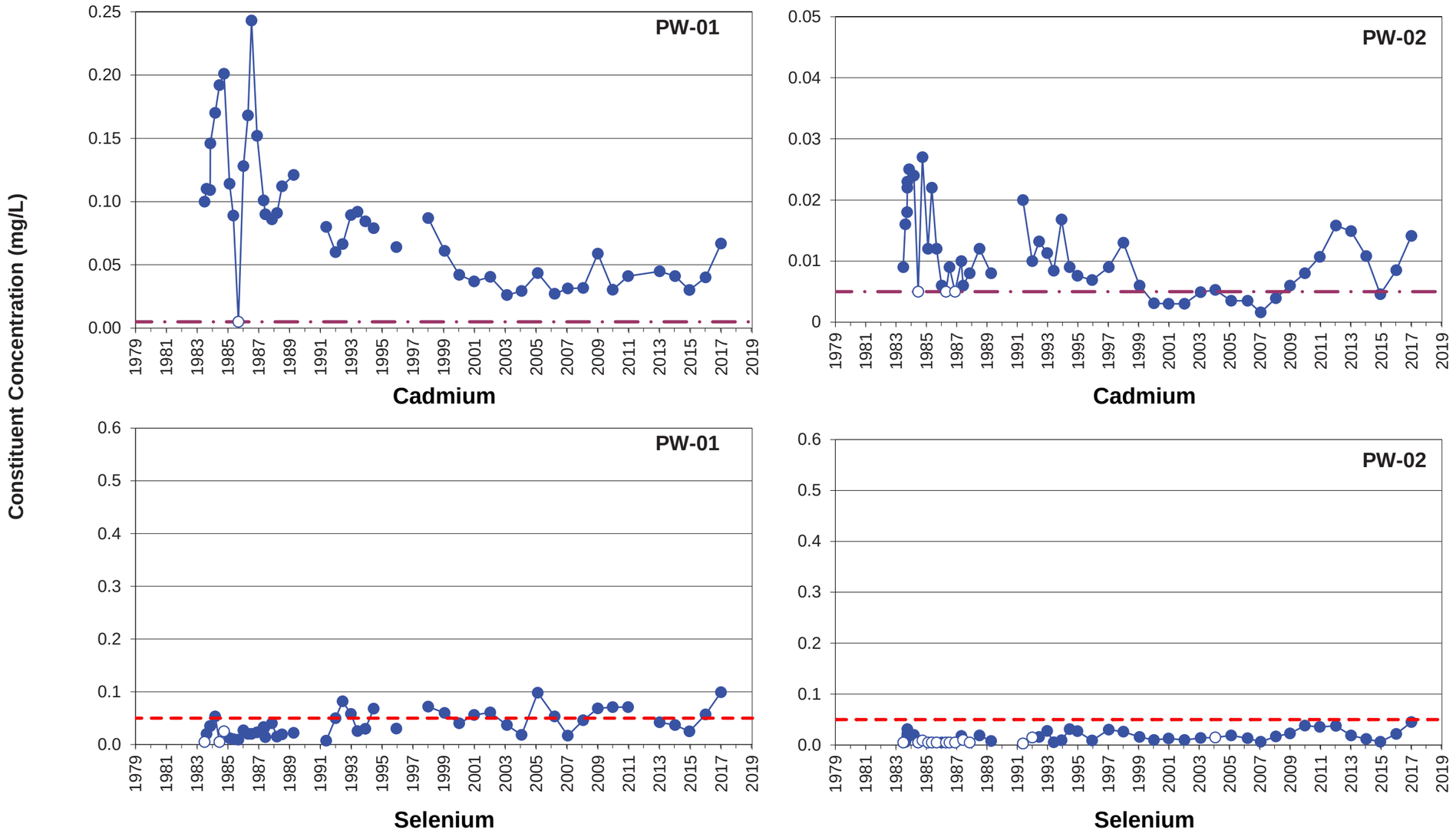
0 600 1200
1" = 600' FEET

NOTES

1. NAD83 IDAHO STATE PLANES, EAST ZONE, US FOOT.
2. AERIAL PHOTO FROM GOOGLE EARTH (8/2/2013).
3. **YELLOW/GREEN SHADED AREA EXCEEDS SELENIUM RG OF 0.05 MG/L.**

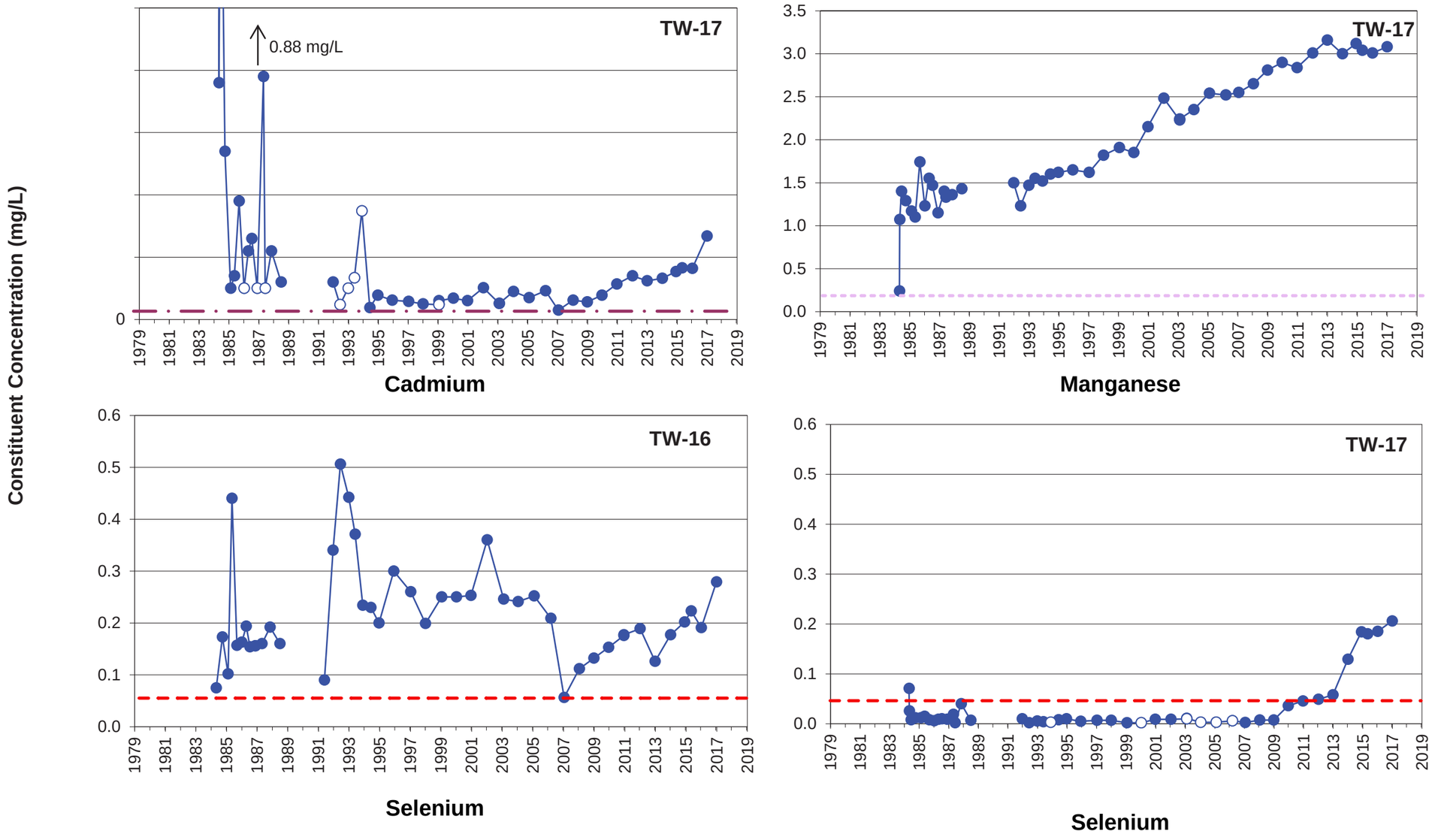
FIGURE 8
Selenium Concentrations in the Upper Basalt Zone (June 2017)
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

Source: Golder Associates Inc. 2018. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



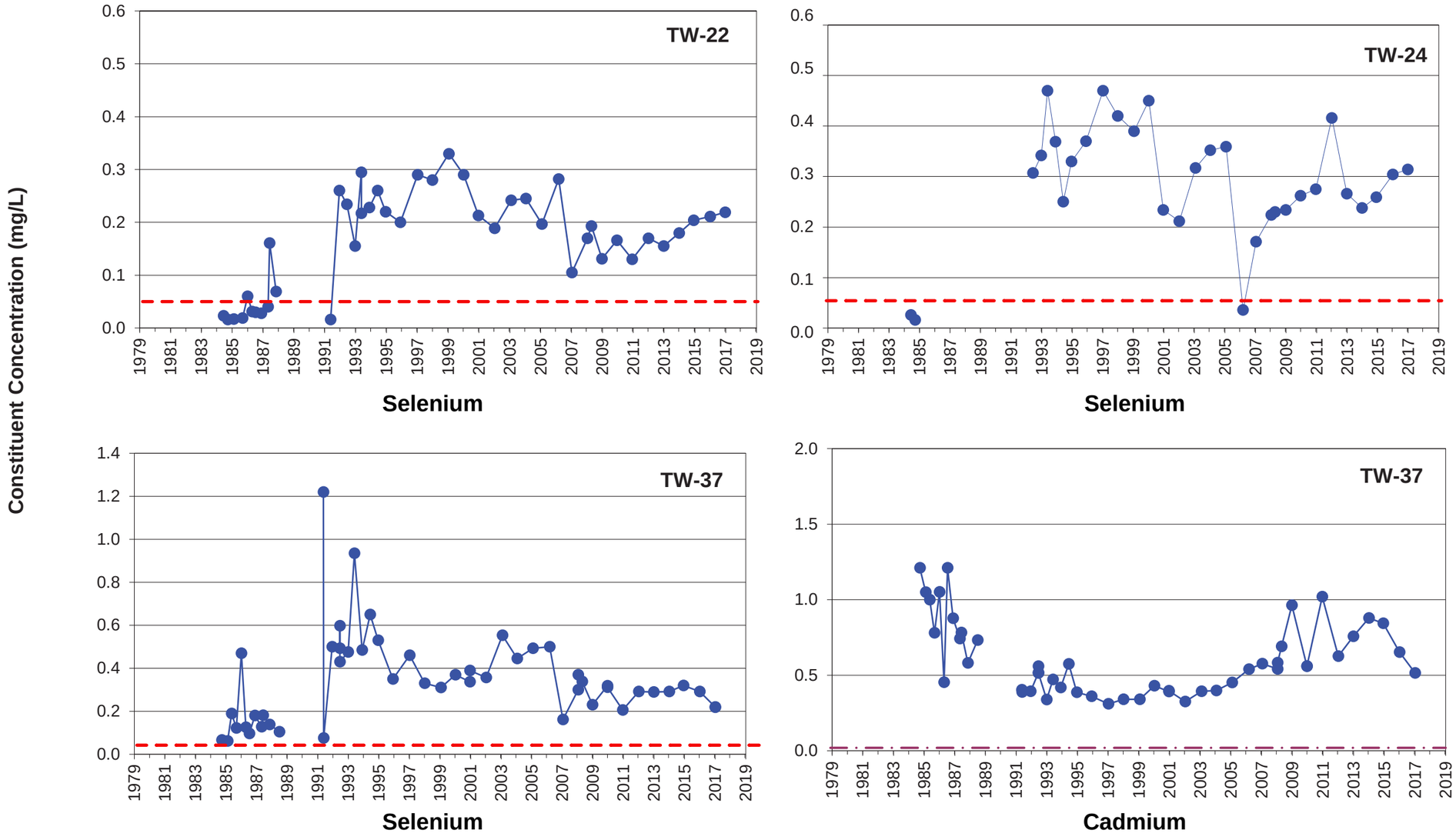
Source: Golder Associates Inc. 2018. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.

Figure 9.
Cadmium and Selenium in Production Wells (UBZ-4)
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho



Source: Golder Associates Inc. 2018. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.

Figure 10.
Cadmium, Selenium, and Manganese in Northwest Pond Wells (UBZ-4 Source Area)
Monsanto Site 2018 4th Five-Year Review
Caribou County, Idaho

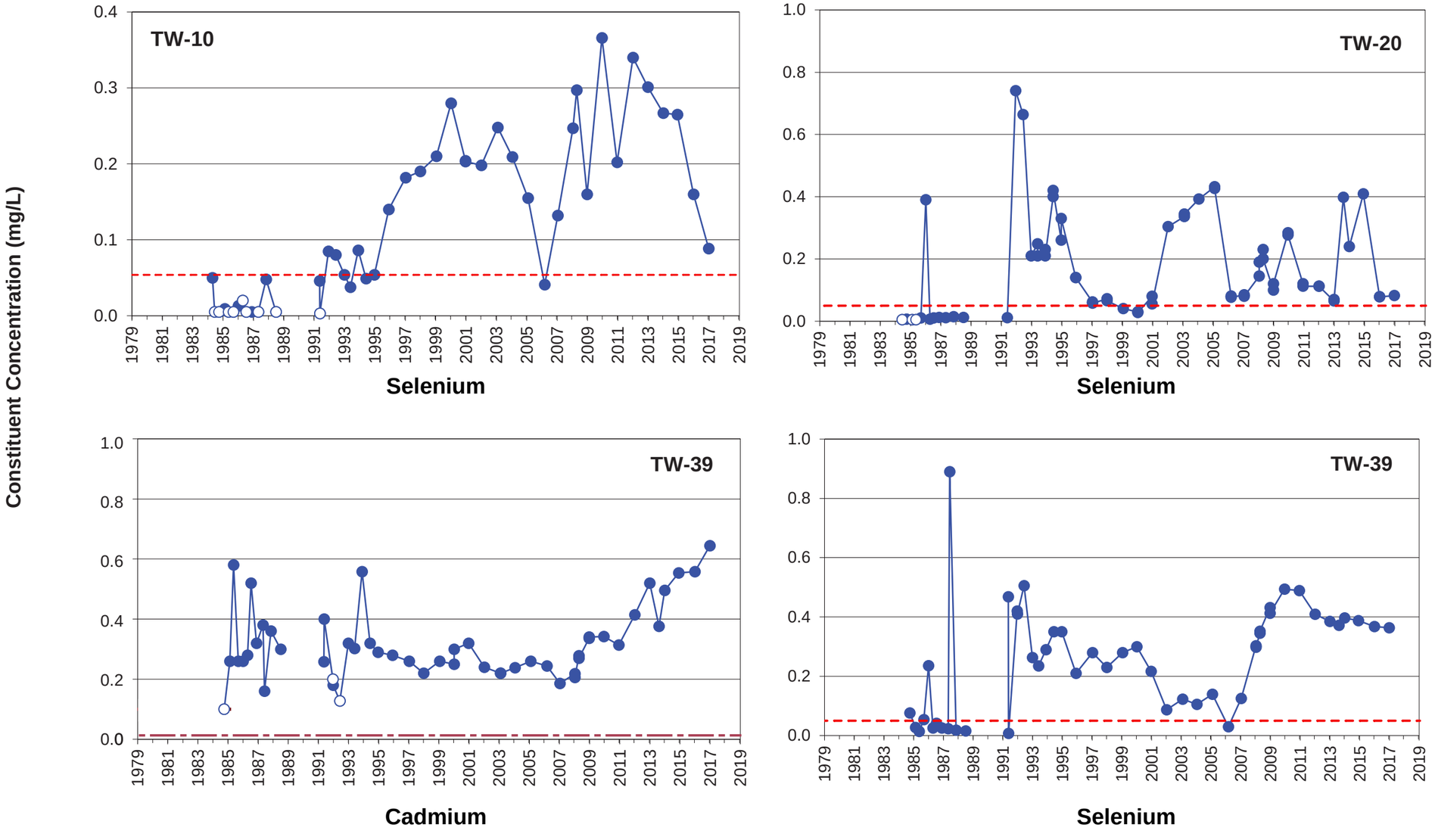


LEGEND

- Constituent Concentration (mg/L)
- Non-Detects
- Selenium Remediation Goal (0.05 mg/L)
- Cadmium Remediation Goal (0.005 mg/L)

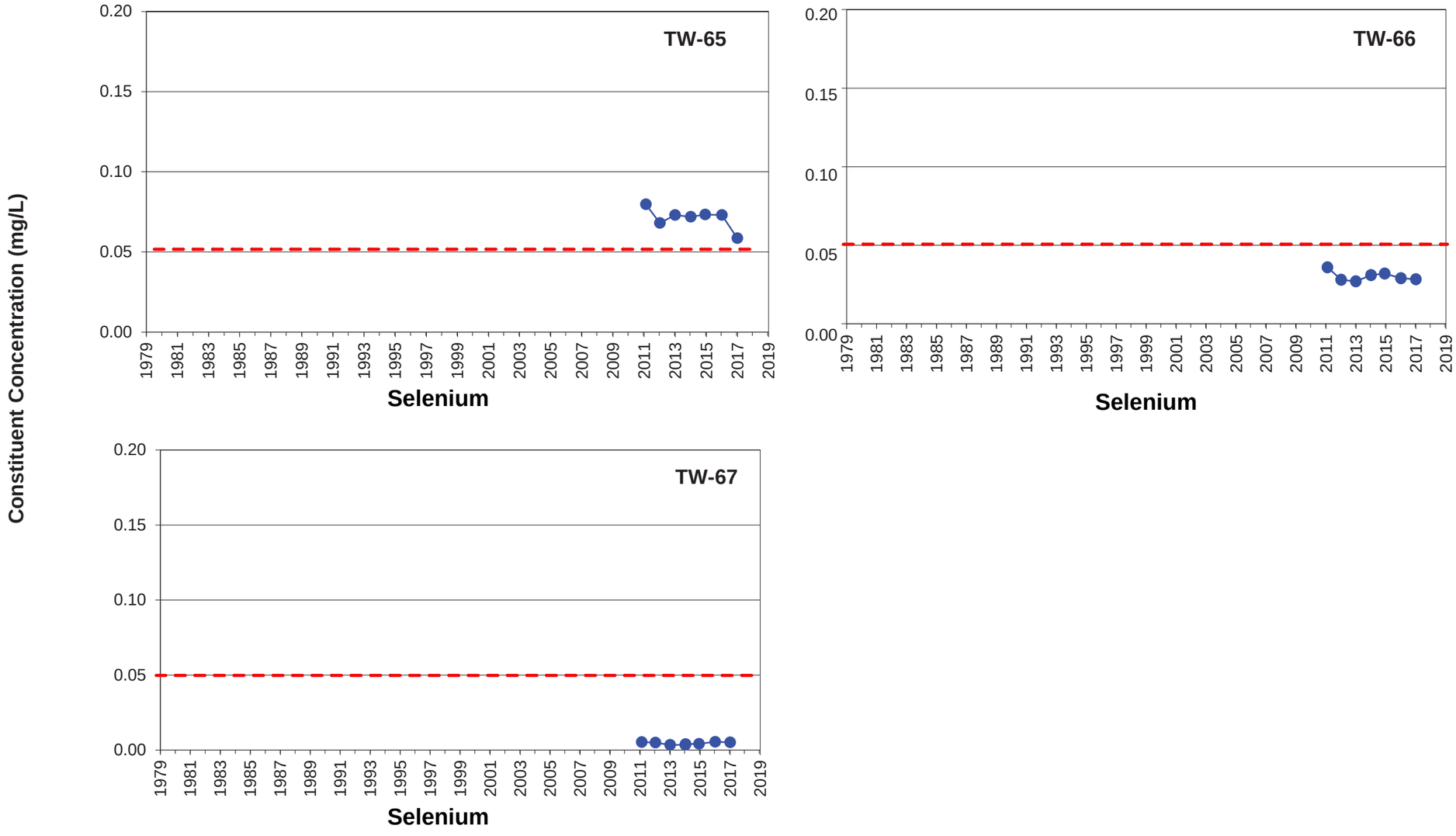
Source: Golder Associates Inc. 2018. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.

Figure 11.
Selenium and Cadmium Trends in Old Underflow Solids Pond Area Wells (UBZ-2 Source Area) TW-22, -24, -37
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho



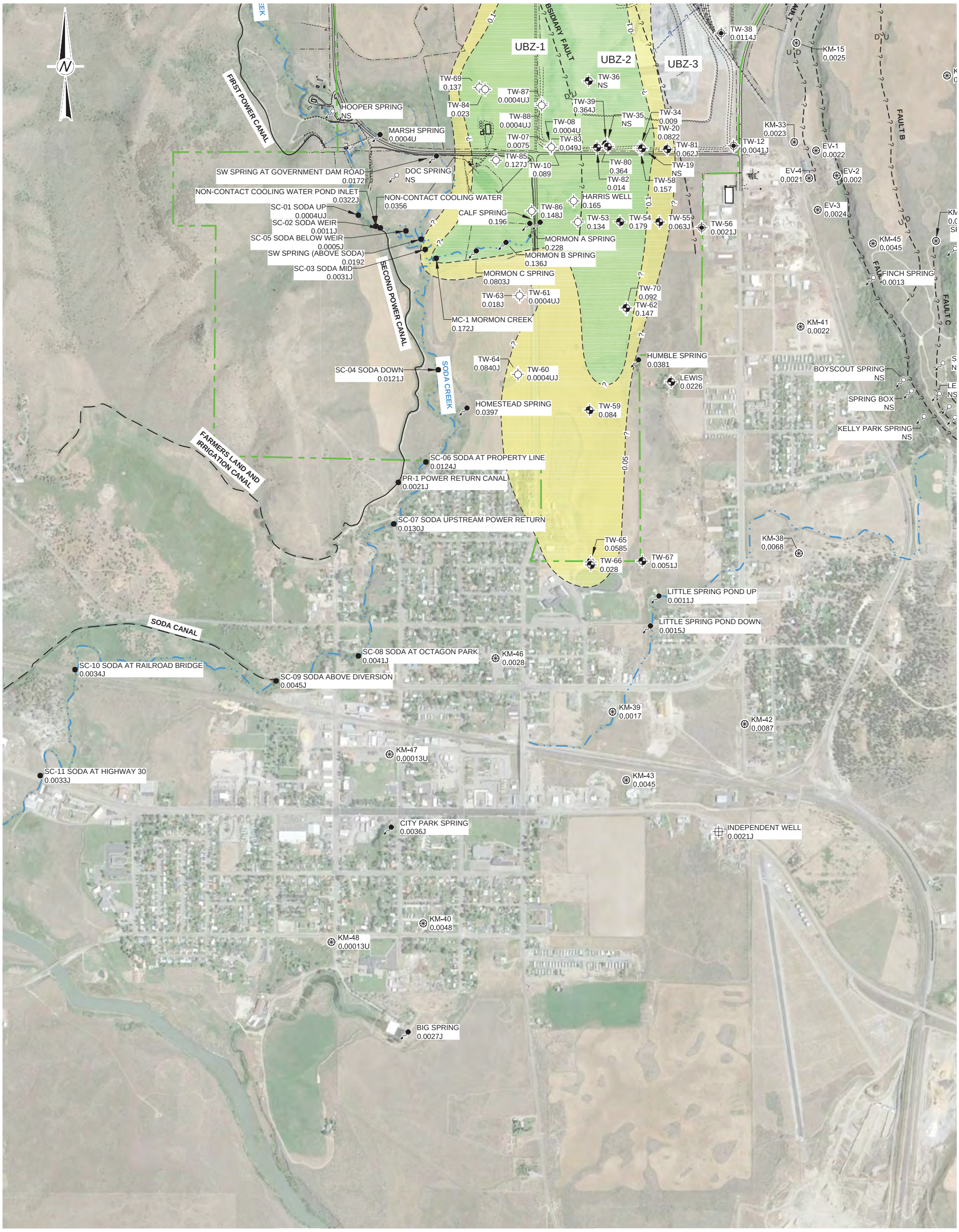
Source: Golder Associates Inc. 2018. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.

Figure 12.
Selenium and Cadmium Trends in South Fenceline and Southwest Corner POC Wells (UBZ-1 and 2 Downgradient) TW-10, -20, -39
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho



Source: Golder Associates Inc. 2018. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.

Figure 13.
Selenium Trends in UBZ-2 Wells at South Property Line (UBZ-1 and 2 Downgradient)
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho



LEGEND

MORMON A (0.015)	SPRING LOCATION WITH NAME (WHERE KNOWN)	TW-60 (<0.002 U)	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-1	? U/D ?	FAULT
DOC	SPRING LOCATION (NOT SAMPLED) WITH NAME (WHERE KNOWN)	TW-59 (<0.002 U)	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-2		FISSURE
MORMON CREEK	SURFACE WATER LOCATION WITH NAME	TW-56 (<0.002 U)	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-3	UBZ-1	GROUNDWATER ZONE
INDEPENDENT	WELL LOCATION IN SODA SPRINGS WITH NAME	TW-28 (<0.002 U)	MONITORING WELL LOCATION WITH NAME IN GROUNDWATER ZONE UBZ-4		INSTITUTIONAL CONTROL BOUNDARY
(<0.041)	SAMPLE: CHEMICAL CONCENTRATION (mg/L) WITH QUALIFIER (IF ANY) (...U) = NOT MEASURED (...J) = ESTIMATED (J+) = ESTIMATED WITH HIGH BIAS	PW-1 (<0.041)	PRODUCTION WELL LOCATION WITH NAME		CREEK
		KM-1	TRONOX WELL LOCATION WITH NAME IN UBZ		POWER CANAL
					IRRIGATION CANAL
					GROUNDWATER FLOW REGION BOUNDARY

0 600 1200
1" = 600' FEET

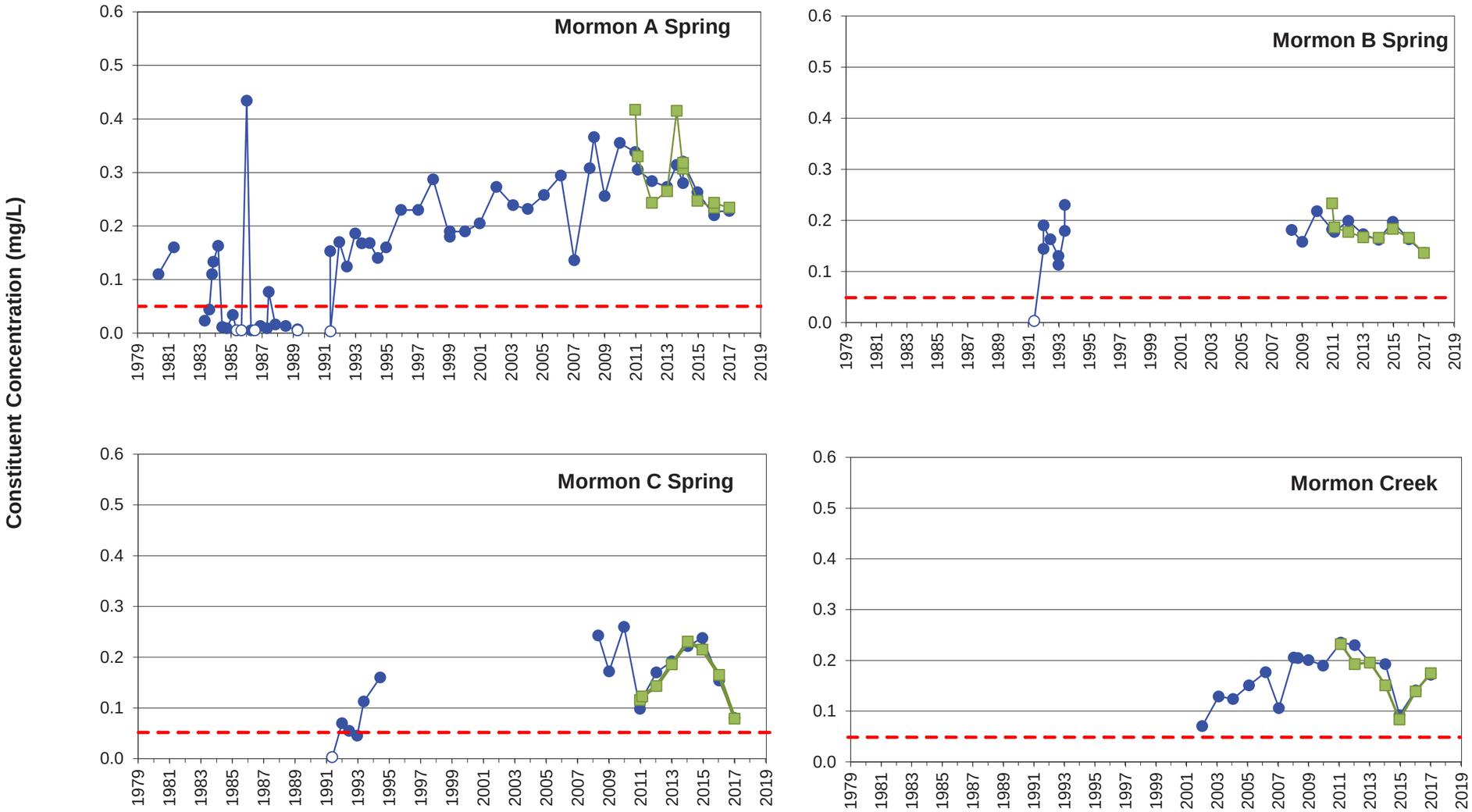
CHEMICAL ISOPLETH (mg/L)
DASHED WHERE APPROXIMATE
? WHERE UNKNOWN
0.05
0.5
0.10

NOTES

1. NAD83 IDAHO STATE PLANES, EAST ZONE, US FOOT.
2. AERIAL PHOTO FROM GOOGLE EARTH (8/2/2013).

FIGURE 14
Selenium Concentrations in Springs and Surface Water (Distribution)
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

Source: Golder Associates Inc. 2018. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



Source: Golder Associates Inc. 2018. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.

Figure 15.
Selenium Trends in Mormon A, B, and C Springs and Mormon Creek
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

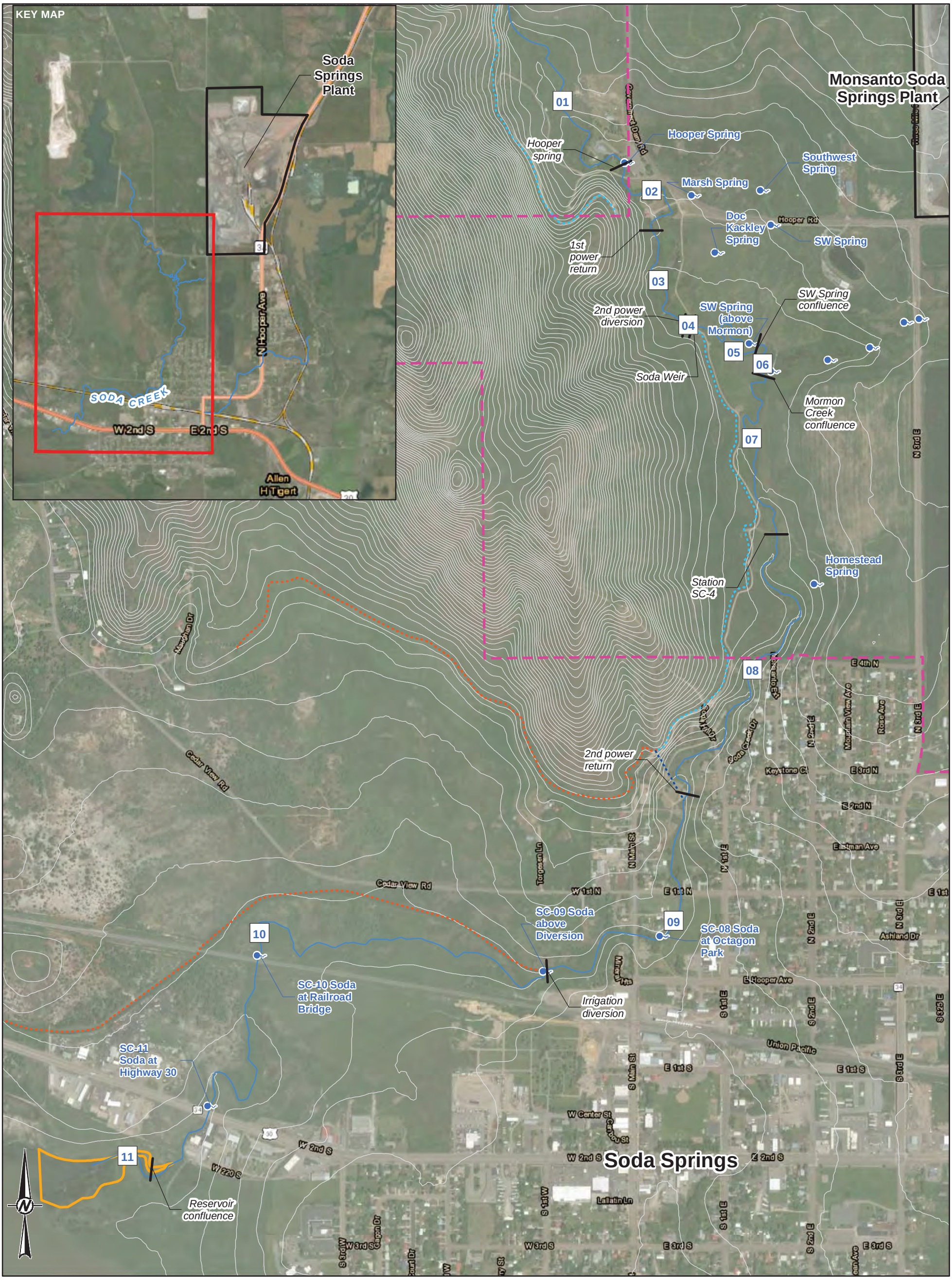


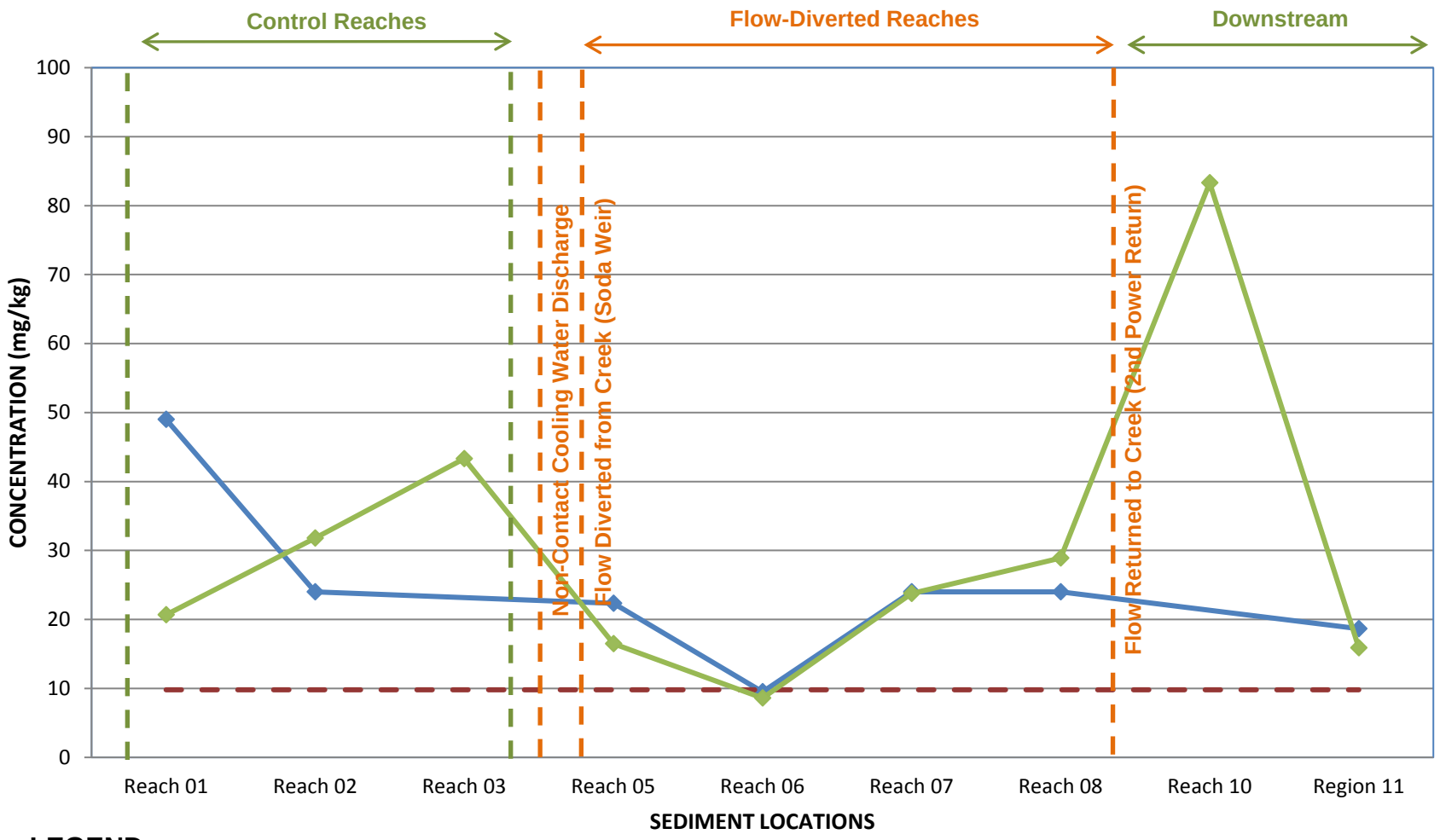
FIGURE 16

Locations of the Sediment Sample Reaches in Soda Creek

Monsanto Site 2018 Fourth Five-Year Review

Caribou County, Idaho

Source: Golder Associates Inc. 2018. *Soda Creek Sediment Sampling and Analysis Fourth CERCLA Five-Year Review, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



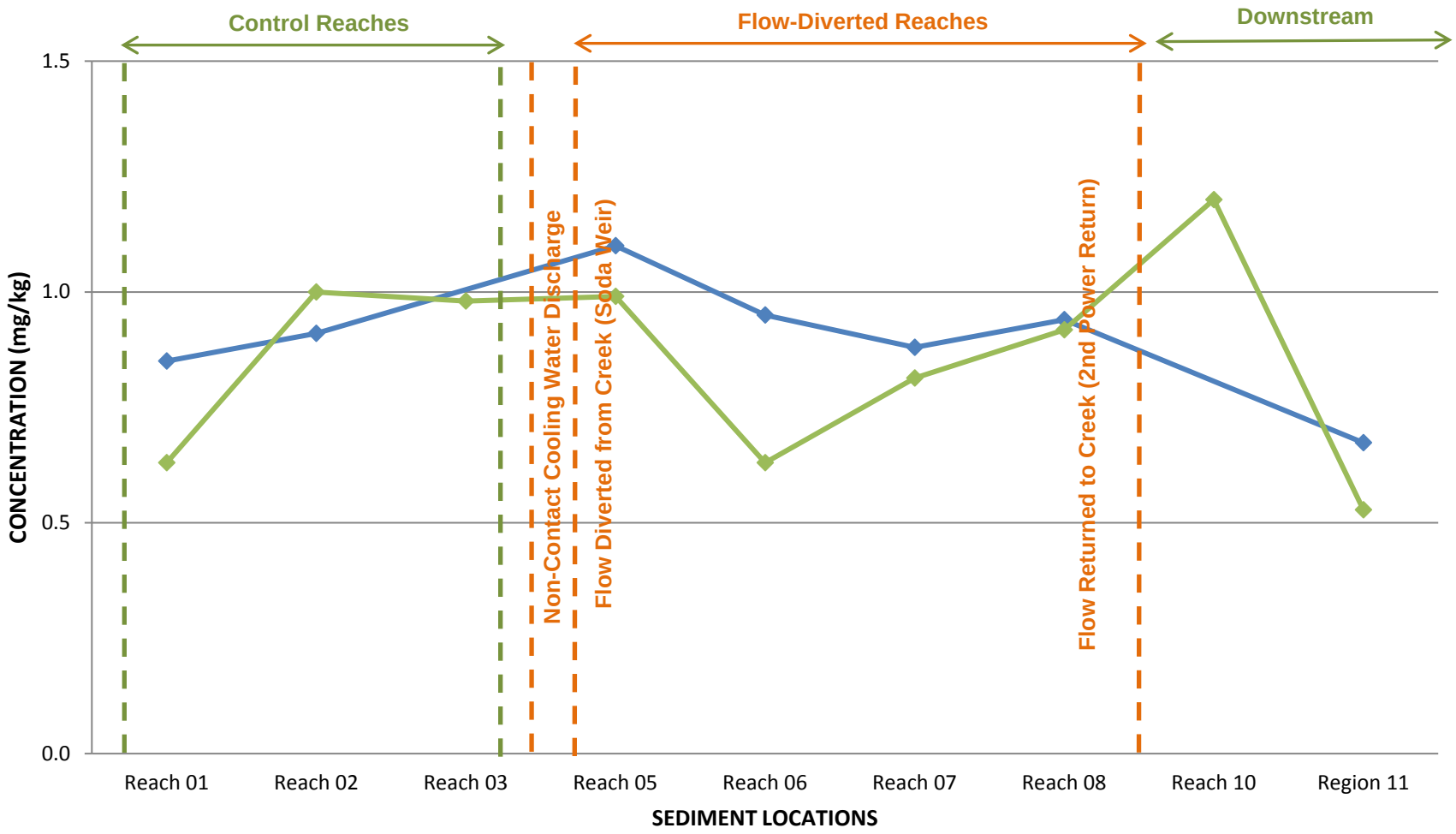
LEGEND

- 2017 Sediment Concentration (mg/kg)
- 2012/13 Sediment Concentration (mg/kg)
- Sediment Benchmark - (EPA 2006) (mg/kg)

Note - Samples were not collected in 2017 from Reach 3 and 10 due to unsafe sampling conditions. Reach 4 and 9 samples were not collected in either event due to unsafe sampling conditions.

FIGURE 17
Arsenic Concentrations in Soda Creek Sediment
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

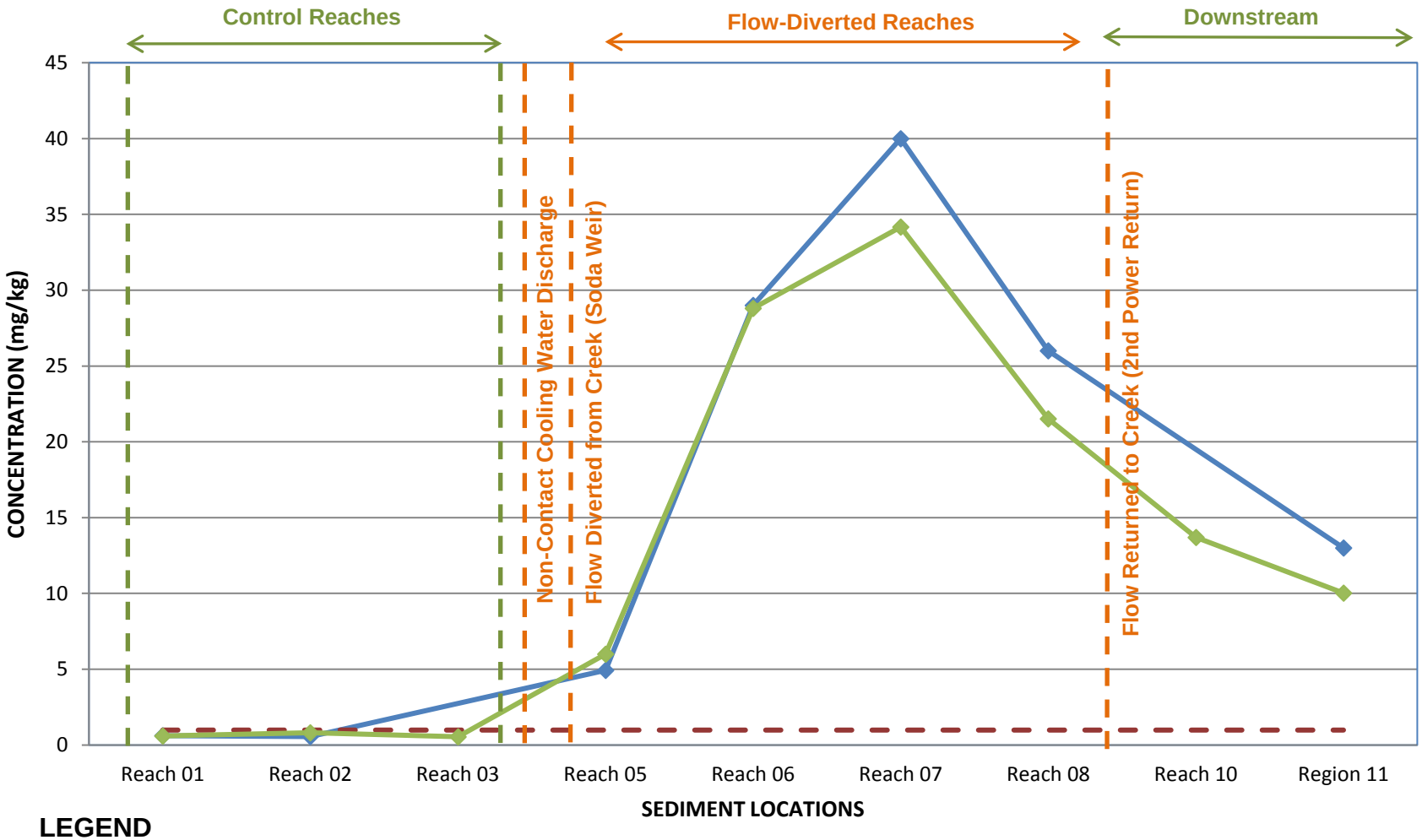
Source: Golder Associates Inc. 2018. *Soda Creek Sediment Sampling and Analysis Fourth CERCLA Five-Year Review, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



Note - Samples were not collected in 2017 from Reach 3 and 10 due to unsafe sampling conditions. Reach 4 and 9 samples were not collected in either event due to unsafe sampling conditions.

FIGURE 18
Beryllium Concentrations in Soda Creek Sediment
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

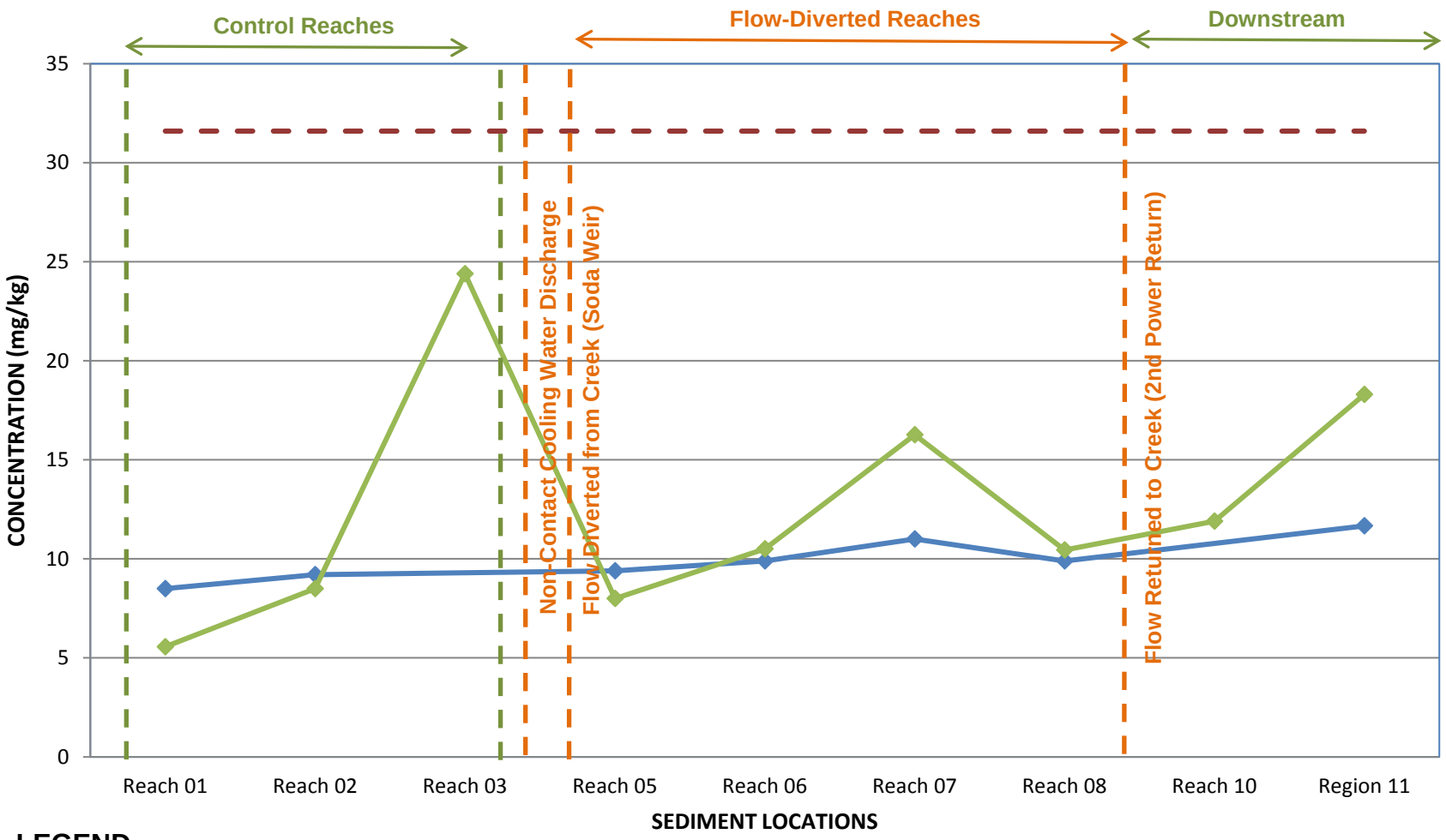
Source: Golder Associates Inc. 2018. *Soda Creek Sediment Sampling and Analysis Fourth CERCLA Five-Year Review, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



Note - Samples were not collected in 2017 from Reach 3 and 10 due to unsafe sampling conditions. Reach 4 and 9 samples were not collected in either event due to unsafe sampling conditions.

FIGURE 19
Cadmium Concentrations in Soda Creek Sediment
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

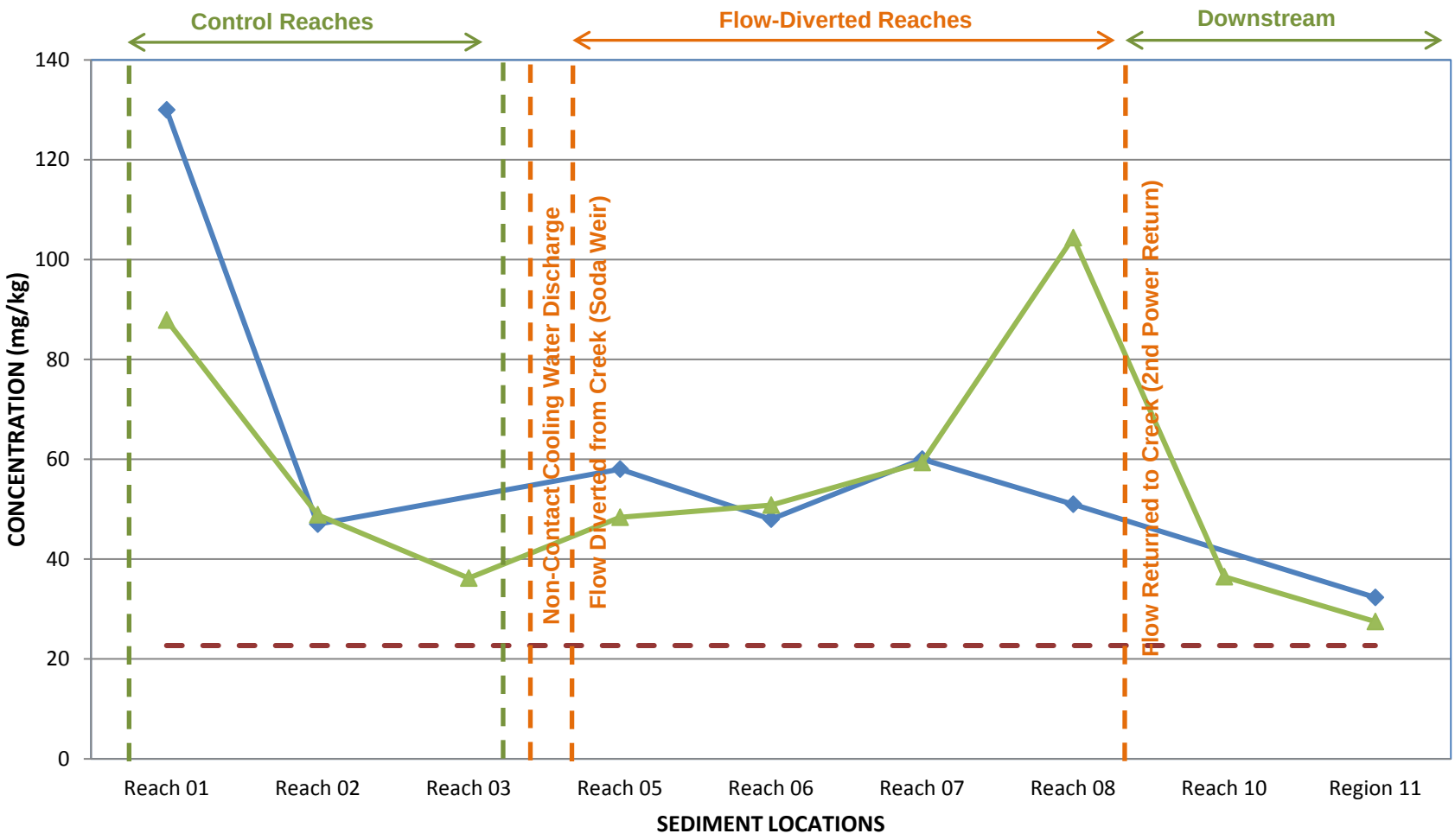
Source: Golder Associates Inc. 2018. *Soda Creek Sediment Sampling and Analysis Fourth CERCLA Five-Year Review, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



Note - Samples were not collected in 2017 from Reach 3 and 10 due to unsafe sampling conditions. Reach 4 and 9 samples were not collected in either event due to unsafe sampling conditions.

FIGURE 20
Copper Concentrations in Soda Creek Sediment
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

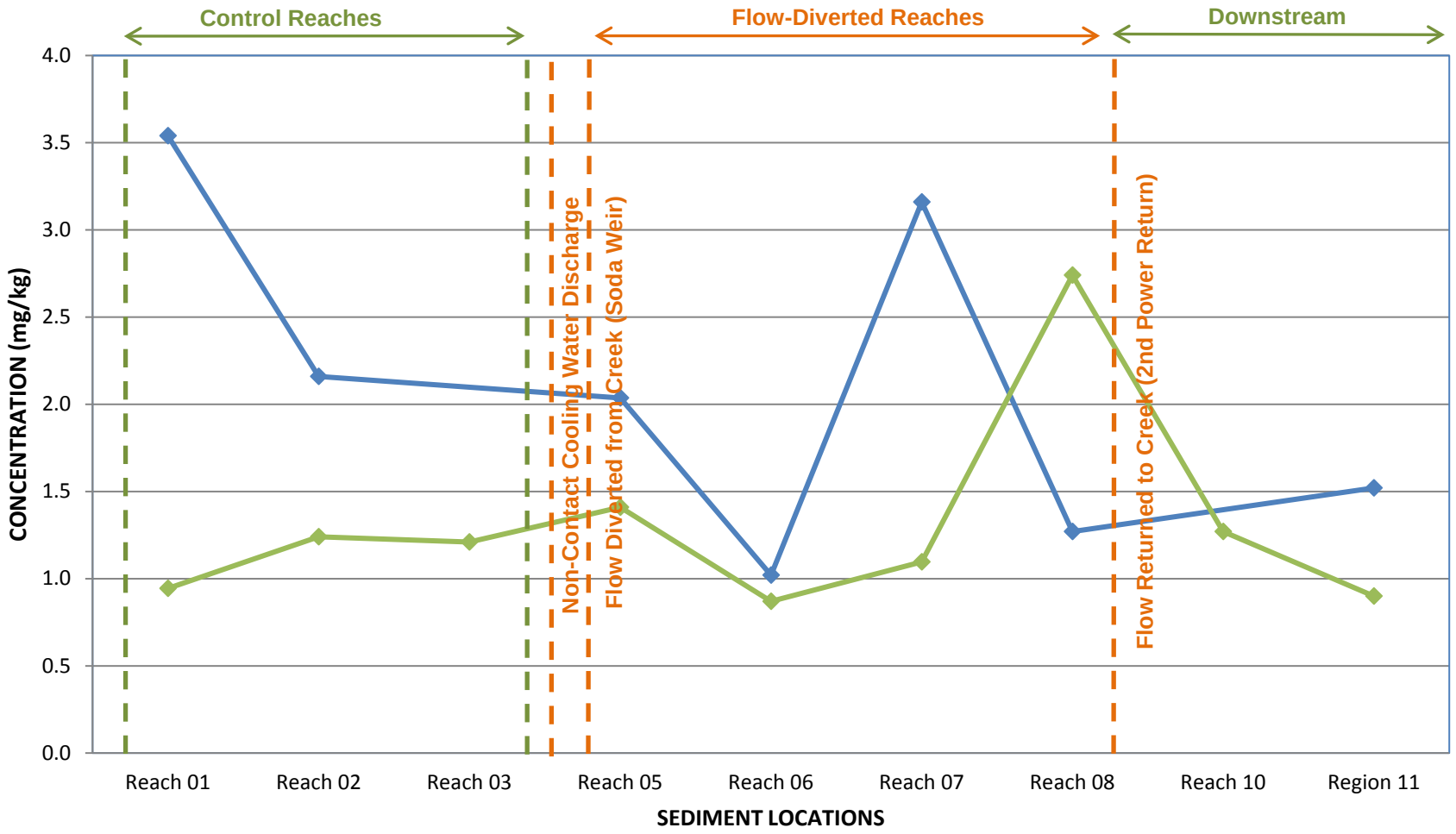
Source: Golder Associates Inc. 2018. *Soda Creek Sediment Sampling and Analysis Fourth CERCLA Five-Year Review, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



Note - Samples were not collected in 2017 from Reach 3 and 10 due to unsafe sampling conditions. Reach 4 and 9 samples were not collected in either event due to unsafe sampling conditions.

FIGURE 21
Nickel Concentrations in Soda Creek Sediment
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

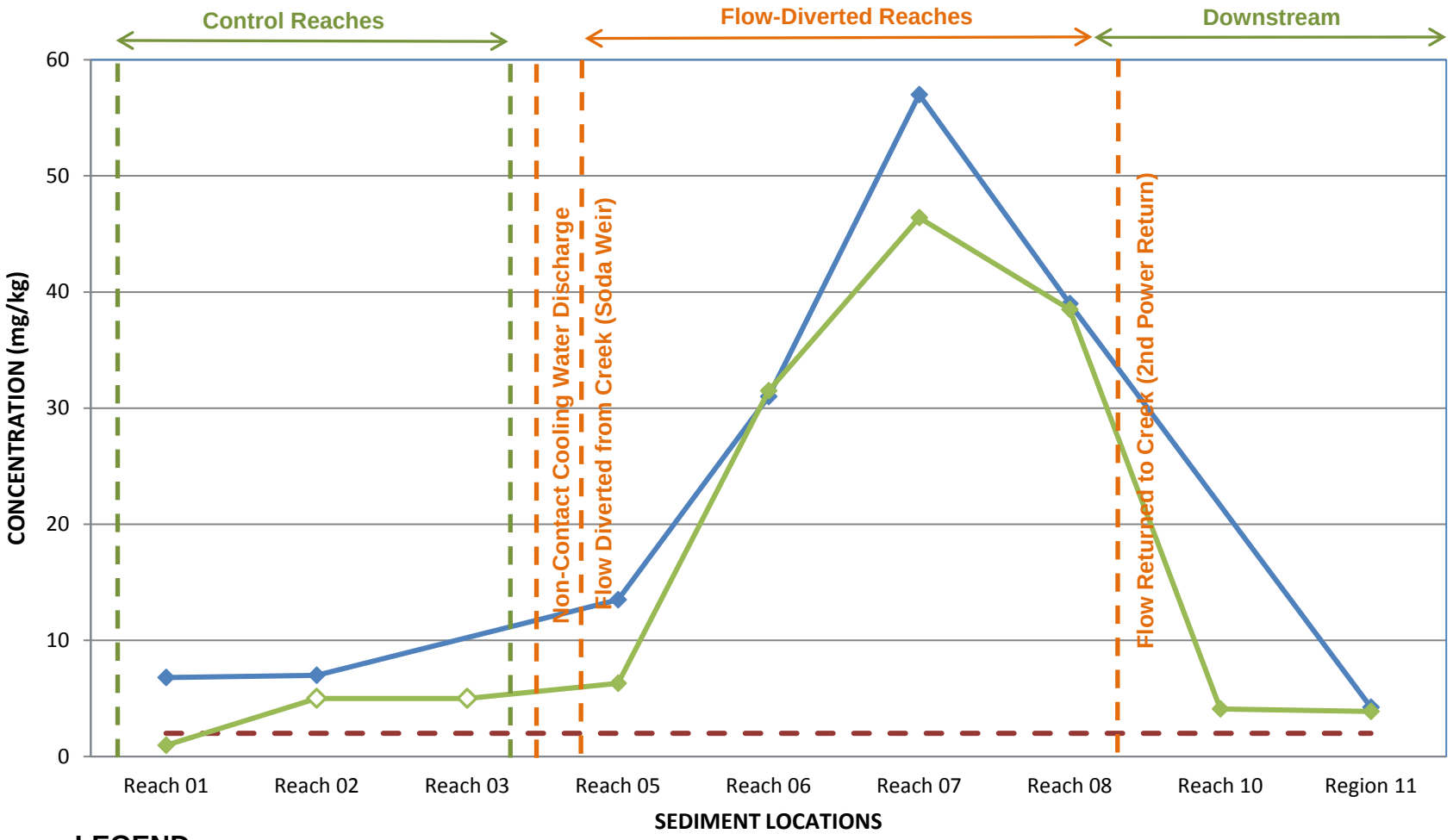
Source: Golder Associates Inc. 2018. *Soda Creek Sediment Sampling and Analysis Fourth CERCLA Five-Year Review, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



Note - Samples were not collected in 2017 from Reach 3 and 10 due to unsafe sampling conditions. Reach 4 and 9 samples were not collected in either event due to unsafe sampling conditions.

FIGURE 22
Polonium-210 Concentrations in Soda Creek Sediment
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

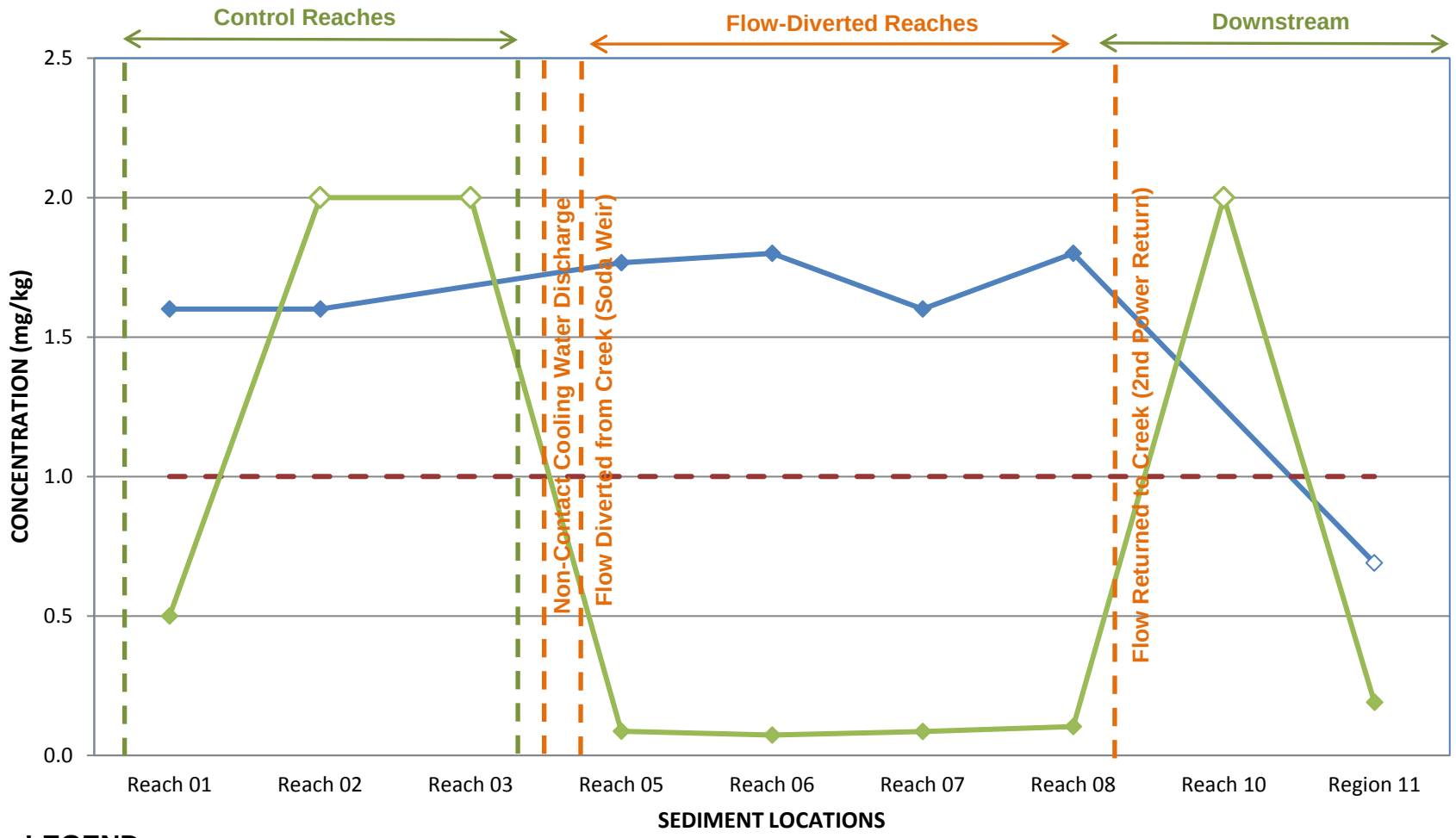
Source: Golder Associates Inc. 2018. *Soda Creek Sediment Sampling and Analysis Fourth CERCLA Five-Year Review, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



Note - Samples were not collected in 2017 from Reach 3 and 10 due to unsafe sampling conditions. Reach 4 and 9 samples were not collected in either event due to unsafe sampling conditions.

FIGURE 23
Selenium Concentrations in Soda Creek Sediment
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

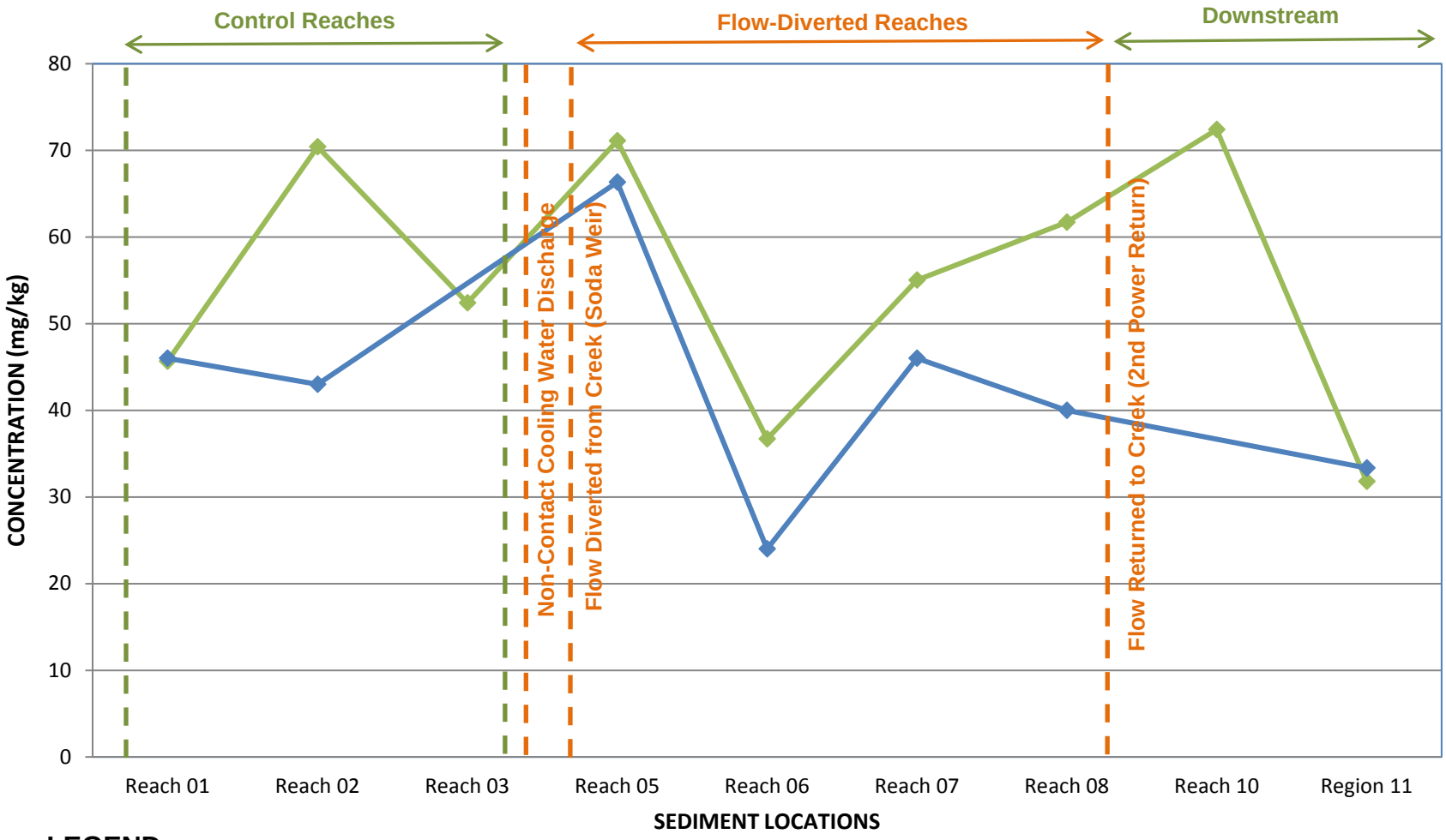
Source: Golder Associates Inc. 2018. *Soda Creek Sediment Sampling and Analysis Fourth CERCLA Five-Year Review, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



Note - Samples were not collected in 2017 from Reach 3 and 10 due to unsafe sampling conditions. Reach 4 and 9 samples were not collected in either event due to unsafe sampling conditions.

FIGURE 24
Silver Concentrations in Soda Creek Sediment
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

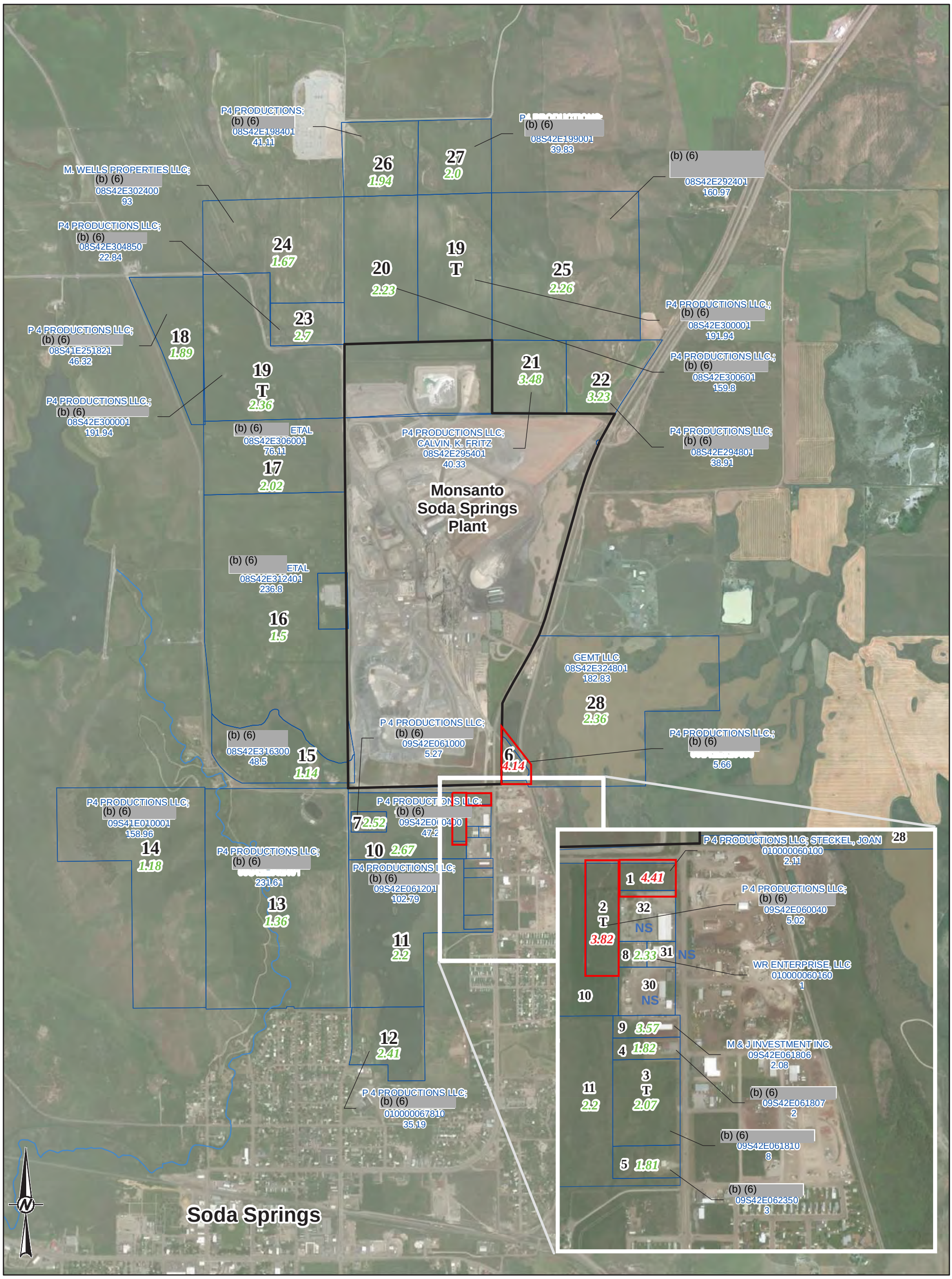
Source: Golder Associates Inc. 2018. *Soda Creek Sediment Sampling and Analysis Fourth CERCLA Five-Year Review, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



Note - Samples were not collected in 2017 from Reach 3 and 10 due to unsafe sampling conditions. Reach 4 and 9 samples were not collected in either event due to unsafe sampling conditions.

FIGURE 25
Vanadium Concentrations in Soda Creek Sediment
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

Source: Golder Associates Inc. 2018. *Soda Creek Sediment Sampling and Analysis Fourth CERCLA Five-Year Review, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.



LEGEND

- PARCEL
- PLANT BOUNDARY
- SODA CREEK
- 1.81 — Radium-226 Fourth FYR (pCi/g) Result
- 3.82 — Radium-226 Fourth FYR (pCi/g) Result Concentrations > remediation goal (3.71 pCi/g)
- NS — Not sampled
- 20 T — PARCEL IDENTIFICATION NUMBER TRIPLICATE SAMPLES COLLECTED

NOTE(S)

1. THE MONSANTO PLANT OWNS THE PROPERTIES WITH THE OWNER NAMES OF P4 PRODUCTIONS

P4 PRODUCTIONS — PARCEL OWNER INFORMATION
010000067810 — PARCEL IDENTIFICATION NUMBER
35.9 — PARCEL AREA (ACRES)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

0 1,000 2,000 4,000
FEET

Source: Golder Associates Inc. 2018. *Off-site Soil Sampling Report Fourth CERCLA Five-Year Review, Monsanto Company Soda Springs, Idaho Plant.* Prepared for Monsanto Company. May.

FIGURE 26
Soil Sampling Parcels and Radium-226 Concentrations
Monsanto Site 2018 Fourth Five-Year Review
Caribou County, Idaho

AX0629180941BOI

Appendix A: References

Golder Associates, Inc. (Golder). 1998. *May 1998 Groundwater Status – Solutia Soda Springs Site, prepared for Monsanto Chemical Company* by Golder Associates, Inc., Redmond, WA.

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Golder Associates, Inc. (Golder). 2018a. *2017 Summary Report on Groundwater Conditions, Monsanto Company Soda Springs, Idaho Plant*. May.

Golder Associates, Inc. (Golder). 2018b. *Soda Creek Sediment Sampling and Analysis, Fourth CERCLA Five-Year Review*. May.

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Idaho Department of Fish and Game (IDFG). 2018. *Caribou County Observation List.* Accessed July 11, 2018. https://idfg.idaho.gov/species/taxa/list/county/caribou.

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U.S. Environmental Protection Agency (EPA). 2017. *Technical Review Comments, 2016 Summary Report on Groundwater Conditions at the Monsanto Soda Springs Idaho Plant.* Submitted to Monsanto Chemical Company. July.

U.S. Environmental Protection Agency (EPA). 2013. *Third Five-Year Review Report For Monsanto Chemical Co. (Soda Springs Phosphorous Plant) Superfund Site Caribou County, Idaho.* Prepared by CH2M HILL, Boise, Idaho. Prepared for U.S. Environmental Protection Agency, Region 10, Seattle, Washington, August.

U.S. Environmental Protection Agency (EPA). 2008. Second Five-Year Review Report for Monsanto Chemical Co. (Soda Springs Plant). EPA ID: IDD081830994. Caribou County, Idaho. Prepared by U.S. EPA Region 10, Seattle, Washington. August.

U.S. Environmental Protection Agency (EPA). 2006. *Freshwater Sediment Screening Benchmarks*. https://www.epa.gov/sites/production/files/2015-09/documents/r3_btag_fw_sediment_benchmarks_8-06.pdf.

U.S. Environmental Protection Agency (EPA). 2003. *Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs).* OSWER Directive 92857-55.

U.S. Environmental Protection Agency (EPA). 1997. *EPA Superfund Record of Decision: Monsanto Chemical Co. (Soda Springs Plant) EPA ID: IDD081830994, OU 01, Soda Springs, Idaho*. 04/30/1997.

Appendix B: Public Notice

EPA
United States Environmental Protection Agency

Cleanup Review Underway
Monsanto Chemical Co. Soda Springs Plant
Public Input Welcomed

EPA Would Like Your Feedback

The 2018 review for Monsanto Soda Springs Plant is now underway and scheduled to be completed by September. EPA reviews Superfund sites every five years to assess cleanup progress and identify any additional actions that might be needed. As part of the review, EPA would like to hear from the community. If you have anything you would like us to consider during our review or if you have questions, please contact Kathryn Cerise, EPA Project Manager, **no later than July 1, 2018.**

Evaluation of Cleanup Measures

The Monsanto Soda Springs Plant is an active phosphate processing facility. Soils and groundwater were contaminated with hazardous chemicals including radium-226 in soil, and fluoride, cadmium, manganese, nitrate, and selenium in groundwater. The cleanup actions for the soil contamination at the site are complete. The plan for groundwater is to control the suspected sources of contamination, then allow the groundwater to recover naturally. Regular sampling and monitoring of groundwater track the results. This is referred to as "monitored natural attenuation." Data show decreasing levels of contamination but not as fast as expected. Since the last review in 2013, additional studies have been done to learn why contaminants in groundwater are not decreasing at the rates originally expected. Information from these studies will be included in the 2018 Monsanto Five-Year Review Report out in September.

Contact EPA: Kathy Cerise, EPA Project Manager, at **cerise.kathryn@epa.gov**
or 206-553-2589 or toll free 800-424-4372 ext. 2589.

For more information:

Visit the site page: **https://www.epa.gov/superfund/monsanto-soda-springs**

2017 EPA Selenium Fact Sheet: **https://semspub.epa.gov/src/document/10/100049057**

2013 Monsanto 3rd Five-Year Review: **https://semspub.epa.gov/src/document/10/690731**

Visit the library: Soda Springs Public Library, 149 S. Main, 208-547-2606

TDD and/or TTY users may call the Federal Relay Service at 800-877-8339.
Please give the operator phone number 206-553-2589, for Kathryn Cerise.

Appendix C: Site Inspection Checklist

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Monsanto Chemical Company, Soda Springs Phosphorous Plant	**Date of inspection: June 6, 2018**
Location and Region: Soda Springs, ID, Region X	**EPA ID: IDD08180994**
Agency, office, or company leading the five-year review: EPA/CH2M HILL	**Weather/temperature: Sunny, 70s**

Remedy Includes: (Check all that apply)

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

x Monitored natural attenuation
☐ Groundwater containment
☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager ___Jason Maughan_____ Regulatory Specialist___ __June 6, 2018____**
   Name Title Date
   Interviewed **x at site** ☐ at office ☐ by phone Phone no**. 208-240-1540_____**
   Problems, suggestions; ☐ Report attached _____

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

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

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☐ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☐ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☐ N/A

Remarks: O&M I ncludes annual surface water and groundwater sampling

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
   x Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A
   Remarks: Monsanto plant (active facility) has ERP.

3. **O&M and OSHA Training Records** X Readily available ☐ Up to date X N/A
   Remarks: **Site is active phosphorous plant. No reportables.**

4. **Permits and Service Agreements**

x Air discharge permit	**x Readily available**	**x Up to date**	**□ N/A**
x Effluent discharge	**x Readily available**	**x Up to date**	**□ N/A**
X Waste disposal, POTW	X Readily available	□ Up to date	□ N/A
□ Other permits_____	□ Readily available	□ Up to date	□ N/A

Remarks_____

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

Remarks_____

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

Remarks_____

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

Remarks: **Copies of annual GW and SW annual reports kept on site and available for review.**

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

Remarks: **Manage solids from environmental control system.**

9. **Discharge Compliance Records**

x Air	**□ Readily available**	**□ Up to date**	**□ N/A**
x Water (effluent)	**□ Readily available**	**□ Up to date**	**□ N/A**

Remarks: **Kept on site and available for review**

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

Remarks: **Site is active 24-7, fenced/gated, and has sign in/sign out and full-time security staff**

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
x PRP in-house **x Contractor for PRP**
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date
x Funding mechanism/agreement in place
Original O&M cost estimate: **Not Available**

From _ Jan 2013_	To_ Dec. 2013	__$165,159.61__	☐ Breakdown attached
Date	Date	Total cost	
From _ Jan 2014_	To_ Dec. 2014	__$136,057.20__	☐ Breakdown attached
Date	Date	Total cost	
From _Jan 2015__	To _Dec 2015_	_$148,166.29___	☐ Breakdown attached
Date	Date	Total cost	
From _ Jan 2016__	To _Dec 2016__	_$119,509.00__	☐ Breakdown attached
Date	Date	Total cost	
From _ Jan 2017__	To _Dec. 2017	_$171,000.00__	☐ Breakdown attached
Date	Date	Total cost	

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

Describe costs and reasons: **None to report**

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured **x N/A**

Remarks: **Monsanto maintains fences.**

B. Other Access Restrictions

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

Remarks: **Monsanto maintains signs. Only access is through front gate via security guards.**

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs properly implemented **x Yes** ☐ No ☐ N/A

Site conditions imply ICs being fully enforced **x Yes** ☐ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) **Self monitored, Restrictive Deeds in Place, conducted domestic well survey to confirm no use of impacted groundwater.**

Frequency: **Continuous**

Responsible party/agency: **PRP (Monsanto), Greenfield Environmental Trust, DEQ, EPA.**

Contact ___Jason Maughan__ Regulatory Specialist__ _June 6, 2018___

Name Title Date Phone no.

Reporting is up-to-date ☐ Yes ☐ No **x N/A**

Reports are verified by the lead agency ☐ Yes ☐ No **x N/A**

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No **x N/A**

Violations have been reported ☐ Yes ☐ No **x N/A**

Other problems or suggestions: ☐ Report attached

_____

_____

_____

_____

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

Remarks_____

_____

_____

D. General

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

Remarks_____

_____

2. **Land use changes on site x N/A**

Remarks: **The site is an active phosphorous processing facility, continued production will result in additional UFS, slag, SO2, treater dust, coke as part of processing. Otherwise, plant continues normal operations**.

_____

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

Remarks: **Still farming surrounding buffer property within IC boundary.**

_____

VI. GENERAL SITE CONDITIONS

A. Roads X Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map **x Roads adequate** ☐ N/A

Remarks_____

_____

B. Other Site Conditions

Remarks __**Continue fugitive dust control, discontinued MgCL for dust control, plot tested cover materials for plants on UFS piles.**

_____

_____

VII. LANDFILL COVERS ☐ Applicable **x N/A**

A. Landfill Surface

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

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

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

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

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

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

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

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

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

B. Benches ☐ Applicable ☐ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____
_____

C. Letdown Channels ☐ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____
_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____
_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____
_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____
_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____
_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____
_____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____
_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____
_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____
_____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____
   _____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____
   _____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____
   _____

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____
   _____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____
   _____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☐ Siltation not evident
   Remarks_____
   _____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____
   _____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____
   _____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____
   _____

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____
   _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____
   _____

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

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____
   _____

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

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____
   _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable **x N/A**

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____☐ Evidence of breaching
   Head differential_____
   Remarks_____
   _____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☐ N/A

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

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks: Extraction wells operating as part of RI/FS activities; continue to collect data on water quality improvements. _____
_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition☐ Needs Maintenance
Remarks_____
_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition☐ Requires upgrade ☐ Needs to be provided
Remarks_____
_____

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

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition☐ Needs Maintenance
Remarks_____
_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition☐ Needs Maintenance
Remarks_____
_____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition☐ Requires upgrade ☐ Needs to be provided
Remarks_____
_____

C. Treatment System ☐ Applicable **x N/A**

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☐ Carbon adsorbers
   ☐ Filters_____
   ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   ☐ Others_____
   ☐ Good condition ☐ Needs Maintenance
   ☐ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☐ Equipment properly identified
   ☐ Quantity of groundwater treated annually_____
   ☐ Quantity of surface water treated annually_____
   Remarks_____
   _____

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

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

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

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

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

D. Monitoring Data

1. Monitoring Data
   x Is routinely submitted on time **x Is of acceptable quality**

2. Monitoring data suggests: **some COCs are stable, some are migrating**
   ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

x Properly secured/locked **x Functioning** **x Routinely sampled** **x Good condition**
x All required wells located ☐ Needs Maintenance ☐ N/A
Remarks: **Monitoring well network sampled and maintained annually.**

X. OTHER REMEDIES

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

No other remedial actions for soils, air, surface water, sediment. 5YR monitoring required for sediment and off-site soil.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

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

Remedy is in place to monitor migration of COCs downgradient and to evaluate if COC concentrations are declining (attenuating) and groundwater plumes are stable or decreasing. Concentrations of some COCs have not decreased as originally expected and continue to migrate. In particular, selenium has been identified in southern property wells at concentrations above the MCL. In addition, remaining sources of COCs were identified during source area investigations. These could be contributing to ongoing COC detections. Additional remedies appear to be warranted to address remaining source areas and also COC behavior in groundwater. Pilot testing and groundwater aquifer testing are being conducted to evaluate the effectiveness of a change in the remedy.

B. Adequacy of O&M

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

No issues identified with O&M. Annual surface water and groundwater monitoring continues to track COC trends.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. **No issues identified with O&M**
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. **PRP added additional water level monitoring points i.e transducers, and constructed additional monitoring wells to characterized COC distribution and optimize data collection.**