Five-Year Review Report

First Five-Year Review Report

For

Monsanto Chemical Co. (Soda Springs Plant)

Caribou County, Idaho

September 2003

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For
Monsanto Chemical Co. (Soda Springs Plant)
Caribou County, Idaho

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List of Acronyms & Terms

Buffer Area	Portion of Monsanto site outside operating area (approximately 260 acres)
CERCLA	Comprehensive Environmental Response Compensation & Liability Act
Consent Decree	Legal document that implements ROD
COPCs	Constituent of Potential Concern (or COPC)
CWA	Clean Water Act
Decision Documents	ROD and Consent Decree
EPA	United States Environmental Protection Agency, Region 10
Golder	Golder Associates
IDEQ	Idaho Department of Environmental Quality
LBZ	Lower Basalt Zone
MCLs	Maximum Contaminant Levels (or MCL)
Monsanto site	Monsanto Chemical Co. (Soda Springs Plant)
MNA	Monitored Natural Attenuation
MWH	Montgomery Watson Harza
NCP	National Contingency Plan
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
Operating Area	Portion of Monsanto site inside fence where elemental phosphorous is produced (approximately 540 acres)
POC	Point of Compliance
RA Start	Date in WasteLAN remedial action initiated, October 15, 1998
RAOs	Remedial Action Objectives (or RAO)
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
UBZ	Upper Basalt Zone
WasteLAN	EPA Tracking Database

Executive Summary

Protectiveness Statement

The remedy at the Monsanto Chemical Co. (Soda Springs Plant) currently protects human health and the environment because all known groundwater and soil exposure pathways have been restricted through institutional controls or other means. However, in order for the remedy to be protective in the long-term, the following actions need to be taken: 1) the (b) (6) well and property needs to be evaluated for institutional controls; 2) Monsanto needs to submit a plan for upgrading their wind dispersal program and for evaluating in the short term those localized areas where increased ^{226}Ra soil concentrations have been observed; and, 3) the U.S. Environmental Protection Agency (EPA) needs to reevaluate during the next five-year review whether the monitored natural attenuation remedy underneath the operating area is proceeding as intended in the decision documents.

Remedies Selected By EPA in the 1997 Record of Decision

EPA selected four remedial actions for the Monsanto site, summarized as follows:

- Monitored natural attenuation with institutional controls for contaminated groundwater.
- Either institutional controls or soil excavation on buffer properties not owned or controlled by Monsanto, at the discretion of the property owners.
- No further action for operating-area source piles and materials. This remedy is subject to continued operations and ongoing five-year reviews.
- No further action for air, surface water, and Soda Creek sediments.

Technical Assessment Summary

Of the four remedial actions included in the Record of Decision, EPA has concluded that two of the remedies (institutional controls and no further action for air, surface water, and sediments) are functioning as intended in the decision documents. These remedies also remain valid in terms of exposure assumptions, toxicity data, cleanup levels, and remedial action objectives. In regards to the selected monitored natural attenuation (MNA) remedy for groundwater, EPA has learned that the MNA remedy underneath the operating area may take longer than was anticipated at the time of the Record of Decision. EPA has also decided that the (b) (6) well may need institutional controls. Otherwise, the MNA remedy for groundwater appears to be working as intended.

The one remedy EPA has concluded is not functioning as intended in the decision documents (no further action for on-site material piles), is summarized as follows ~

<u>No Further Action (NFA) Remedy for On-Site Material Piles</u>

EPA's conclusion that the NFA remedy for on-site material piles is not functioning as intended is based on three observations made during the five-year review, which are described in detail in the main body of the report. EPA has concluded in this instance that the remedial action objectives and related technical underpinnings of the remedy remain valid, though EPA has learned new information about management of material piles at the Monsanto site that has caused EPA to question the protectiveness of this portion of the remedy.

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 County**
SITE STATUS
NPL Status: **X Final** Deleted Other (Specify)
Remediation Status: **Construction Complete**
Multiple OUs? **No** Construction completion date: **09/20/2000**
Has site been put into reuse? Yes No **Not Applicable. Site is an operating facility.**
REVIEW STATUS
Lead agency: **X EPA** State Tribe Other Federal Agency
Author name: **Wallace Reid**
Author title: **Remedial Project Manager** Author affiliation: **EPA Region 10**
Review period: **09/27/2002 to 09/30/2003**
Date(s) of site inspection: **06/10/2003**
Type of review: **CERCLA Five Year Review**
Review Number: **X 1 (first)** 2 (second) 3 (third) Other (specify)
Triggering action: **RA Start**
Triggering action date 9from WasteLAN): **10/15/1998**
Due date (five years after triggering action date): **10/15/2003**

Issues:

- Groundwater samples from the (b) (6) well have revealed elevated cadmium and other hazardous constituent concentrations during the past five years, and the property where this well is located does not have institutional controls.
- MNA for groundwater underneath the operating area may take longer than anticipated during the RI/FS, though this observation needs to be reevaluated during the next five-year review.
- Wind dispersal is occurring from the Monsanto site, and this may be contributing to increasing off-site contamination.
- Three related technical matters that don't lead to EPA concerns about the protectiveness of the MNA remedy for groundwater, but are necessary details to be resolved with Monsanto based on this five year review are: 1) increasing molybdenum concentrations south of the operating area; 2) use of total nitrogen as nitrate for demonstrating compliance with the MCL; and, 3) annual sampling, analyses, and trend evaluation reporting of Soda Creek discharge concentrations at a level of detail similar to annual and five-year review groundwater reporting.

Recommendations and Follow-up Actions:

The five-year review team recommends that:

- EPA request Monsanto to submit a plan by February 1, 2004 pertaining to the (b) (6) well, examining the options for bringing the (b) well under institutional controls, and for evaluating whether other such domestic wells may be present in the non-buffer area immediately south of the Monsanto site.
- EPA request Monsanto to submit a plan by February 1, 2004 to control wind dispersal from on-site material piles. This plan shall include a sampling program to investigate areas off-site where ^{226}Ra soil concentrations were found to have increased over the past five years. Monsanto shall conduct the sampling portion of this plan no later than sixty days following EPA approval, and Monsanto shall promptly report all sampling results to affected property owners.
- EPA request Monsanto to perform sampling and five-year review activities on a scale similar to the technical work performed in support of this review. Two exceptions shall be: 1) soil sampling off-site in areas where sampling density may be increased (as determined by results obtained during development of the wind dispersal control plan above); and, 2) Monsanto shall collect and analyze surface water discharges to Soda Creek for hazardous constituents at a level of detail consistent with ongoing groundwater data reporting.
- EPA request Monsanto to engage in technical dialogue with EPA and IDEQ to resolve three related groundwater technical matters described in the main body of the report.

Protectiveness Statement:

The remedy at the Monsanto Chemical Co. (Soda Springs Plant) currently protects human health and the environment because all known groundwater and soil exposure pathways have been restricted through institutional controls or other means. However, in order for the remedy to be protective in the long-term, the following actions need to be taken: 1) the (b) well and property needs to be evaluated for institutional controls; 2) Monsanto needs to submit a plan for upgrading their wind dispersal program and for evaluating in the short term those localized areas where increased ^{226}Ra soil concentrations have been observed; and, 3) the EPA needs to reevaluate during the next five-year review whether the monitored natural attenuation remedy underneath the operating area is proceeding as intended in the decision documents.

Other Comments: None

Five-Year Review Report

I. Introduction

The purpose of this five-year review effort has been to determine whether the remedy implemented at the Monsanto Chemical Co. (Soda Springs Plant) [Monsanto site] remains protective of human health and the environment. The methods, findings, and conclusions of this five-year review are documented herein. Additionally, issues pertaining to possible remedy failures that could lead to potential exposures are itemized.

The United States Environmental Protection Agency Region 10 (EPA) is preparing this five-year review pursuant to the Comprehensive Response Compensation and Liability Act (CERCLA) § 121 and the National Contingency Plan (NCP). CERCLA § 121 states:

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

The agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii), which states:

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

The EPA conducted a five-year review of the remedial actions implemented at the Monsanto site from September 2002 to September 2003. This report documents the results of this review. Monsanto retained independent contractors to perform investigations and to provide data as directed and approved by EPA in support of this five-year review. Montgomery Watson Harza (MWH) performed soil and sediment investigations and Golder Associates (Golder) performed groundwater monitoring.

The five-year review team consisted of Wallace Reid from EPA, Douglas Tanner, Margie English, and Clyde Cody from the Idaho Department of Environmental Quality (IDEQ), Robert Geddes of Monsanto, and various other Monsanto staff and contractors.

The entire project team, except Margie English from IDEQ, attended the site visit with EPA in Soda Springs on June 10th, 2003. IDEQ has also provided comments to EPA on a number of topics covered in this report, including interpretation of groundwater data. EPA also sent information about this five-year review effort to the general public in Soda Springs during June 2003 and offered to consider any comments the public might wish to make about the Monsanto site. A copy of EPA's notice to the public regarding the five-year review is included as Figure 1.

This is the first five-year review for the Monsanto site. The triggering action for this review is the date remedial activities were initiated, October 15th, 1998, as shown in EPA's WasteLAN database. Although the site has achieved construction completion status, the contaminants of potential concern (COPCs; used interchangeably in this report with the term "hazardous constituents") in both groundwater and soil remain elevated above background levels at some locations. This review was conducted to determine whether the remedy of institutional controls and monitored natural attenuation (MNA) remain protective.

Important language used for the first time in this five-year review and not used in the Monsanto decision documents (Record of Decision [ROD] and Consent Decree) are the terms: "operating area" and "buffer area". The term "operating area" is used in this five-year review to reference all Monsanto property inside the fence intended to secure operations of the currently operating Monsanto elemental phosphorous plant. The phrase "buffer area" is used in this five-year review to reference all Monsanto-owned and other properties outside the fence for which institutional controls have been recorded in Caribou County. The operating area and buffer area constitute the entire Monsanto site subject to this five-year.

II. Site Chronology

Event	Date
Confirmation of initial discovery of contamination	1985
Site added to the national priorities list (NPL)	August 30th, 1990
Administrative Order On Consent	March 19th, 1991
Remedial Investigation/Feasibility Study (RI/FS)	April 1996
Record of Decision Signed	April 1997
Consent Decree Signed	September 1997
Remedial Activities Initiated (RA Start)	October 15th, 1998
Construction Completion Date	September 20, 2000
First Five-Year Review Due Date	October 15, 2003

Figure 1
EPA Notice to Public Regarding Five-Year Review

EPA United States Environmental Protection Agency
1200 Sixth Avenue, ECO-081
Seattle, Washington 98101-1128

RETURN SERVICE REQUESTED

MONSANTO SUPERFUND SITE
EPA wants your comments on a Five-Year Review -- June 2003

EPA Plans Checkup at Superfund Site
Monsanto, Soda Springs, Idaho

The U.S Environmental Protection Agency is planning a five-year review of the Monsanto Superfund site this summer to make sure the cleanup continues to protect people and the environment. We welcome your participation during our review.

HOW YOU CAN HELP

Living near the site, you may observe things helpful to the review team. EPA would like to learn of any problems that may be related to the site, such as unusual wind-generated dust clouds from the plant; any human or animal sickness from drinking groundwater or eating grasses and plants close to the site; or any new housing or well installations next to the plant. EPA is not aware of any such reports, but we want to make certain our review is thorough. If you would like to provide input to EPA about the five-year review, please contact:

Wallace Reid, EPA Project Manager at (206) 553-1728, email: *reid.wallace@epa.gov* or
Mark Masarik, EPA Community Involvement Coordinator,(208) 378-5761, email: *masarik.mark@epa.gov*

What happens after the review? EPA will prepare a report that includes background about the site and cleanup, describes the review, and explains the results. Citizens on the site mailing list will be notified later this summer when the finished report is available.

FOR MORE INFORMATION

If you have questions or want to add your name to the mailing list, please contact Wallace or Mark.
Visit EPA 's web site for information about this and other sites at: *www.epa.gov/r10earth*

TTY users: Please call the Federal Relay Service at 1-800-877-8339 and give the operator Mark Masarik's phone number.

III. Background

A. Physical Characteristics

The Monsanto site is located in Caribou County, Idaho, approximately one mile north of the City of Soda Springs. [See Figure 2, Area Map.] Whereas most sites listed on the NPL consist primarily of contaminated properties containing little or no operating facilities, the Monsanto site in Soda Springs houses the only operating elemental phosphorus plant in the United States. The operating area (see Introduction or Acronyms for definitions of "operating area" and "buffer area") of the Monsanto site occupies approximately 540 acres. The size of the entire Monsanto site is approximately 800 acres, which includes the operating area as well as 260 acres of buffer area outside the fenced operating area. The buffer area, as well as the operating area inside the fence, contain institutional controls that were required as part of the decision documents. [See Figure 3, Vicinity Map.] The institutional controls are federally enforceable conditions pursuant to the decision documents, which bind Monsanto to maintain these institutional controls in perpetuity so long as elevated levels of hazardous constituents remain in place. Monsanto implements these institutional controls by recording property restrictions in Caribou County, including the decision documents and appropriate property easements. These property actions vary from parcel to parcel due primarily to the interests of private individuals who own portions of the buffer area; some of the buffer area is owned by Monsanto. The closest surface water body is Soda Creek, located 2,000 feet west of the operating area.

B. Land and Resource Use

The City of Soda Springs is located approximately one mile south of the Monsanto site with a population of about 3,300. Land use within the city limits is mostly residential with some commercial, agriculture, and light industrial zones. A light and heavy industrial zone extends from the north end of the City along State Highway 34 towards the Monsanto site.

The Monsanto site is located outside Soda Spring's city limits. The Monsanto workforce population is approximately 400. Land use within the fenced operating area is industrial. The Monsanto owned property includes agricultural land to the south and southwest of the operating area, and is surrounded by open agricultural and rangelands.

There are significant groundwater resources underneath the broad valley where both the Monsanto site and Soda Springs are located. The groundwater generally flows southward underneath the Monsanto site and then toward Soda Springs. However, even though Soda Springs is located hydraulically down-gradient of the Monsanto site, the Soda Springs population receives residential water supplies from either Formation Spring to the northeast or Ledger Creek Spring to the southeast. Both of these locations are unaffected by ground water flowing beneath the Monsanto site, and EPA reaffirmed as part of this five-year review that Soda Springs' water supplies are unaffected by the Monsanto site.

Figure 2
Area Map

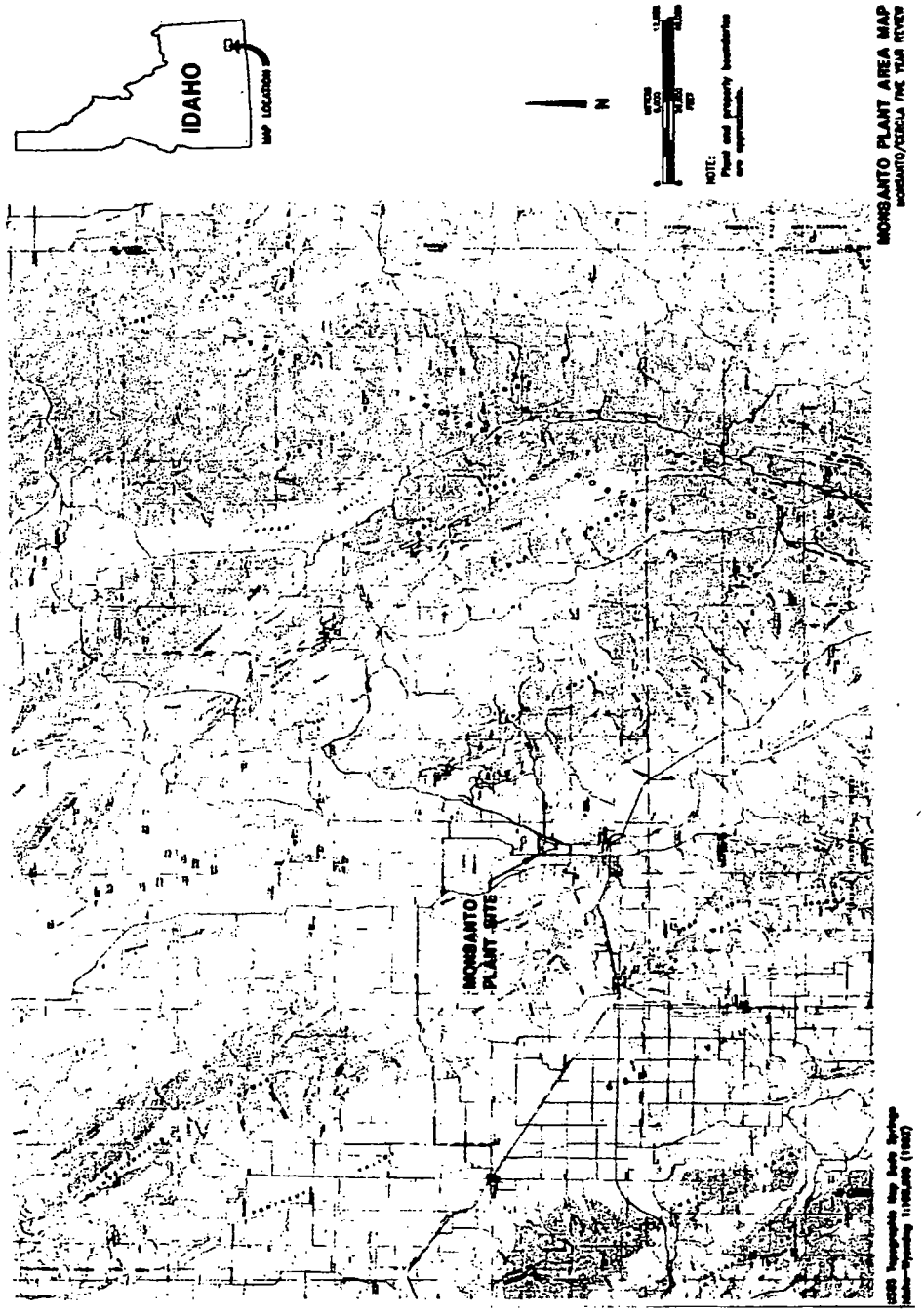
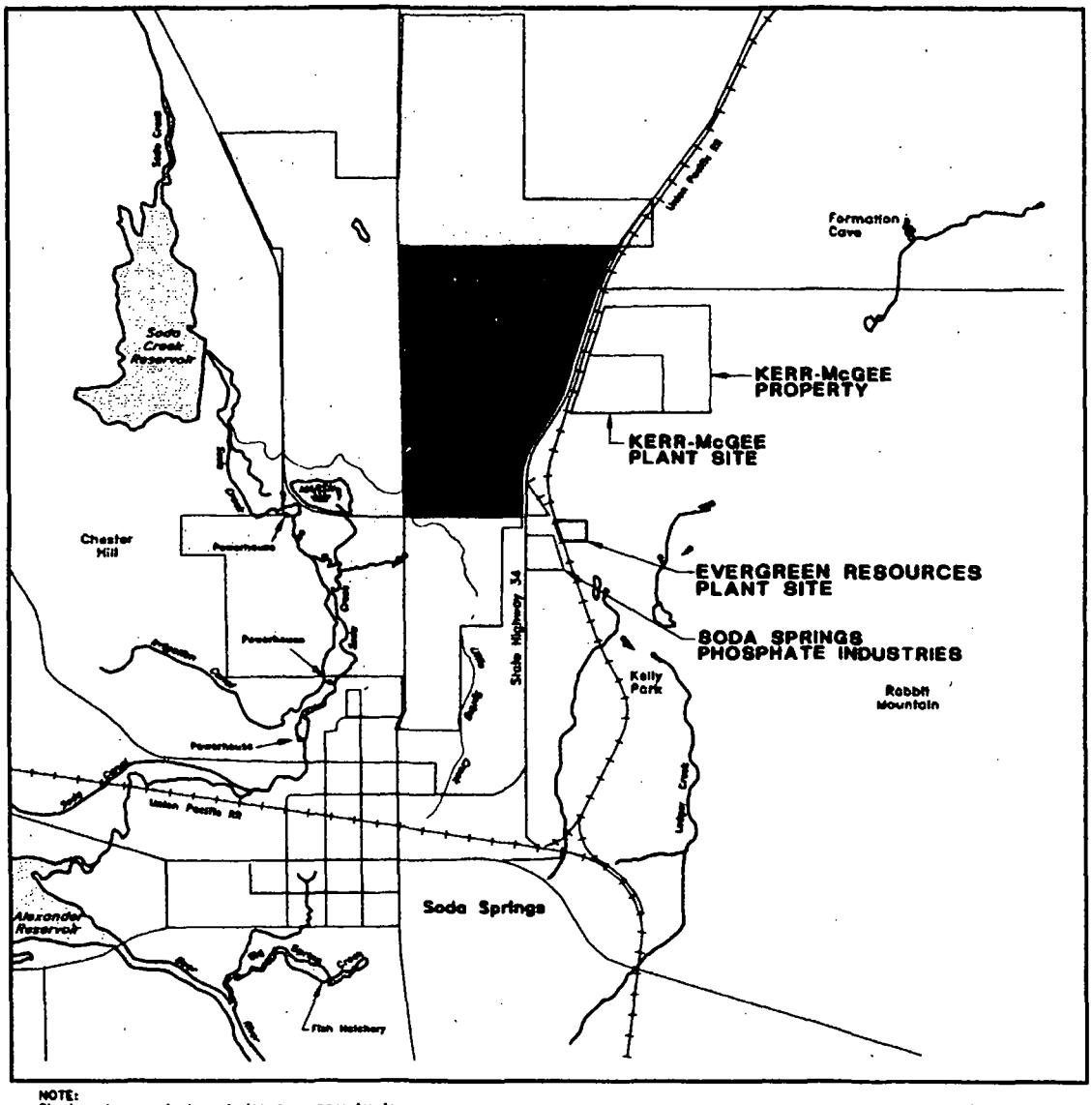


Figure 3
Vicinity Map



NOTE:
Plant and property boundaries are approximate.

SOURCE:
MONSANTO/PHASE II RI REPORT (GOLDER 1995)

LEGEND:

■ MONSANTO PLANT SITE

□ PROPERTY OWNED OR DEED RESTRICTION PURCHASED BY MONSANTO

MONSANTO PLANT VICINITY MAP
MONSANTO/CERCLA FIVE YEAR REVIEW

Groundwater hazardous constituent concentrations immediately south of the Monsanto operating area, but still within the buffer area, remain elevated above maximum contaminant levels (MCLs) for several hazardous constituents. This will be described in more detail herein. EPA is aware of one private groundwater well ((b) (6) well) south of the Monsanto buffer area that is elevated above MCLs, but has also observed a general trend of decreasing concentrations over the last five years in both the buffer area and the operating area. This trend predates the decision documents and may be attributed in some measure to operating changes Monsanto implemented after they learned groundwater contamination was found south of their site in the mid-1980s.

C. History of Contamination

Monsanto purchased the operating area property in 1952 in order to build the elemental phosphorus plant, which was located to take advantage of locally mined phosphate ore. Prior to EPA's CERCLA involvement, Monsanto hired Golder in 1984 to characterize groundwater impacts from past and current operations. This was approximately five years prior to EPA listing the Monsanto site on the NPL.

This pre-CERCLA investigation showed that groundwater under the Monsanto site contained elevated levels (above MCLs) of fluoride, cadmium, selenium, and vanadium. Monsanto determined from this work (without any EPA or IDEQ oversight) that their underflow solids pond, northwest pond, hydroclarifier, and intermediate processing steps in the elemental phosphorus production process were leaking into the subsurface and into groundwater, thereby creating the elevated hazardous constituent concentrations.

Kerr-McGee Chemical Corp. owned property (which they still own) and operated an industrial facility (now closed) in 1986, when the RI/FS for Monsanto was completed, immediately to the northeast of the Monsanto site. A separate plume unrelated to Monsanto (containing chloride, sulfate and vanadium) was also discovered by Golder. This plume originated on Kerr-McGee Chemical Corps. property to the east and extended onto the southeast portion of the Monsanto site. This plume still exists and is subject to investigation and follow-up by EPA pursuant to a separate action under CERCLA. The Kerr-McGee plume is distinguishable from the Monsanto plume by the distinct suite of hazardous constituents involved, so EPA's primary intent in this Monsanto five-year review is to acknowledge the Kerr-McGee plume for clarity, and to evaluate whether this plume interferes with the effectiveness of Monsanto's remedial activities. To date, EPA has not observed significant Monsanto issues pertaining to the Kerr-McGee plume. However, groundwater in the (b) (6) well south of the Monsanto buffer area contains elevated hazardous constituents from both the Kerr-McGee and Monsanto plumes, and this well is currently not protected by institutional controls. This matter is discussed later in this five-year review report.

D. Initial Response

Based on Monsanto's disclosure of groundwater impacts, EPA sampled in 1987 and found elevated levels of fluoride, cadmium, selenium, and sulfate in monitoring and production wells at the Monsanto site. Due largely to potential human health and environmental exposures from contaminated groundwater flowing south from the Monsanto site towards Soda Springs, and due also to documented environmental and likely human exposures to excess fluoride from at least one local well, EPA added the Site to the NPL on August 30, 1990.

E. Basis for Taking Action

Introduction

Between March 1991 and April 1996, Monsanto performed an RI/FS under EPA oversight. Investigations were performed for groundwater, soil, source materials, surface water, air, biota, and sediments. Constituents of potential concern were identified based on exceedances of EPA risk screening criteria. Sixty monitoring wells, eighteen spring locations, numerous off-plant soil-sampling locations, and sediment sampling locations from Soda Creek and Alexander Reservoir were sampled and chemically analyzed.

Issues of Potential Concern

A summary list of potential exposure concerns during the RI/FS included: 1) ^{226}Ra (radionuclide) exposures in the operating area, primarily to Monsanto employees; 2) potential residential exposures to metals and radionuclides in groundwater, soil, and air immediately outside the operating area if future residential development were not controlled; 3) potential elevated exposures inside the operating area if Monsanto or future property owners developed industrial processes other than the existing elemental phosphorous plant; 4) groundwater threats to the City of Soda Springs water supply; and, 5) surface water discharges to Soda Creek. The first three of these concerns at the conclusion of the RI/FS ended up being the primary drivers for development of remedial actions at the Monsanto site. The last two concerns were carried through the RI/FS, but EPA concluded in the decision documents that no remedial actions were necessary; these two issues are summarized below.

City of Soda Springs Water Supply

Groundwater generally flows southward underneath the Monsanto site and then toward Soda Springs. This was of great concern to EPA at the time the Monsanto site was listed on the NPL, but during the RI/FS EPA learned that groundwater supplies for Soda Creek are delivered from either Formation Spring to the northeast or Ledger Creek Spring to the southeast. Both of these locations are unaffected by ground water flowing beneath the Monsanto site.

Despite the finding that general water supplies to the City of Soda Springs were (and remain) unaffected by the Monsanto site, local groundwater immediately south of the operating area was (and still is) clearly impacted. Much of this area is now buffer area, since Monsanto has either purchased these properties or has purchased restrictive covenants to control further development. For example, Monsanto purchased the (b) (6) properly immediately south of and adjacent to the operating area. Monsanto then closed the (b) (6) well to prevent further consumptive uses, though it is still used for environmental monitoring. EPA is aware of only one private domestic well (the (b) (6) well) immediately south of the Monsanto site that is not restricted via institutional controls. This well appears to be affected by both the Monsanto and Kerr-McGee groundwater plumes, and it has over the past five years experienced concentrations of cadmium, fluoride, and other constituents that have exceeded MCLs. Monsanto and Kerr-McGee have cooperated to replace the (b) (6) home water supply with City of Soda Springs water. Therefore, the human consumption issues for the (b) (6) family have been resolved, but the long-term disposition of the (b) (6) well, the (b) (6) property, and surrounding private properties, remains unknown. Without institutional controls the (b) (6) well and property could transfer ownership without any notice to EPA or IDEQ, and use of the (b) (6) well could be altered without notice, which is of concern to EPA.

Surface Water Discharge to Soda Creek

The Monsanto elemental phosphorous plant pumps groundwater for production purposes and then discharges excess groundwater via a point source (pipeline) discharge to Soda Creek pursuant to a National Pollutant Discharge Elimination System (NPDES) permit. The NPDES permit was written to control thermal loading to Soda Creek, meaning that Monsanto must control the temperatures and total heat content they deliver to Soda Creek. Not included in the NPDES permit are any controls over other hazardous constituents that are also present in Monsanto's surface water discharge; these hazardous constituents are present in the discharge in part because they are present in groundwater that Monsanto pumps out of the ground for use in their plant. For example, discharge sample results over the past five years have documented excess (above MCL) concentrations of cadmium. This is not prohibited by the NPDES permit, and potential revision of the NPDES permit is outside the scope of this five-year review. Such review, if required, would be carried out by EPA's Clean Water Act (CWA) program in consultation with IDEQ. This five-year review report will be delivered to EPA's Clean Water Act program management for their consideration. Wallace Reid, EPA employee in the CERCLA program, did consult on at least two occasions during this five-year review with staff in EPA's CWA program. Mr. Reid learned that the Monsanto NPDES permit will not be subject to revision by EPA in the foreseeable future.

During the RI/FS EPA was concerned that contaminated surface water discharged to Soda Creek could end up being applied to crops or used for livestock. Thus, EPA decided at that time to test for hazardous constituent concentrations in surface water and sediment. Even though some COPCs were elevated in Soda Creek surface water and sediments relative to

background concentrations, these concentrations were not sufficiently high for EPA to require remedial action. Both human-health and ecological exposures were considered in EPA's January 1995 baseline risk assessment, and in both cases the risks did not exceed EPA risk criteria for the Monsanto site. EPA therefore decided in the decision documents that no remedial activities were required to control discharges to Soda Creek, except annual monitoring and reevaluation of this decision during subsequent five-year reviews. EPA did obtain additional sediment samples from Soda Creek and Alexander Reservoir as part of this five-year review, and the results of these analyses are described later in this report.

Monsanto Site Risks Requiring Remedial Action

After completing the RI/FS, EPA decided the following potential Monsanto site exposures warranted remedial action:

1. Operating area (inside the fence) exposures to radionuclides from slag and source materials, which would primarily affect Monsanto employees;

2. Potential future exposures of people to metals and radionuclides in groundwater, soil, and air in any residential development that might be constructed on the immediate southern or northern fence-line areas immediately outside the Monsanto operating-area; and,

3. Potential increased Monsanto operating-area exposures of industrial employees to radionuclides if the Monsanto plant ever closed and were redeveloped for other industrial uses.

IV. Remedial Actions

A. Remedy Selection

The selected RAOs are detailed in the ROD and summarized below.

1. Prevent human ingestion of, inhalation of, or direct contact with groundwater at levels exceeding: cadmium 0.005 mg/L; fluoride 4 mg/L; manganese 0.015 mg/L; nitrate as N 44 mg/L; selenium 0.05 mg/L.

2. The ultimate goal of the remedy for groundwater is to eliminate groundwater contamination sources and to restore the shallow groundwater aquifer underlying the site to levels below applicable MCLs (no distinction between the operating area and buffer area is made in the ROD).

3. Prevent external exposure, ingestion, or inhalation exposure to ^{226}Ra soil concentrations exceeding 3.7pCi/g and a radiation effective dose equivalent of 15 mrem/year.

4. RAOs for the operating area material piles (identified in the ROD as solid waste piles) are not necessary due to wind dispersal controls implemented for these piles, and because Monsanto has an effective worker protection program; should these conditions change, RAOs to control off-plant dispersal of contaminants and to promote on-site worker protection would be required.

5. These RAOs are contingent on continued operation of the Monsanto elemental phosphorus plant. If Monsanto stops pumping production wells, converts the site to other industrial uses, or otherwise changes its operations in any substantial way, the RAOs will need to be reconsidered and/or amended by EPA. Any required changes to the remedy for the site based on amended RAOs would then also need to be considered at that time. During this five-year review Monsanto reiterated to EPA their intention to continue operation of the elemental phosphorous plant for the foreseeable future.

The selected remedies in the ROD to achieve the above RAOs are:

1. MNA with institutional controls for contaminated groundwater.

2. Either institutional controls or soil excavation on buffer properties not owned or controlled by Monsanto, at the discretion of the property owners.

3. No further action (NFA) for operating area source piles and materials. This remedy is subject to continued operations and ongoing five-year reviews.

4. No further action for air, surface water, and Soda Creek sediments.

B. Remedy Review

The CERCLA Five-Year Review requirements as determined by the ROD include the following:

1. Groundwater ~ review and assess groundwater and outfall monitoring data (which should be collected and evaluated at least annually).

2. Groundwater & Surface Water ~ compare groundwater and outfall quality and extent of contamination (plume(s)) to regulatory levels, remediation goals and groundwater modeling projections. Determine if/when remediation goals have been achieved, and if not, that institutional controls are still in place and effective.

3. Sediments ~ sediment samples should be collected to support the five-year review assessment of whether contaminant concentrations are remaining stable or declining as predicted.

4. Soils ~ soil sampling should be done no less often than every five years to: a) determine the concentrations of COPCs in soils; and, b) verify that source control is effectively preventing further spread of site contaminants and/or recontamination of soils.

5. Institutional Controls ~ review that institutional controls are in place for all soil grids surrounding the plant which contain ^{226}Ra concentrations greater than the remediation goal of 3.7 pCi/g, based on a statistically valid sampling program.

6. Operating Area ~ verify that operations continue to be in compliance with environmental and worker health and safety requirements so that potential releases and exposures remain adequately controlled and the remedy remains effective. Evaluate dust control efforts and land-use/institutional controls, and determine if closure has occurred or is planned.

C. System Operations/O&M

Although the ROD required no remedial construction activities except potential buffer area excavations as described above, Monsanto has reported to EPA several voluntary remedial construction activities from 1985 to the present. These activities were not performed under EPA or IDEQ oversight, and neither agency can confirm these details, but site operational changes do appear to have reduced the hazardous constituent loading to groundwater, as evidenced by decreasing concentrations in many site wells.

- In August, 1985, the old hydroclarifier, which was suspected as potentially affecting groundwater, was replaced with a unit that includes a synthetic liner, a leachate collection system, and a monitoring well network.

- In 1986, an old coke and quartzite dryer and wet scrubber was replaced with a more efficient dryer and dust collector, resulting in air emission reductions of over 95 percent. The coke and quartzite dust slurry ponds were remediated and capped.

- In 1986, four underground fuel storage tanks were replaced with aboveground tanks with concrete sumps. These underground tanks were removed to comply with new regulations. There was no indication that leaking had occurred.

- In September 1987, four parallel high-energy venturi scrubbers, separators, fans and stacks were installed to provide additional scrubbing of kiln exhaust. The parallel arrangement of equipment effectively reduced upset/breakdown emissions that would occur if only one or two fans existed. This project resulted in a reduction of particulate emissions of about 95% and contributes to a cumulative cleaning efficiency of 99.9 percent.

- In 1987, four wells (TW-3, TW-4, TW-5, and TW-6) which were discovered to be creating hydraulic communication between upper and lower aquifers due to poor construction were abandoned in accordance with regulatory guidelines.

- In 1983, the old underfiow solids ponds suspected as sources of groundwater contamination were taken out of service. Much of the solids were subsequently excavated and recycled. In 1988, the upper layer of contaminated soil was removed, and the depression was back-filled with material excavated from the northwest pond (see below) and with clean material. The ponds were then filled with molten slag and sealed with a bentonite cap to isolate the remaining underfiow solids from infiltration and prevent further migration of contaminants. Solids that remained in the pond are below the cap, but above the water table.

- In 1988, the northwest pond, also a suspected groundwater contamination source, was closed and excavated. Discolored soils were removed and deposited in the old underfiow solids ponds. The base of the pond was sealed with bentonite. The area is currently permitted by IDEQ to received Plant sanitary solid waste and is being operated as a lined general waste landfill.

- In 1988, a new operating-area drinking water well (PW-4) was installed upgradient of known and suspected source areas to prevent degradation of the potable water supply. A new independent potable water distribution system was installed with the new well, thus preventing cross-connection of potable and raw process water.

- Between 1985 and 1989, several wells were installed around the hydroclarifier and used as recovery wells to intercept contaminated groundwater. The groundwater was pumped into the new hydroclarifier. Three wells were pumped intermittently at a rate of approximately 12 gallons per minute per well from *1985* to 1989.

- Since 1990, fugitive emissions from the baghouse dust disposal pile have been reduced through improved handling procedures and placing crushed slag on the surface of unused portions of the pile. Additional projects have significantly reduced fugitive air emissions from the conveyance of slag from the furnace.

- During 1992, emission controls were implemented in the nodule reclaim area. These controls included a stationary stacking tube and dust collectors at material transfer points to reduce fugitive dust emissions.
- Three separate "short-runner" projects have been implemented to significantly reduce fugitive air emissions from the conveyance of slag from the furnace to pots. Pots were moved and the shorter conveyance area fully enclosed. The No. 8 furnace project was completed during 1992. The short-runner upgrade to furnace No. 9 was implemented in 1993, and a similar upgrade for furnace No. 8 was completed in 1994.
- In 1993, sewage evaporation ponds were taken out of service and the Plant was connected to the City wastewater collection system. The ponds were closed in 1995.
- The one rural road was paved during spring 1995.
- The operating area is now free from regulated PCB containing equipment.

V. Progress Since the Last Review

This is the first five-year review.

VI. Five-Year Review Process

A. Administrative Components of the Five-Year Review Process

The team for this five-year review effort included representatives from EPA, IDEQ, and Monsanto. Team members were previously identified in the introduction to this report. EPA representatives in Boise also assisted in issuing a notice to the public that this five-year review effort was proceeding, and informed the public that EPA would welcome any comments pertaining to the Monsanto site in Soda Springs.

EPA requested and approved a Monsanto work plan during September 2002 to provide EPA with the technical data necessary to complete the analyses required for this report. Monsanto also submitted a draft Five-Year Report to assist EPA in this effort. EPA has used the technical data and information Monsanto provided under EPA's oversight, but all technical analyses, conclusions, and recommendations included in this report are solely those of EPA, in consultation with IDEQ.

B. Document Review

The RI/FS, ROD, Consent Decree, annual groundwater monitoring data, and appendices to this five-year review report were all reviewed in support of this five-year review effort.

C. Data Review

1. Sediment Investigation

Sediment samples were collected by Monsanto during October 2002 in accordance with the EPA approved "Work Plan and Sampling and Analysis Plan for CERCLA Five-Year Review". The sampling approximated previous sampling performed as part of the RI/FS in Soda Creek and the Alexander Reservoir. Samples collected during the five-year monitoring program were analyzed for arsenic (As), cadmium (Cd), copper (Cu), nickel (Ni), selenium (Se), silver (Ag), vanadium (V), and polonium-210 (^{210}Po). Appendix A, Alexander Reservoir and Soda Creek Sampling Results provides a complete presentation of the data collection and analyses. Appendix C, Monsanto Plant Sediment Data Validation and Quality Control Summary is provided in support of Appendix A. The results are summarized below.

2. Alexander Reservoir

The Table below summarizes the sediment analytical results from Alexander Reservoir. The entire suite of analytical results and discussion are provided in Appendix A and hereby incorporated into the official record for this five-year review. EPA has concluded from this data that monitored hazardous constituents in this portion of Alexander Reservoir are not increasing, and there is a general trend of decreasing concentrations. This conclusion is narrowly applicable to the location in Alexander

Reservoir where Bear Creek ("Control") and Soda Creek ("Affected") discharge into the Reservoir. Soda Creek is the water body into which Monsanto discharges their excess groundwater and surface water. The column "RI" refers to analytical results observed during the remedial investigation during the mid-1990s, and the column "M" refers to analytical results observed during this five-year review process. The results in the "RI" columns were used in EPA's risk assessments during the mid-1990s to determine that no remedial action was required to control Monsanto discharges to Soda Creek.

Sediment Quality Summary in Alexander Reservoir*

	Control RI	Control M	Affected RI	Affected M
$[As]_{sed}$ mg/kg dw	2.4	1.9	5.9	3.6
$[Cd]_{sed}$ mg/kg dw	0.30	0.46	8.9	2.8
$[Cu]_{sed}$ mg/kg dw	6.7	5.1	6.4	5.9
$[Ni]_{sed}$ mg/kg dw	8.0	7.2	20	11
$[Se]_{sed}$ mg/kg dw	0.70	0.29	2.3	0.66
$[Ag]_{sed}$ mg/kg dw	0.040	0.077	0.10	0.087
$[V]_{sed}$ mg/kg dw	19	7.8	25	11
$[^{210}Po]_{sed}$ mg/kg dw		1.1		1.2

* **Sample analytical results for this five-year review are average values, representing 9 sediment samples in the control area and 9 sediment samples in the affected area. The statistical average includes all samples collected in each area. All individual sediment results are presented in Appendix A.**

3. Soda Creek

The Table below summarizes the sediment analytical results from Soda Creek. The entire suite of analytical results and discussion are provided in Appendix A. EPA has concluded from this data that monitored hazardous constituents in this portion of Soda Creek are not increasing, and there is a general trend of decreasing concentrations. The column "RI" refers to analytical results observed during the remedial investigation during the mid-1990s, and the column "M" refers to analytical results observed during this five-year review process. "Control" in this context means upstream of the Monsanto outfall to Soda Creek and "Affected" means downstream from the outfall. The results in the "RI" columns were used in EPA's risk assessments during the mid-1990s to determine no remedial action was required to control Monsanto discharges to Soda Creek.

Sediment Quality Summary in Soda Creek

	Control RI	Control M	Affected RI	Affected M
$[As]_{sed}$ mg/kg dw	6.2	24	33	9.2
$[Cd]_{sed}$ mg/kg dw	11	0.38	22	10
$[Cu]_{sed}$ mg/kg dw	2.7	6.4	18	5.1
$[Ni]_{sed}$ mg/kg dw	55	30	35	12
$[Se]_{sed}$ mg/kg dw	0.60	0.79	3.5	3.3
$[Ag]_{sed}$ mg/kg dw	0.10	0.14	1.6	0.11
$[V]_{sed}$ mg/kg dw	23	50	100	41
$[^{210}Po]_{sed}$ mg/kg dw	0.67	0.96	1.2	2.0

* **Sample analytical results for this five-year review are average values, representing 7 sediment samples in the control area and 7 sediment samples in the affected area. The statistical average includes all samples collected in each area. All individual sediment results are presented in Appendix A.**

4. Soil Investigation

The soil investigation was conducted by Monsanto during October 2002 in accordance with the EPA approved "Work Plan and Sampling and Analysis Plan for CERCLA Five-Year Review". The sampling approximated previous sampling performed as part of the RI/FS. Samples collected during the five-year monitoring program were subject to analysis for ^{226}Ra, as this was the only hazardous constituent requiring remedial action for off-site soils at the time of the ROD. The summary data presented in this section is detailed in Appendix B, Monsanto Plant Soil Sampling Results, and supported by Appendix D, Monsanto Plant Soil Data Validation and Quality Control Summary Report.

The column "RI" refers to analytical results observed during the remedial investigation during the mid-1990s, and the column "M" refers to analytical results observed during this five-year review process. "Control" in this context means soil samples from locations EPA concluded were generally unaffected by the site, and "Affected" means soil samples from areas where elevated ^{226}Ra concentrations have been observed in the past. The results summarized by the "RI" columns were used in EPA's risk assessments during the mid-1990s to determine that remedial action was required in some areas to control potential exposures from elevated ^{226}Ra concentrations.

Soil Quality Summary Off-Site*

	Control RI	Control M	Affected RI	Affected M
$[^{226}Ra]_{soil}$ pCi/g dw	1.6	1.2	1.8	1.6

* **Sample analytical results for this five-year review are average values, representing 6 soil samples in the control area and 39 soil samples in the affected area. The statistical average includes all samples collected in each area. All individual sediment results are presented in Appendix A.**

EPA has noted Monsanto's interpretation that the summarized data above suggest ^{226}Ra soil concentrations have not increased over the past five years. However, regardless of whether this overall Monsanto claim is accurate or not, it fails to reveal that ^{226}Ra soil concentrations actually did increase in 16 of 39 off-site samples collected by Monsanto for this five-year review (approximately 40%). Four of these sixteen increases resulted in exceedances of the 3.7 pCi/g ROD objective in locations where exceedances had not been observed during the RI/FS. Two of these locations are outside the buffer area, where no institutional controls are in place. EPA recognizes that exceeding 3.7 pCi/g in any one sample off-site does not necessarily mean that an immediate exposure problem has been identified. EPA determined during the RI/FS that farming activities would be acceptable in areas where soil concentrations of ^{226}Ra 3.7 pCi/g were exceeded, but that such concentrations would not be acceptable for residential development. The two soil samples collected for this five-year review in which elevated ^{226}Ra soil concentrations were found outside of any institutional controls are from a local farm and an industrial rail yard. An EPA recommendation pertaining to this finding is included in this report.

A related EPA concern generated as a result of this five-year review effort is whether the selected NFA remedy for operating area material piles is further warranted. While EPA acknowledges Monsanto's conclusion that off-site ^{226}Ra sample results do not statistically demonstrate an increasing trend over the broad area under consideration, nonetheless the increased concentration in 40% of all samples collected suggests the possibility that wind dispersal of Monsanto's material piles is leading to unacceptable increases in hazardous constituent concentrations off-site. While the EPA review team was physically located at a sample location where the ^{226}Ra soil concentration had increased, on June 10th, 2003, a local storm event descended on the Monsanto site and our review team observed wind dispersal of materials from the operating area toward our location. An EPA recommendation pertaining to this finding is included in this report.

5. Site Inspection & Interviews

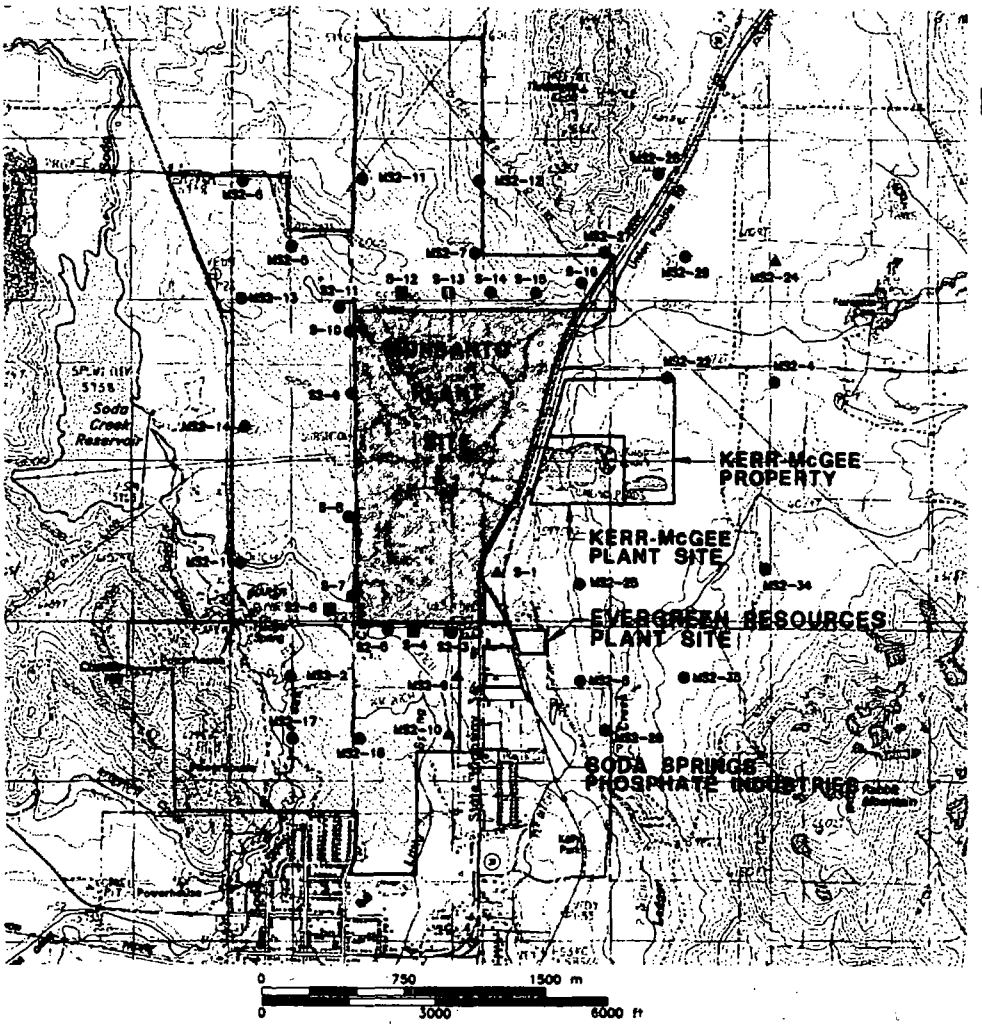
EPA and IDEQ inspected the Monsanto site on June 10th, 2003. Monsanto and their entire technical team participated in the inspection and were the primary interviewees for EPA and IDEQ inquiries. The site inspection occurred over an entire work day and included inspection of: 1) the Monsanto site operating area; 2) Monsanto site buffer area; 3) Alexander Reservoir; 4) Soda Creek, including Soda Creek's discharge location into Alexander Reservoir; and, 5) the soil sample location where an elevated ^{226}Ra concentration was observed.

6. Institutional Control Review

The ROD requires a review of land use and institutional controls for all soil grids surrounding the plant which contain ^{226}Ra concentrations greater than the remediation goal of 3.7 pCi/g based on a statistically valid sampling program. All of the affected property owners (those with soil concentrations exceeding 3.7 pCi/g at the time of the ROD) have elected institutional controls over the option of soil excavation and disposal. Monsanto purchased either the property or an environmental easement for all adjacent agricultural land showing elevated concentrations in the RI/FS, so potential ^{226}Ra exposures identified in the decision documents are controlled as of this five-year review.

Figure 4 shows an updated map of properties currently owned by Monsanto or other parties; parcels for which recorded (in Caribou County) deed restrictions are in place to limit residential uses and groundwater wells. Figure 4 also shows recent ^{226}Ra concentrations observed during this five-year review, which EPA has previously described herein.

Figure 4
Institutional Control Properties



LEGEND:

- ● —— NO SIGNIFICANT CHANGE
- ■ —— NOW BELOW TARGET CLEANUP GOAL 3.7 pCi/g
- ▲ —— NOW ABOVE TARGET CLEANUP GOAL 3.7 pCi/g
- ▨ —— MONSANTO PLANT SITE
- □ —— PROPERTY OWNED OR DEED RESTRICTION PURCHASED BY MONSANTO

SOURCE:
PHASE II RI REPORT (GOLDER, 1995)

USGS Topographic Map Soda Springs Idaho–Wyoming 1:100,000 (1982)

MONSANTO PLANT VICINITY SOILS
DIFFERENCE IN RADIUM-226 CONCENTRATIONS
BETWEEN RI AND MONITORING

MONSANTO/CERCLA FIVE YEAR REVIEW – APPENDIX B

7. Groundwater Investigation

The ROD established the points of compliance (POC) for annual and five-year review monitoring. Well TW-19 is listed as a POC, however, that well does not provide sufficient water. Well TW-20 is located in the same well pair as TW-19 and therefore replaces it as a point of compliance. The ROD also lists TW-29 as a POC. This well is located at the north end of the operating area where groundwater is unaffected by plant operations. This was a typographical error and TW-39 at the south plant fence line was the intended point of compliance. Reflecting these modifications, the POC wells subject to annual and five-year review monitoring are as follows:

- Production Wells: PW-01, 02 and 03
- South Plant Fence Line: TW-20, 34, 35 and 39
- Southern Plant Boundary: TW-53, 54, 55 and Hams well
- Soda Creek.

Well TW-34 is affected by naturally occurring manganese concentrations because it is completed in the transition zone between the upper basalt zone (UBZ) (fresh water) and lower basalt zone (LBZ). TW-34 is therefore not appropriate for monitoring the UBZ. The south plant fence line wells are located inside the southern plant fence line near Hooper Springs Road. The southern site wells are located outside the operating area but on Monsanto property in the southern buffer area. In May 2001, two locations were established in Soda Creek at locations upstream and downstream of the effluent discharge (non-contact cooling water) and surface water samples were collected during the 2001 and 2002 sampling rounds.

The ROD requires the following activities:

- Review and assess groundwater and outfall monitoring data (collected and evaluated at least annually), and

- Compare groundwater and outfall quality and extent of constituent plumes to regulatory levels, remediation goals, and groundwater modeling projections. Determine if/when remediation goals have been achieved, and, if not, that institutional controls are still in place and effectively preventing human exposure.

<u>Groundwater POC & Institutional Controls</u>

Based on the June 2002 sampling results, most POC wells are below remediation goals for the COPCs. For fluoride and nitrate, POC wells are below remediation goals. However, cadmium exceeds remediation goals at four POC wells (PW-01, TW-20, 39 and 54), manganese at TW-34, and selenium at six POC wells (PW-01, TW-20, 39, 53, 54 and (b) (6) well).

With one exception, groundwater exceedances are located at points within Monsanto's operating area or buffer area, and EPA notes that concentrations overall are generally decreasing as was anticipated when the ROD was issued. EPA also concludes from the groundwater data that institutional controls necessary to prevent potential groundwater exposures in this southern portion of the Monsanto site are effective at this time, except for the (b) (6) well (described earlier in this report) which is the subject of an EPA recommendation included in this report.

Another technical matter the EPA review team will recommend for follow-up with Monsanto is the discovery of increasing molybdenum concentrations in groundwater samples collected from at least one southern boundary well (TW-53) and from the (b) (6) well.

Groundwater Observations in the Operating Area

Appendix E provides a detailed presentation of groundwater results. In addition to the COPCs in the ROD, chloride, molybdenum and sulfate were analyzed. Furthermore, the following non-POC wells were monitored for the purposes of determining trends:

- Production well: PW-04
- Northwest Pond area wells: TW-16, 17 and 18;
- Old Underflow Solids Ponds Area Wells: TW-22, 24, 37 and 45;
- Hydroclarifier Area Wells: TW-40 and 44

Wells in the operating area have both increased and decreased in concentration for various COPCs over the past five years. The general trend appears to be decreasing concentrations, with some concentrations staying about the same. Increases in some COPC concentrations have been observed in the following wells, many of which are located near closed waste handling areas or refitted production units.

Fluoride:

Production Wells: PW-02, 03 and 04
Northwest Pond Wells: TW-18
Old Hydroclarifier Wells: TW-44

Manganese

NW Pond wells: TW-17

Selenium

Old Hydroclarifier wells: TW-40

Chloride

Old Hydroclarifier wells: TW-44

Groundwater Transport Modeling

A groundwater solute transport model was developed by Monsanto as part of the RIFS to predict the fate and transport of hazardous constituents in groundwater in the vicinity of the plant for a period of one hundred years. Three endpoints south of the plant were used, (the southern plant boundary, the estimated discharge point of the plume into Soda Creek, and the estimated discharge point of the plume into Bear River). The original RIFS model predicted that the constituent concentrations for cadmium would peak at the southern fenceline in 1994. The model was based on groundwater quality, data over a period of five years, and was revised during the five-year review process based on twelve years of available data. The revised model (Monsanto's model, but with new data) indicates that the cadmium peak will occur at the southern fenceline significantly later than originally anticipated. This information does not seriously raise concerns about meeting groundwater remedial action objectives in the Monsanto site buffer area as anticipated by EPA at the time of the ROD, but it suggests that remedial action objectives for groundwater may be more difficult to achieve underneath the Monsanto site operating area.

Groundwater Conclusion For This Five-Year Review

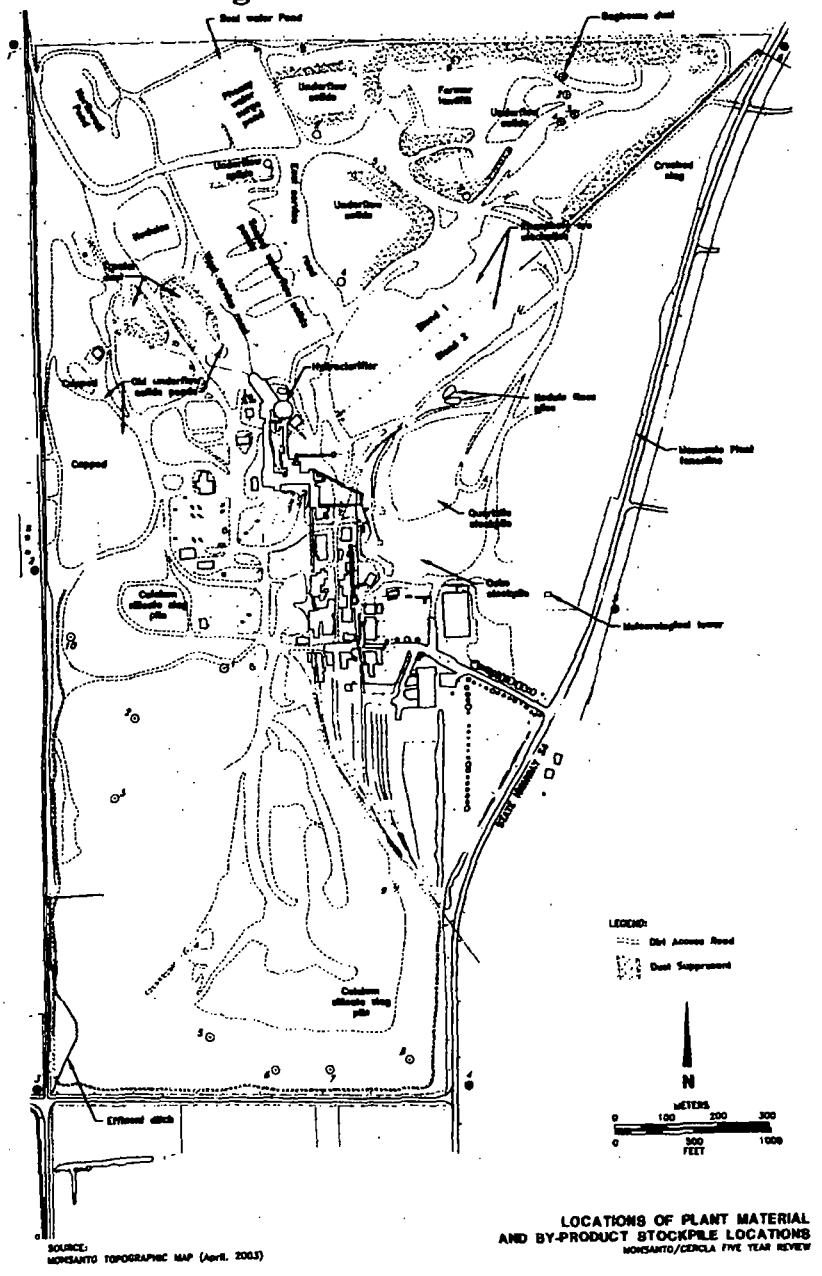
A review of the entire groundwater data set over the past five years (included in Appendix E and in the official record for the Monsanto site) reveals that COPC concentrations in groundwater in the buffer area south of the plant are generally decreasing. This also tends to be the case for wells in the operating area, but there are exceptions to this general trend. EPA has concluded from this that the monitored natural attenuation remedy for groundwater appears, as of this five-year review, to be working as intended in the buffer area and to be moving along somewhat more slowly underneath the operating area. EPA has included a recommendation pertaining to this finding later in the repot.

Three related technical matters that don't lead to EPA concerns about the protectiveness of the MNA remedy for groundwater but are necessary details to be resolved with Monsanto based on this five year review are: 1) increasing molybdenum concentrations south of the operating area; 2) use of total nitrogen as nitrate for demonstrating compliance with the MCL; and, 3) annual sampling, analyses, and trend evaluation reporting of Soda Creek discharge concentrations at a level of detail similar to annual and five-year review groundwater reporting. These technical matters are described in the RI/FS and decision documents, but have not been adequately addressed as of this five-year review in the official record. The EPA review team has included a recommendation in this report to sort out the details of these technical matters with Monsanto based on the findings of this five-year review. If Monsanto believes these maters have already been vetted with the regulatory agencies, they are welcome to point out any portion of the official record for EPA to review and evaluate.

8. Plant Compliance Review

The EPA review team inspected the operating area during the June 10th, 2003 five-year review site visit. We toured the material piles in the northeast quadrant of the operating area, and also noted significant wind dispersal from these piles later in the day. Figure 5 shows the current extent and locations of the material piles.

Figure 5 ~ Material Piles



As already noted, EPA did observe wind dispersal from Monsanto's operating area (specifically from the underflow solids pile [shown on Figure 6 above]) during the June 10th, 2003 five-year review site inspection. This is a potential source of elevated ^{226}Ra off-site, so EPA has concluded that additional wind dispersal measures will be necessary to correct this problem and has determined that a higher density of off-site ^{226}Ra sampling will be necessary both in the short-term and during the next five-year review.

VII. Technical Assessment

Earlier in this report EPA summarized the four selected remedial actions for the Monsanto site as follows:

- Monitored natural attenuation with institutional controls for contaminated groundwater.
- Either institutional controls or soil excavation on buffer properties not owned or controlled by Monsanto, at the discretion of the property owners.
- No further action for operating-area source piles and materials. This remedy is subject to continued operations and ongoing five-year reviews.
- No further action for air, surface water, and Soda Creek sediments.

The five-year technical assessment that follows is completed as four distinct analyses, one for each selected remedy. For each selected remedy, EPA has answered yes or no to the following three questions, and has supplemented each response with supporting data, information, or references:

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

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

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

A. Monitored Natural Attenuation for Groundwater

Question A: Yes
Question B: Yes
Question C: Yes

The ROD was written with the idea in mind that it is possible for elevated hazardous constituent concentrations below the operating area of the Monsanto plant to naturally decrease over time to acceptable (below MCL) concentrations. EPA has concluded based on five years of data collection and Monsanto's own modeling predictions, that achieving below-MCL concentrations everywhere underneath Monsanto's operating area is still possible but may occur over a longer timeframe than anticipated at the time of the ROD. In contrast, MNA progress in the buffer area surrounding the Monsanto site, particularly the southern buffer area, appears to be working as intended in the decision documents.

New information EPA has relied on to question the protectiveness of the remedy is the most recent transport modeling which shows contaminant concentrations decreasing for cadmium at a much slower rate than calculated during the RI/FS. This information does not demonstrate the remedy is ineffective, but is cause for continued annual groundwater monitoring and greater scrutiny by EPA during the next five-year review.

An additional new piece of information since the ROD relating to protectiveness of the remedy is elevated cadmium concentrations in the (b) (6) well (which is no longer used for potable water supplies). This well is outside current site institutional controls and it is unclear as of this five-year review what the ultimate status of the (b) (6) well will be.

B. Institutional Controls

Question A: Yes
Question B: Yes
Question C: No

EPA has concluded the institutional control remedy is working as intended. This may change in the future if additional elevated off-site ^{226}Ra soil concentrations are discovered, or if additional domestic wells are discovered in the buffer area, such as the (b) (6) well. Except for the (b) (6) well, no additional properties were discovered during this five-year review that may require Monsanto to implement new institutional controls. Several elevated off-site ^{226}Ra samples have been described herein, and EPA has included a recommendation in this report to respond appropriately to this finding.

C. No Further Action for On-Site Source Piles & Materials

Question A: No
Question B: Yes
Question C: Yes

EPA has considered three facts in determining that the NFA remedy for on-site materials is not working as intended. First, EPA observed significant wind dispersal from the underflow solids pile during our June 10th, 2003 inspection. Second, EPA is aware the underflow solids pile fails the Toxicity Characteristic Leaching Procedure (TCLP) test for certain hazardous constituents [from on-site interview with Bob Geddes, and EPA RCRA inspector Sylvia Burges], which would in most cases mean the material must be managed as a hazardous waste pursuant to RCRA. However, Monsanto has declared the underflow solids are exempt from the hazardous waste definition pursuant to the Bevill Amendment to RCRA. Either way, EPA is concerned that wind dispersal may lead to off-site contamination, which is the subject of the ROD and this five-year review. Third, several data points obtained during this five year review indicate that ^{226}Ra soil concentrations have increased in some localized areas over the past five years. Furthermore, the underflow solids likely contain ^{226}Ra, since it is a naturally occurring element in the local ores used in elemental phosphorous production, so it may be the source of increased ^{226}Ra concentrations off-site.

Based on this finding, EPA has included a recommendation herein for Monsanto to submit a plan to control wind dispersal of material piles. EPA has also requested herein that the wind dispersal plan include off-site soil sampling to occur within sixty days of plan approval by EPA, and that all affected off-site property owners be notified about all sample results on their properties.

D. No Further Action for Air, Surface Water and Soda Creek Sediments

Question A: Yes
Question B: Yes
Question C: No

As for the institutional control remedy, EPA has concluded based on this five-year review effort that the remedy decisions relative to air, surface water, and sediments were proper and remain protective as of this five-year review.

E. Technical Assessment Summary

In summary, of the four remedial actions included in the ROD, EPA has concluded that two of the remedies (institutional controls, and NFA for air, surface water, and sediments) are functioning as intended in the decision documents. These remedies also remain valid in terms of exposure assumptions, toxicity data, cleanup levels, and RAOs. In regards to the selected MNA remedy for groundwater, EPA has learned that the MNA remedy underneath the operating area may take longer than anticipated at the time of the ROD, and has noted further that the (b) (6) well may need institutional controls, but that otherwise the MNA remedy for groundwater appears to be working as intended.

The one remedy EPA has concluded is not functioning as intended in the decision documents (NFA for on-site material piles), is summarized as follows:

NFA Remedy for On-Site Material Piles

EPA's conclusion that the NFA remedy for on-site material piles is not functioning as intended is based on three observations made during the five-year review, all of which are already described in the previous section. EPA has concluded in this instance that the RAOs and related technical underpinnings of the remedy remain valid, though EPA has learned new information about management of material piles at the Monsanto site that have caused EPA to question the protectiveness of the remedy. For example, if wind dispersal continues as the review team observed on Jun 10th, 2003, off-site soil concentrations may continue increasing in localized areas, leading to more institutional controls and more potential off-site exposures.

VIII. Issues

The issues listed below have been articulated in detail elsewhere in this report, so for brevity they are simply repeated here as summary statements:

- Groundwater samples from the (b) (6) well have revealed elevated cadmium and other hazardous constituent concentrations during the past five years, and the property where this well is located does not have institutional controls.
- MNA for groundwater underneath the operating area may take longer than anticipated during the RI/FS, though this observation needs to be reevaluated during the next five-year review.

- Wind dispersal is occurring from the Monsanto site, and this may be contributing to increasing off-site contamination. EPA has determined this component of the Monsanto site remedy is not working as intended in the decision document.

- Three related technical matters that don't lead to EPA concerns about the protectiveness of the MNA remedy for groundwater but are necessary details to be resolved with Monsanto based on this five year review are: 1) increasing molybdenum concentrations south of the operating area; 2) use of total nitrogen as nitrate for demonstrating compliance with the MCL; and, 3) annual sampling, analyses, and trend evaluation reporting of Soda Creek discharge concentrations at a level of detail similar to annual and five-year review groundwater reporting.

Issues	**Affects Current Protectiveness (Y/N)**	**Affects Future Protectiveness (Y/N)**
1. Lack of institutional controls on (b) (6) well & property	N	Y
2. Monitored natural attenuation for groundwater may take longer underneath the operating area than anticipated at the time of the ROD	N	Y
3. Wind dispersal from Monsanto material piles may be contributing to ^{226}Ra soil concentration increases observed in localized areas off-site	N	Y
4. Three technical matters need resolution: 1) increasing molybdenum concentrations in the southern buffer area; 2) using total nitrogen as nitrate for MCL compliance; and, 3) sampling, analyzing and reporting Soda Creek discharge data at a level of detail similar to groundwater reporting	N	N

IX. Recommendations and Follow-up Actions

The five-year review team recommends that:

- EPA request Monsanto to submit a plan by February 1, 2004 pertaining to the (b) (6) well, examining the options for brining the (b) (6) well under institutional controls, and for evaluating whether other such domestic wells may be present in the non-buffer area immediately south of the Monsanto site.

- EPA request Monsanto to submit a plan by February 1, 2004 to control wind dispersal from on-site material piles. This plan shall include a sampling program to investigate areas off-site where ^{226}Ra soil concentrations were found to have increased over the past five years. Monsanto shall conduct the sampling portion of this plan no later than sixty days following EPA approval, and Monsanto shall promptly report all sampling results to local property owners.

- EPA request Monsanto to perform sampling and the next five-year review activities on a scale similar to the technical work performed in support of this review. Two exceptions shall be: 1) soil sampling off-site in areas where sampling density may be increased (as determined by results obtained during development of the wind dispersal control plan above); and, 2) Monsanto shall collect and analyze surface water discharges to Soda Creek for COPCs, report these finding to EPA annually, and as part of the next five-year review, and provide trend analyses of this discharge data at a level of detail consistent with ongoing groundwater data reporting.

- EPA request Monsanto to engage in a technical dialogue with EPA and IDEQ to resolve three related groundwater technical matters already described in this report.

Issue	Recommendations and Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Dates	Affects Protectiveness (Y/N) Current	Affects Protectiveness (Y/N) Future
1.	Submit plan pertaining to institutional controls for (b) well and nearby properties	Monsanto	EPA	2/1/2004	N	Y
2.	Reevaluate MNA for groundwater underneath operating area	EPA	EPA and IDEQ	Sep 2008	N	Y
3.	Submit plan pertaining to wind dispersal and off-site soil sampling	Monsanto	EPA	2/1/2004	N	Y
3.	Perform next five-year review technical work with some modifications	Monsanto	EPA	Sep 2008	N	Y
4.	Resolve three technical matters	Monsanto	EPA	2/1/2004	N	N

X. Protectiveness Statement

The remedy at the Monsanto Chemical Co. (Soda Springs Plant) currently protects human health and the environment because all known groundwater and soil exposure pathways have been restricted through institutional controls or other means. However, in order for the remedy to be protective in the long-term, the following actions need to be taken: 1) the (b) (6) well and property needs to be evaluated for institutional controls; 2) Monsanto needs to submit a plan for upgrading their wind dispersal program and for evaluating in the short term those localized areas where increased ^{226}Ra soil concentrations have been observed; and, 3) the U.S. Environmental Protection Agency (EPA) needs to reevaluate during the next five-year review whether the monitored natural attenuation remedy underneath the operating area is proceeding as intended in the decision documents.

XI. Next Review

The next five-year review for the Monsanto site is required by September 2008, five years from the date of this review.