# RECORD OF DECISION AMENDMENT
# for the
# SOLA OPTICAL USA, INC. SUPERFUND SITE
PETALUMA, CALIFORNIA

U.S. Environmental Protection Agency
Region IX
San Francisco, California
March 2007

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# ACRONYMS

| | |
|---|---|
| ARARs | Applicable or Relevant and Appropriate Requirements |
| CERCLA | Comprehensive Environmental Response, Compensation and Liability Act |
| DTSC | California Department of Toxic Substances Control |
| EPA | United States Environmental Protection Agency |
| GAC | Granular Activated Carbon |
| ICs | Institutional Controls |
| MCLs | Maximum Contaminant Levels |
| MNA | Monitored Natural Attenuation |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| NPDES | National Pollution Discharge Elimination System |
| ppb | Parts Per Billion |
| PRMD | Sonoma County Permit and Resource Management Department |
| RCRA | Resource Conservation and Recovery Act |
| Regional Board | San Francisco Bay Regional Water Quality Control Board |
| ROD | Record of Decision for Sola Optical USA, Inc. Superfund Site (1991) |
| ROD Amendment | Record of Decision Amendment |
| Sola site or Site | Sola Optical USA, Inc. Superfund Site |
| TI | Technical Impracticability |
| VOC | Volatile Organic Compound |

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# PART 1: THE DECLARATION

## I. Site Name and Location

Sola Optical USA, Inc. Superfund Site
Petaluma, Sonoma County, California
EPA ID. No. CAD981171523

## II. Statement of Basis and Purpose

This decision document presents the amended remedial action for the Sola Optical USA, Inc. Superfund Site (Sola site or Site) in Petaluma, Sonoma County, California. The United States Environmental Protection Agency (EPA) has chosen this action in accordance with Section 117 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. § 9617, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR § 300.435(c)(2)(ii). This decision is based on EPA's Administrative Record file.

The lead agency for the remedial effort at this Site is the EPA and the state support agency is the San Francisco Bay Regional Water Quality Control Board (Regional Board). The Regional Board has informed EPA that it considers the Site to be a low risk and does not plan to have any further involvement with overseeing remediation.

## III. Assessment of Site

The response action selected in the 1991 Record of Decision (ROD), as modified by this Record of Decision Amendment (ROD Amendment), is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, and/or contaminants from this Site which may present an imminent and substantial endangerment to public health or welfare.

## IV. Description of Selected Remedy

This ROD Amendment modifies the previously selected remedy for the Sola site. A remedial action was selected for the Sola site in 1991. The original remedial action was groundwater extraction and treatment. The amended remedial action is Monitored Natural Attenuation (MNA) and institutional controls, with monitoring of both. The goal for MNA is aquifer restoration. The institutional control will take two forms: a restrictive covenant and County well permitting restrictions. The restrictive covenant will prevent inappropriate uses of the groundwater that could result in unsafe exposures to humans. Sonoma County's well permitting authority will also function as an institutional control and contribute to the overall protection of human health and the environment at the Sola site.

Sola operated the groundwater extraction and treatment system for approximately ten years, after which it ceased active operations and monitored the aquifer's response. The response demonstrated that natural attenuation was reducing contaminant concentrations

at rates sufficient to achieve the cleanup standards within a reasonable timeframe. Sola dismantled the groundwater extraction and treatment system in 2002.

## V. Statutory Determinations

The amended remedy satisfies the requirements of CERCLA Section 121 and the NCP. Specifically, the remedy is protective of human health and the environment, complies with all Federal and State requirements that are applicable or relevant and appropriate, is cost-effective, and utilizes permanent solutions to the maximum extent possible.

The amended remedy does not include active treatment as a principal element and therefore does not satisfy the statutory preference for treatment as a principal element of the remedy. However, MNA will achieve the groundwater cleanup levels in a reasonable timeframe (less than 10 years) and in a cost-effective manner and follows several years of extraction and treatment.

If the cleanup takes more than five years from the previous five-year review (completed in 2005) to achieve cleanup standards, a subsequent five-year review will be conducted to ensure that the amended remedy is, or will be, protective of human health and the environment.

## VI. Authorizing Signature

Elizabeth J Adams

Elizabeth J. Adams, Chief
Site Cleanup Branch

March 30, 2007

Date

# PART 2: THE DECISION SUMMARY

## I. Introduction to the Site and Statement of Purpose

The Sola Optical USA, Inc. Superfund Site is in Petaluma, California, at 1500 Cader Lane, just west of the intersection of Lakeville Highway and Interstate 101. From 1978 through 2001, Sola manufactured eyeglass lenses at the Site. When operations first began, Sola stored various manufacturing-related solvents in underground storage tanks at the Site. After discovering contamination in the groundwater near those tanks, Sola removed the tanks and has been responsible for cleaning up the remaining volatile organic compound (VOC) contamination ever since. The Sola site was listed on the National Priorities List of Superfund sites in February 1990.

The groundwater aquifer at the Site is the source of drinking water for the City of Petaluma. One of the City's groundwater extraction wells was located near the Sola site, but it was not impacted by the Site contamination. However, the well was shut down to avoid interference with the groundwater clean-up.

In 1991, EPA decided that Sola's groundwater treatment system should be expanded. Sola complied and operated the expanded system for another six years. Eventually, however, the system became decreasingly effective, and Sola stopped operating it in 1997. Since then, the levels of contamination in the groundwater have continued to decline, and contamination above the MCL remains in only one monitoring well. EPA is now adopting a different approach to address the clean-up of that small area.

EPA selected a remedy in a ROD dated September 27, 1991. The original ROD and this ROD Amendment were selected in accordance with Section 117 of CERCLA, 42 U.S.C. § 117, and 40 C.F.R. § 300.435(c)(2)(ii) of the NCP. EPA is the lead agency responsible for directing the CERCLA remediation process; the Regional Board is the support agency. The Regional Board has indicated to EPA that it considers the Site a low risk and does not intend to provide additional input on Site work.

Eventually, it became clear that the original remedy, a groundwater extraction and treatment system, would not achieve the cleanup standard of 5 parts per billion (ppb) for 1,1-DCA. Sola's system initially reduced contaminant concentrations, but by the mid-1990s those reductions reached an asymptote where concentrations were essentially staying at the same, elevated levels, despite continued operation of the system. Some parts of the contaminated aquifer had achieved the cleanup standard by this time, but others had not. At that point, Sola stopped operating the remedial system and instead focused on monitoring the aquifer and its contaminant characteristics. Subsequent analysis of the monitoring data established the reliability and effectiveness of natural attenuation processes in remediating the small portion of groundwater that was still slightly contaminated above the clean-up standard.

In addition to revising the groundwater remediation approach, this ROD Amendment documents EPA's selection of a restrictive covenant as a necessary and appropriate institutional control at the Site. The five-year review conducted in 2005 identified that no institutional control was in place (or had been selected in the original ROD) to prevent inappropriate uses of the groundwater and subsequent exposure to humans during the

clean-up period. EPA concluded that it would need to select institutional controls in a decision document and to ensure their implementation, in order to guarantee protectiveness until the clean-up goals are attained.

The decisions documented in this ROD Amendment are based on the Administrative Record file and will become part of the Administrative Record file in accordance with 40 C.F.R. § 300.825(a)(2) of the NCP.

A copy of the Administrative Record is available for review at the following locations:

Petaluma Public Library
100 Fairgrounds Drive
Petaluma CA 94952
(707) 763-9801
Hours:
10a-9p Tues & Wed
10a-6p Mon, Thu, Fri, Sat

EPA Superfund Records Center
95 Hawthorne St., 4th Fl.
San Francisco, CA 94105
(415) 536-2000.
Hours: 8a-5p Mon - Fri

## II. Site History, Contamination, and Original Selected Remedy

### Site History and Contamination

Sola established a manufacturing facility at 1500 Cader Lane, Petaluma, California, just west of the intersection of Lakeville Highway and Interstate 101. They manufactured eyeglass lenses at the Site from 1978 to 2001. The facility had one manufacturing building and an adjoining administration office building. When Sola began operations, it had six 1,000-gallon underground storage tanks behind the north corner of the manufacturing building. The tanks were used to store solvents such as 1,1,1-trichloroethane (1,1,1-TCA), acetone and methanol.

In 1982, Sola found low concentrations of VOC contamination in the groundwater beneath its property near the six storage tanks. The groundwater aquifer was and still is the City of Petaluma's drinking water source. Although one of the City's groundwater extraction wells was near the Sola Site, it was not impacted by the contamination.

In 1983, the Regional Board directed Sola to investigate the groundwater contamination at the Site. Sola identified the following chemicals in the groundwater: 1,1–dichloroethane (1,1–DCA), 1,1–dichloroethene (1,1–DCE), methylene chloride, and 1,1,1–TCA. These chemicals appeared to have originated from the gravel surrounding the tank and adjacent soils. In 1985, Sola removed the six storage tanks as well as the surrounding gravel and several feet of soil from the sides and bottom of the excavation.

Further investigation by Sola revealed the extent of the groundwater contamination. In 1987, the Regional Board ordered Sola to construct and operate a groundwater extraction and treatment system. The treated groundwater was discharged into Adobe Creek, just northwest of the Site, under a permit from the Regional Board. The extraction and treatment system began operating in 1988. Sola also arranged to have the City of Petaluma shut down the nearby municipal water supply well, to avoid interference with the groundwater clean-up efforts and prevent potential use of Site-impacted groundwater. Pumping the municipal well could have gradually drawn the contaminated groundwater cross-gradient towards it, spreading the contamination.

In 1989, EPA became the lead regulatory agency for remedial activities at the Site. On February 21, 1990, EPA added the Site to the National Priorities List of Superfund sites. Soon thereafter, EPA issued an administrative order directing Sola to conduct further environmental sampling and to prepare a remedial investigation report and a feasibility study of clean-up options, both of which Sola completed in 1991. That year, EPA also prepared an assessment of risks posed by the Site (described below).

### Human Health Risks

In 1991, EPA prepared a risk assessment to evaluate the human health and environmental risks posed by contamination at the Site. A risk assessment begins by identifying the chemical contaminants of concern. The assessment then evaluates pathways through which the chemicals can travel to reach human or ecological receptors. The human health evaluation then estimates the duration of possible chemical exposure to humans. (The ecological assessment is further described in the subsequent section entitled "Ecological Risk Evaluation"). All of this information is used to calculate a human health risk. This risk is presented in two parts: the carcinogenic effects (cancer-causing effects), and the

non-carcinogenic effects (all other health effects). The carcinogenic effect is expressed in terms of an additional chance of contracting cancer, above the normal rate, as a result of the chemical exposure. The non-carcinogenic effect is shown as a hazard quotient; values greater than 1 indicate that an effect on human health will occur (such as impacts to central nervous system or specific organs), and less than 1 indicates that no effect will occur.

The 1991 risk assessment identified 12 volatile organic compounds (VOCs) as chemicals of concern: acetone, butanone, 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, freon 113, 4-methyl-2-pentanone, tetrachloroethene, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, and trichloroethene. VOCs are extremely volatile, meaning they vaporize easily and thus constantly move from one medium to another, for example from soil to water or air. The risk assessment established that the main exposure pathway for humans was through their homes. This potential exposure was based on a hypothetical future residential use. However, the Site was and still is used for light industrial/commercial purposes. Residential uses are not planned for the Site. The existing groundwater plume does not extend below any residences, and no drinking water wells operate near the plume. The Site and the surrounding properties receive water from the City of Petaluma's municipal water supply, which is not impacted by the Site. If residents were to use the contaminated groundwater for drinking or washing they could ingest the contaminants or absorb them through their skin. Water from a faucet or showerhead could release contaminants that residents could inhale. The chemicals could also move into indoor air from the groundwater and soil beneath homes via "vapor intrusion."

The risk assessment calculated that a person living in a house directly above the contamination who was exposed to the vapor intrusion all of his/her life would have an excess cancer risk of 9 in 1,000,000 ($9x10^{-6}$). The national average rate of cancer from all causes is 1 in 4. The calculated "excess" cancer risk means that if a million people were exposed to this amount of contamination for their lifetimes, there might be nine additional cases of cancer. The assessment concluded that there would not be any non-carcinogenic health effects.

The risk assessment also calculated that a person who used the contaminated groundwater for residential water supply all of his/her life would have an additional 1 in 10,000 ($1x10^{-4}$) risk of contracting cancer. The risk assessment concluded that there would not be any non-carcinogenic health effects.

**Subsequent Risk Evaluation**

Additional risk evaluations were conducted in 2005 as part of the five-year review. EPA performed a screening level evaluation of the potential for remaining levels of contaminants to cause negative health effects either by entering commercial buildings via vapor intrusion or through human ingestion of home-grown produce.

To evaluate the potential risk of vapor intrusion, EPA compared the current groundwater contaminant concentrations to its published "Target Groundwater Concentrations"[1] and

[1] *"Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils,"* EPA OSWER, November 2002, Doc No. EPA530-D-02-004.

the Regional Board's published "Groundwater Screening Levels for Evaluation of Potential Vapor Intrusion Concerns."[2] All current contaminant concentrations in the groundwater were found to be well below both the vapor intrusion target and screening levels. On this basis, EPA determined that vapor intrusion does not pose a human health risk at this Site.

To evaluate the potential effects on gardens and homegrown fruits and vegetables, EPA examined other existing studies on the subject. Research demonstrates that volatile chemicals do not build up in the plant tissues even if contaminated groundwater beneath a garden manages to reach the plants and the chemicals are absorbed by the plants. When volatile chemicals move into plant leaves, they are released through the tiny openings in the plant leaves where gas exchange occurs and therefore do not accumulate. Studies have also shown that volatile chemicals taken up through plant roots tend to concentrate in the cells near the surface of the roots. For root vegetables such as beets, carrots and potatoes, these cells are typically lost during washing and peeling of the produce. Plants are also able to break down or degrade volatile chemicals. Thus, any such chemicals taken up by the plants may be present temporarily in the roots and stems of the plant but are much less likely to be present in the leaves or other above-ground parts of the plant. In summary, existing studies indicated that uptake and accumulation of volatile chemicals in plants, and subsequent exposure from human consumption, would be minimal.

**Ecological Risk**

As part of the 1991 risk assessment, EPA also prepared an ecological risk assessment to evaluate possible impacts to the environment. The ecological assessment focused on possible impacts on nearby Adobe Creek. This creek is the closest surface water body to the Site. At the time of the assessment, a local environmental group had launched a project to reintroduce anadromous steelhead trout to the creek.

EPA examined data from groundwater monitoring wells between the Sola facility and Adobe Creek. Based on this data, EPA determined that no contaminants were moving towards or had reached the creek. The assessment did determine that if the groundwater extraction system were *not* operating, contaminated groundwater from the Sola facility could flow in the direction of Adobe Creek. However, the contaminant concentrations in the groundwater beneath the Sola facility were below federal surface water quality criteria for the protection of aquatic life at the time the treatment system was shut off.

Today, the Site environmental setting is not much different than it was in 1991. The one area in the aquifer that has not yet attained the groundwater clean-up standard is located on a parcel adjacent to the original facility property. This parcel is currently an open field in the process of being developed for light industrial/commercial use. Approximately one-third of that property has been recently graded. The field has not otherwise changed since the time of the original risk assessment. No new ecological receptors were found at the Site.

[2] *"Screening For Environmental Concerns at Sites With Contaminated Soil and Groundwater,"* Regional Board, February 2005.

**Original Selected Remedy**

Based on the remedial investigation report, feasibility study, and risk assessment, EPA issued the original ROD on September 27, 1991. The ROD determined that an expanded groundwater extraction and treatment system was the most appropriate method for remediating contamination at the Site. The ROD specified the following:

*This remedy addresses groundwater at the site and consists of:*

- *groundwater monitoring to assure capture of contaminated groundwater and to demonstrate restoration of groundwater to cleanup standards throughout the aquifer,*
- *operation of existing extraction wells (8),*
- *construction and operation of two (2) additional shallow extraction wells,*
- *conversion of monitoring wells lf-13 and lf-17 to deep extraction wells,*
- *construction and operation of additional piping for the new and converted wells,*
- *on-site treatment and discharge off-site or discharge to the City of Petaluma sewage treatment system.*

*The intent of this remedy is to restore groundwater to its beneficial use, which for this site is drinking water. Based on information obtained during the remedial investigation and on a careful analysis of all remedial alternatives, EPA and the State of California believe that the selected remedy will achieve this objective.*

*The selected remedy includes groundwater extraction for an estimated period of 15 to 20 years. This groundwater extraction system will operate until the cleanup standards are achieved and continuously maintained throughout the aquifer. The cleanup standards are state or federally promulgated drinking water standards. Until these standards are achieved and continuously maintained, EPA will periodically re-evaluate the remedy every five years with the first evaluation in October 1993. At these evaluations, if available EPA methodology is more accurate, the risks of soil/groundwater gases migrating through the soil into potential residences on the site will be re-evaluated.*

*It may become apparent, during implementation or operation of the groundwater extraction system, that contaminant levels have ceased to decline and are remaining constant at levels higher than the cleanup standards. Based on the performance data, operation of the extraction system will be adjusted as warranted if so determined during the periodic EPA evaluations. For example, it may be appropriate to discontinue operation of extraction wells in areas where cleanup goals have been attained, alternate pumping at wells to eliminate stagnation points, and pulse pump to allow aquifer equilibration and encourage adsorbed contaminants to partition into groundwater for extraction.*

## III. Basis for the Document

This section describes the information regarding two issues that prompted and now support the fundamental remedy change described in this ROD Amendment: (1) groundwater clean-up, and (2) institutional controls.

**Groundwater Clean-up**

Sola began operating the groundwater extraction and treatment system in 1987, as required by the Regional Board. Sola expanded the system in 1992 pursuant to EPA's ROD, and continued operations. The system was expected to restore the shallow groundwater to clean-up standards within 15-20 years. Initially, concentrations of the VOC contamination at the Site decreased significantly. By 1997, however, the rate of contaminant reduction slowed to almost zero. Groundwater monitoring data at four wells showed that concentrations of two contaminants, 1,1-DCE and 1,1,-DCA, appeared to have stabilized and reached an asymptote at levels above the clean-up standards. Continued monitoring reflected no further reductions in contaminant concentrations. Some parts of the contaminated aquifer had achieved the clean-up standard of 5 ppb (for 1,1-DCA) by this time, but some parts had not. The extraction and treatment system was no longer effectively removing these lower concentrations of contaminants from the groundwater.

In 1997, Sola requested approval from EPA to shut off the extraction and treatment system and issue a technical impracticability (TI) waiver, arguing that the clean-up goals for these two contaminants could not be achieved using extraction and treatment. EPA requested instead that Sola examine MNA as a potential remedy for the Site. Sola ceased operating the groundwater extraction and treatment system and monitored the aquifer's response.[3]

The concentrations of the two remaining contaminants slowly declined. In 2001, Sola analyzed the data gathered since system shut-down in 1997 and presented its evaluation of MNA, following EPA guidance.[4] Sola concluded that extraction and treatment alone would not be capable of achieving the clean-up standard for the remaining aquifer contaminant. Sola's evaluation concluded that MNA would likely be an effective remedy for attaining the clean-up standard. The extraction and treatment system was decommissioned in 2002.[5]

Since 2002, monitoring has shown that concentrations of the two contaminants have continued to decline. Concentrations of 1,1-DCE dropped below the clean-up standard of 6 ppb in all wells in 2004 and has consistently remained below the standard since.[6] Concentrations of 1,1-DCA declined as well. The contaminant is now detectable at only one single on-site well, W-27, where its level has dropped to 12 ppb (as of December 2006), slightly above the clean-up standard of 5 ppb. All other on-site wells show 1,1-

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[3] Letter to Claire McCarthy, Sola Optical, from Holly Hadlock, EPA, January 10, 1997.

[4] *"Evaluation of Monitored Natural Attenuation as a Remedy to Meet Remedial Action Objectives, Sola Optical USA, Inc., Site, Petaluma California,"* LFR Levine Fricke, April 4, 2001.

[5] Letter to Roman Starno, Sola Optical USA, Inc., from Holly Hadlock, EPA, November 5, 2001.

[6] *"Second Five-Year Review Report for the Sola Optical USA Inc. Superfund Site,"* EPA, September 2005.

DCA concentrations below the clean-up standard. The higher level of contamination in W-27 is likely due to the well's location: W-27 is directly downgradient from the location of the original contaminant release, and the last of the contaminants have slowly been released from the soils and flowed down to W-27.

As a result of the findings of the groundwater monitoring and evaluation, EPA is amending the ROD to select MNA as the remedy for accomplishing the groundwater clean-up standards.

**Institutional Controls**

The second issue addressed by this ROD Amendment is the need for institutional controls. Institutional controls (ICs) are non-engineering, legal measures that help prevent or limit the potential for exposure to hazardous substances by restricting land or water use. One common institutional control is a restrictive covenant which is an agreement, recorded with the county recorder's office, whereby a land owner agrees to restrict the use of his or her property.

EPA first identified the need for institutional controls in its 1991 health risk assessment.[7] The assessment recommended that institutional controls be implemented at the Site to prevent any use of the contaminated groundwater for drinking water supplies before drinking water standards are achieved. The remedy selected in the 1991 ROD, however, did not include institutional controls.

The second Site five-year review, conducted in 2005, again raised the need for institutional controls at the Site. The review found that no controls were in place (or had been selected in the original ROD) that would prevent inappropriate uses of the groundwater, creating a risk of unsafe exposures to humans during the clean-up period. Therefore, the five-year review recommended that institutional controls be selected in a decision document and implemented to guarantee protectiveness during the interim clean-up period until the clean-up standards are attained.[8]

In response to this recommendation, EPA has identified an appropriate institutional control mechanism, a restrictive covenant, to be included in this ROD Amendment and discussed in more detail below.

[7] *"Public Health Risk Assessment, Sola Optical USA, Inc. Site,"* CH2M Hill, April 1991.

[8] *"Second Five-Year Review Report for the Sola Optical USA Inc. Superfund Site,"* EPA, September 2005.

# IV. Description of Current Alternatives

## Original Selected Remedy

The 1991 ROD selected a treatment remedy to restore contaminated groundwater to its beneficial use (drinking water). The original remedy did not include any containment components or institutional controls.

The selected remedy required groundwater extraction and treatment system until the clean-up standards were achieved and continuously maintained throughout the affected portions of the aquifer. Depending on the particular contaminant, the standards were set at either the state or federally promulgated drinking water standards (5 ppb for 1,1-DCA). The ROD estimated that the remedy would need to operate for 15 to 20 years to attain the clean-up standards.

The major Applicable or Relevant and Appropriate Requirements (ARARs) associated with the original remedy consisted of federal and State of California laws and regulations establishing drinking water standards and requirements for solid and hazardous waste handling and disposal, hazardous waste control laws, as well as municipal or county hazardous material ordinances. These requirements are described below.

EPA determined that both the federal and State of California drinking water standards, whichever was most stringent for each chemical of concern, were ARARs for the Site groundwater. See the following table for details.

| | 1990 Maximum Concentration (ppb) | | Drinking Water Standards (ppb) | | Cleanup Standards (ppb) |
|---|---|---|---|---|---|
| chemical | Shallow | Deep | State | Federal | |
| 1,1-DCE | 1,400 | 22 | 6 | 7 | 6 |
| 1,1-DCA | 280 | 1 | 5 | -- | 5 |
| 1,1,1-TCA | 220 | 10 | 200 | 200 | 200 |
| Freon 113 | 9 | 2 | 1,200 | -- | 1,200 |

The groundwater extraction and treatment system used granular activated carbon (GAC) adsorption for VOC removal. GAC use triggers requirements for the regeneration or disposal of the spent GAC. If the spent GAC were a "listed" or "characteristic" waste, it would be regulated as a hazardous waste under the federal Resource Conservation and Recovery Act (RCRA) and California's hazardous waste control laws.[9] On-site storage of contaminated GAC may also trigger substantive requirements under state laws[10] and municipal or county hazardous material ordinances, including construction and monitoring requirements for storage facilities.

## New Remedy

The new remedy utilizes the following:

- Monitored Natural Attenuation to achieve groundwater clean-up standards;

[9] California Health & Safety Code §§25100, *et seq.*; California Code of Regulations, tit 22, §§67520-67525.
[10] California Code of Regulations, tit 22 §§67180-67194 and §§67240-67248.

- Institutional Controls to protect against inappropriate use of the contaminated groundwater until the clean-up standards are achieved; and
- Monitoring of both of the remedy components until clean-up standards are achieved and sustained.

The term "Monitored Natural Attenuation," as used by EPA in Directive Number 9200.4-17P, refers to the reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific objectives within a time frame that is reasonable compared to that offered by other more active methods. The natural attenuation processes that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater.[11] The following natural attenuation mechanisms may be active at the Site: dilution, dispersion, diffusion, volatilization, sorption, biodegradation, and abiotic degradation. All of these processes result in a decrease in the dissolved-phase concentration of the contaminant. However, only biodegradation and abiotic destruction result in destruction of the contaminant.

MNA will be utilized until the clean-up standards are achieved and continuously maintained throughout the aquifer. The standards are the state or federally promulgated drinking water standard, whichever is more stringent, in this case the state standard. This remedy will achieve the clean-up standard within an estimated one to three years. The MNA must be monitored, pursuant to an EPA-approved monitoring plan, and the data and analysis reported to EPA.

The second component of the remedy is the implementation of institutional controls. As noted above, ICs are non-engineering, legal measures that limit the potential for exposure to hazardous substances by restricting land or water use. These controls can consist of governmental controls, proprietary controls, enforcement tools, or informational controls.

Governmental controls are usually implemented and enforced by a state or local government and are used to restrict property or resource use; examples include zoning, well drilling or water usage restrictions, licensing, and permitting. Proprietary controls are legal instruments placed in the chain of title to real property that convey a property interest for purposes of imposing restrictions on land or water use. A common proprietary control in California is a restrictive covenant which is an agreement, recorded with the county recorder's office, whereby a land owner agrees to restrict the use of his or her property. The State of California has promulgated a specific statute authorizing and establishing requirements for such covenants (discussed further in ARARs discussion below).

Enforcement tools for IC components include enforceable orders and consent decrees, which EPA can use to compel a party to limit certain site activities and to ensure the performance of affirmative obligations. Informational controls provide potential users of

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

land or water information about the presence of hazardous substances and often warn against taking specific actions, but these controls (including State registries, deed notices, and advisories) are not enforceable.

The primary institutional control for this Site will be a restrictive covenant. A restrictive covenant, also known as a deed restriction, is a type of proprietary control that is signed by the property owner and, typically, the State of California, and that includes EPA as a third-party beneficiary with rights to enforce. The restrictive covenant at the Sola site will restrict the use of groundwater contaminated above the clean-up level. The objective of the restriction is to prevent uses of the groundwater that could result in unacceptable exposure of humans or the environment to contaminants. The restrictive covenant must remain in place until the groundwater clean-up standard is met and maintained for at least two years throughout the Site.

The local well permitting process provides an additional layer of institutional control that will help prevent human exposure to contaminated groundwater at the Sola site. The Sonoma County Permit and Resource Management Department (PRMD) is responsible for issuing all well installation permits in the county. PRMD has a system called Permit Plus that is used to maintain information about properties. At EPA's request, PRMD placed a note in the Permit Plus system regarding the Site parcel that lies directly above the contaminated groundwater. The note states that the parcel is part of a Superfund site and that well permits should not be issued before consulting with PRMD and U.S. EPA. According to PRMD, if anyone requests a permit for the Sola site parcel, PRMD will see that notation.

The institutional controls must also be monitored, pursuant to an EPA-approved monitoring plan, and the results reported to EPA.

The primary ARARs associated with the new remedy consist of federal[12] and State of California[13] drinking water standards and the state regulations regarding environmental restrictive covenants.[14] The federal and State of California drinking water standards were described in the "Original Selected Remedy" section above. Their application to the new remedy is the same as for the original remedy. The state regulations regarding environmental restrictions are California Civil Code Section 1471(a) and Title 22 of the California Code of Regulations, Section 67391.1(a)(1), (a)(2), and (d). Section 1471 specifies how environmental covenants are to be recorded and made applicable to successors. The substantive provision of Section 1471 – subpart (a) – is an ARAR for this ROD Amendment because compliance with this section is necessary for the restrictions to run with the land. The substantive provisions of Section 67391.1 – (a)(1), (a)(2), and (d) – are also ARARs for this ROD Amendment. These regulations include requirements for imposing covenant restrictions and for properly recording the covenant.

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[12] Safe Drinking Water Act (SDWA), Section 1412, 42 USC §300g-1; National Primary Drinking Water Regulations, 40 CFR Part 141.

[13] California Safe Drinking Water Act, California Health & Safety Code §§116270-116751; California Domestic Water Quality Monitoring Regulations, California Code of Regulations, tit. 22, div. 4, ch. 15.

[14] California Civil Code section §1471(a); and California Code of Regulations, tit 22, §67391.1 (a)(1), (a)(2), and (d).

**Remedial Action Objectives**

The ROD Amendment will not affect the Remedial Action Objectives stated in the original ROD. Those objectives are to restore groundwater to its beneficial use, which is drinking water. For the remaining contaminant of concern, 1,1-DCA, the cleanup standard is the state promulgated drinking water standard of 5 ppb.

**Expected Outcomes**

The expected outcome of this ROD Amendment is the same as the expected outcome of the 1991 ROD: the contaminated groundwater will be restored to its beneficial use as municipal supply. This ROD Amendment contemplates no changes to land use or cleanup levels.

## V. Evaluation of Alternatives

The purpose of this evaluation is to compare the three remedial action alternatives identified using the "nine criteria" established in the National Contingency Plan, 40 CFR § 300.430(e)(9). The resulting strengths and weaknesses of the alternatives are then weighed to identify the alternative providing the best balance among the nine criteria.

The criteria are:

(1) overall protection of human health and the environment;

(2) compliance with applicable or relevant and appropriate requirements (ARARs);

(3) reduction of toxicity, mobility, or volume through treatment;

(4) long-term effectiveness and permanence;

(5) short-term effectiveness;

(6) implementability;

(7) cost;

(8) state acceptance; and

(9) community acceptance.

**RA#1: No Action**

RA#1 is the "No Action" alternative, required by the NCP. This evaluation establishes a baseline against which to compare the other alternatives. The No Action alternative consists of no further action to clean up contaminated groundwater at this Site. The existing contamination would remain in the groundwater at its current concentrations, until it naturally degrades over time. Currently, one chemical of concern, 1,1-dichloroethene (1,1-DCA) exists in the groundwater at concentrations exceeding its 5 ppb clean-up goal. No groundwater monitoring or institutional controls would be implemented.

**RA#2: Extraction and Treatment, Institutional Controls**

RA#2 consists of groundwater extraction, treatment, and off-site disposal of treated effluent, and institutional controls. This alternative resembles the remedial action selected in the 1991 ROD, with the addition of institutional controls. The 1991 ROD selected groundwater extraction, on-site treatment with GAC adsorption, and off-site discharge to nearby Adobe Creek under a National Pollution Discharge Elimination System (NPDES) permit. The extraction system previously consisted of eleven extraction wells in the shallow aquifer, and two extraction wells in the deep aquifer. Sola dismantled the system in 1998, so this alternative would involve rebuilding the treatment unit and associated conveyance system. The system could possibly utilize the existing monitoring wells for extraction.

RA#2 would include institutional controls, in the form of a restrictive covenant with the property owner, to restrict use of the contaminated groundwater that could result in unacceptable exposure of humans or the environment to the contamination.

RA#2 would take an estimated 18 months to design and construct, and would take an estimated 1 to 3 years to attain the clean-up goal. The present worth cost would be approximately $572,000.

**RA#3: Monitored Natural Attenuation, Institutional Controls**

RA#3 is the new proposed alternative that consists of MNA and institutional controls. MNA relies on natural attenuation processes to achieve clean-up standards. With MNA, Sola and EPA would closely monitor the groundwater for key parameters to track how the contamination is changing over time. This alternative would rely on existing groundwater monitoring wells, so it would take no additional time to construct. It is estimated that this alternative will achieve the clean-up standards within 1 to 3 years. The institutional controls for this alternative would be the same as RA#1. The first control consists of a restrictive covenant with the property owner to restrict groundwater uses that could result in unacceptable exposure to humans or the environment. The second control consists of the County's well permitting controls. The present worth cost of this alternative is approximately $149,000.

**CRITERIA 1: Overall Protection of Human Health and the Environment**

Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

The no-action alternative (RA#1) would not provide adequate protection of human health. (As documented in the 1991 ROD, EPA determined that the Site contamination did not pose a risk to the natural environment). It is expected that RA#1 would achieve the clean-up standard over time because natural attenuation processes will be occurring without any human intervention. However, we would not know when the clean-up goal was achieved because we would not be monitoring the groundwater. The no-action alternative will not protect human health during the interim period between now and when the clean-up standard is reached. No enforceable institutional control currently prevents use of the water that would expose humans to unsafe contaminant concentrations. The local county health department is responsible for approving well permit applications, and its files do indicate the existence of on-site contamination. The department has informed EPA that it would not issue any well permits on the property without consultation, but no written agreement or other instrument requires county compliance. If the county permits a well to be drilled into the contamination, or if an existing well were to be used for a residential water supply, such activity might result in human exposure in excess of acceptable risk levels. Therefore, this alternative does not provide adequate protection of human health.

Remedial alternatives #2 and #3 are both protective of human health. RA#2 includes groundwater extraction and treatment with institutional controls, and RA#3 includes monitored natural attenuation with institutional controls. Both alternatives require recordation of a restrictive covenant, which is an institutional control that EPA is able to enforce, that prohibits use of the contaminated groundwater until the clean-up standard is achieved. RA#2 employs groundwater extraction and treatment to achieve the clean-up standard. RA#3 employs natural attenuation mechanisms and close monitoring of the

groundwater during this clean-up timeframe. Thus, both alternatives will protect human health currently and in the future.

**CRITERIA 2: Compliance with ARARs**

"Compliance with ARARs" addresses whether an alternative meets applicable or relevant and appropriate requirements (ARARs), legal standards, limitations, or criteria. ARARs must be promulgated under federal or state law to address a contaminant, remedial action, location or other circumstance present at a site. To be selected as ARARs, state promulgated laws must be more stringent than federal ARARs and have been identified to EPA by the state in a timely manner and applied consistently by state agencies.

The chemical-specific ARARs for the Sola site are federal[15] and State of California[16] drinking water standards, according to the 1991 ROD. EPA deemed both to be "relevant and appropriate" to Site conditions. The appropriate remedial standard for the remaining contaminated groundwater is the State MCL for 1,1-DCA.

For RA#1, the no-action alternative, it is expected that natural attenuation will be occurring; however, for the groundwater to be utilized as a drinking water source, the California Safe Drinking Water Act requires monitoring, which is not being conducted in this alternative. Therefore, RA#1 does not fully comply with this ARAR.

RA#2 and RA#3 do comply with this ARAR since both will attain the clean-up standard specified by law and both would meet the ARAR monitoring requirements.

RA#2, the extraction and treatment remedy, would implicate action-specific ARARs and other "to be considered" standards pertinent to the use of GAC adsorption in a treatment system. The remedy would need to meet these additional requirements if the spent GAC is a listed or characteristic waste. These requirements include the Solid Waste Disposal Act[17] and California's hazardous waste control laws[18] associated with regeneration or disposal of the spent GAC. RA#2 can meet these requirements.

**CRITERIA 3: Long-Term Effectiveness and Permanence**

"Long-term effectiveness and permanence" refers to the ability of a remedy to reliably protect of human health and the environment over time. This criterion includes the consideration of residual risk and the adequacy and reliability of controls.

All three alternatives would achieve permanent long-term protection, as they would attain the clean-up standard in the groundwater. As discussed earlier, even RA#1, the no-action alternative, would attain the clean-up standard through natural attenuation mechanisms.

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[15] Safe Drinking Water Act (SDWA), Section 1412, 42 USC §300g-1: National Primary Drinking Water Regulations 40 CFR Part 141.

[16] California Safe Drinking Water Act, California Health & Safety Code §§116270-116751; California Domestic Water Quality Monitoring Regulations, California Code of Regulations, tit. 22, div. 4, ch. 15.

[17] As amended by the Resource Conservation and Recovery Act, 42 USC §§6901, *et seq*.

[18] California Code of Regulations, tit. 22, §§67520-67525.

**CRITERIA 4: Reduction of Toxicity, Mobility, or Volume through Treatment**

"Reduction of toxicity, mobility, or volume through treatment" refers to the degree to which a remedy uses treatment to clean-up the contaminated media. This contrasts with remedies that reduce risk through removing an exposure pathway, such as containment.

Only RA#2 involves treatment. RA#2's groundwater extraction and treatment system would physically remove contaminated groundwater and treat it with a carbon adsorption filter to reduce the volume of contaminated media. In contrast, RA#1 and RA#3 both rely on natural attenuation mechanisms to reduce contaminants via intrinsic processes in the groundwater. As described above, Sola operated an extraction and treatment system for a decade. Based on data gathered both at the time and subsequent to the system's shut-down, Sola has demonstrated that active treatment of the groundwater was not effectively reducing the remaining contamination and that natural attenuation was more effective.

**CRITERIA 5: Short-Term Effectiveness**

"Short-term effectiveness" refers to the degree to which an alternative avoids adverse impacts to human health and the environment posed during construction and implementation. This covers the period of time until the clean-up standards are achieved.

RA#1, the no-action alternative, poses a short-term risk of exposure to contaminated groundwater because this remedy does not include an institutional control to restrict groundwater use. There currently are no water supply wells within the contaminant plume, so no one is being exposed to the contaminated groundwater. In addition, the county health department that issues well permits is aware of the contamination and has indicated it would not allow wells therein. However, we have no binding agreement or other instrument that would dictate how the County is to implement well installation restrictions, and of course there remains the possibility that a landowner could install a well without seeking a permit from the county. Therefore, this remedy is considered somewhat problematic with respect to short-term effectiveness.

RA#2 and RA#3 would not pose short-term risks to human health because both remedies include institutional controls that are enforceable by EPA. The institutional controls would take the form of restrictive covenants with the property owner, restricting use of the contaminated groundwater until cleanup is achieved.

**CRITERIA 6: Implementability**

"Implementability" refers to the technical and administrative feasibility of implementing a remedy, including the availability of materials and services needed.

All three of the alternatives are implementable. RA#1 and RA#3 do not involve any further physical construction. The only physical activity that RA#3 involves is monitoring groundwater conditions, which is a standard and uncomplicated procedure. RA#2 requires physical construction of a pump, piping, and carbon treatment system; such construction involves well known methods and commonly available materials. RA#2 and RA#3 would involve administrative procedures to implement the restrictive covenant. The administrative procedure typically consists of EPA working with a State environmental agency (either the Regional Board or the Department of Toxic Substances Control (DTSC)) and the land owner to obtain agreement on a restrictive covenant. The

covenant would restrict use of the contaminated groundwater, and would require annual oversight payments to the State agency by the responsible party. This activity is implementable, but it requires agreement by the State agency, the responsible party, and the land owner. The owner may not agree to the covenant. Therefore EPA considers RA#2 and RA#3 implementable but potentially problematic.

**CRITERIA 7: Cost**

This criterion examines the projected costs for each remedial alternative, including estimated capital and annual operation and maintenance costs, and the present worth.

RA#1, no action, would not involve any cost, as no action (including monitoring) is taken.

RA#2 would include administrative costs associated with negotiating and recording the restrictive covenant. The estimated up-front cost for negotiating and recording the restrictive covenant is $42,500. In addition, implementing RA#2 would require capital costs for design and construction of a new extraction and treatment system. The estimated capital cost for the new extraction and treatment system is approximately $156,000. The estimated annual cost for monitoring and maintaining the restrictive covenant is $3,400 per year for a 5 year period. The estimated cost for operating, maintaining, and monitoring the extraction and treatment system is approximately $100,000 per year for the 3 years that clean-up is projected to take, then an additional 2 years of continued compliance monitoring at a cost of $8,000 per year (total 5 years). Upon obtaining assurance that the clean-up standard has been met and maintained, the restrictive covenant can be terminated and the extraction and treatment system can be removed. The estimated cost for the restrictive covenant termination process is $4,000. The estimate cost for the extraction and treatment system demolition and demobilization is $90,000, which would be incurred at year 5. The present value cost for RA#2 overall, incorporating the up-front and capital costs, operation, monitoring and maintenance costs, and demolition and demobilization costs, is $572,000.

RA#3 would require no additional capital costs for physical construction, but would incur the same up-front costs for implementing the restrictive covenant as RA#2. RA#3 would incur ongoing annual costs for monitoring natural attenuation, as well as monitoring and maintaining the restrictive covenant. The estimated annual cost for monitoring natural attenuation is $18,000 per year for the 3 years it is estimated the clean-up will take, followed by 2 years of continued but decreased compliance monitoring at a cost of $8,000 per year. The estimated annual costs for monitoring and maintaining the restrictive covenant is the same as for RA#2, and the estimated timeframe for which these costs would be incurred is the same as well. Upon obtaining assurance that the clean-up standard has been met and maintained, the restrictive covenant can be terminated and the monitoring wells abandoned or demolished. The estimated cost for the restrictive covenant termination process is $4,000. The estimated cost for the abandonment or demolition of the monitoring wells is $34,500 which would be incurred at year 5. The present value cost for RA#3 overall, incorporating the up-front costs, monitoring costs, maintenance costs, and demolition costs, is $149,000.

**CRITERIA 8: State Acceptance**

State acceptance indicates whether the State in which the Site resides agrees with the preferred alternative, based on its review of the RI, FS, and Proposed Plan.

The Regional Board began overseeing cleanup at the Site in 1983, prior to EPA involvement, and subsequently performed the support agency role after EPA took the lead in 1989. The Regional Board, however, has not been involved at the Site over the past decade. While preparing the Proposed Plan, EPA contacted the Regional Board to solicit renewed involvement and input into the decision-making process. The Regional Board informed EPA that it considers the Site to be a low risk and therefore not in need of further Regional Board involvement. EPA also contacted DTSC regarding the Site, and DTSC deferred to the Regional Board.

**CRITERIA 9: Community Acceptance**

Community acceptance indicates the public support of a given alternative.

EPA mailed the Proposed Plan to the residential and business addresses within a half mile radius of the Site, soliciting input from the community through the public comment process. The mailing, which included both English and Spanish versions, went out on Tuesday, January 16, 2007. It announced the public comment period would run from January 20 to February 20, 2007, and it announced that EPA would hold a public meeting on January 24, 2007. EPA mailed out an additional announcement to the same parties on January 24, 2007, extending the public comment period to March 6, 2007.

EPA held a public meeting on January 24, 2007, from 6:30 p.m. to 8:30 p.m., at the Petaluma Public Library at 100 Fairgrounds Drive, Petaluma. The purpose of the public meeting was to present the proposed clean-up plan amendment to the public, and to solicit public comment. Only one person attended the meeting.

No member of the public submitted comments on the proposed plan or otherwise expressed opposition to the proposed remedy amendment. It is therefore assumed that the remedy has community acceptance.

**Summary of Comparison**

After evaluating the clean-up options, EPA is selecting MNA with institutional controls (RA#3) as the remedy that provides the best balance of the criteria. The three alternatives rate evenly on a number of criteria. The criteria where differences between the alternative exist are as follows: RA#1 (No Action) does not satisfy the threshold criteria of Overall Protection of Human Health and Environment because it does not provide adequate controls to prevent potential exposure to contaminated groundwater. It also does not meet the requirements of all the ARARs because it does not include monitoring and reporting. RA#1 also presents potential short-term risk because it does not have the type of institutional control that provides the most protection (restrictive covenant) against potential exposure during the remainder of the clean-up. RA#2 (Extraction and Treatment, ICs) and RA#3 (MNA, ICs) have some potential implementability uncertainties because for the restrictive covenant, consent of the responsible party and the property owner are required. EPA has not yet contacted the property owner, and therefore does not know whether the owner will consent to implementing a restrictive covenant. RA#2 (Extraction and Treatment, ICs) will be much more expensive (present

worth $572,000) than RA#3 (MNA, ICs – present worth $149,000). RA#1 (No Action) has no cost associated with it.

In summary, RA#1 (No Action) cannot be selected because it does not meet the two threshold criteria, Overall Protection of Human Health and Environment, and Meeting ARARs. A comparison of RA#2 (Extraction and Treatment, ICs) and RA#3 (MNA, ICs) shows that the only difference is cost; RA#2 will cost significantly more than other alternatives, without providing any offsetting advantages. Therefore, RA#3 is the best choice.

## VI. Support Agency Comments

As mentioned in Section V above, the Regional Board began overseeing cleanup at the Site in 1983, prior to EPA involvement, and performed the support agency role after EPA took the lead in 1989. The Regional Board, however, has not been involved at the Site over the past decade. While preparing the Proposed Plan, EPA contacted the Regional Board to solicit renewed involvement and input into the decision-making process. The Regional Board informed EPA that it considers the Site to be a low risk and therefore not in need of further Regional Board involvement. EPA also contacted DTSC regarding the Site, and DTSC deferred to the Regional Board.

## VII. Statutory Determinations

EPA expects RA#3 (MNA, ICs) to satisfy the following statutory requirements of CERCLA, Section 121(b): (1) be protective of human health and the environment; (2) comply with ARARs (or justify a waiver); (3) be cost-effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element to the maximum extent practicable. Once the clean-up standard for 1,1-DCA has been reached, EPA believes that no contamination above clean-up levels will remain on-site, and any use restrictions may be lifted.

## VIII. Public Participation Compliance

The public participation requirements set out in the NCP, 40 C.F.R. §300.435(c)(2)(ii), for amending a ROD have been or will be met. The NCP requires that EPA do the following: (1) issue a notice of availability for the Proposed Plan in a major local newspaper of general circulation, (2) make the Proposed Plan and supporting information available for public comment, (3) provide at least 30 days for submission of public comments on the Proposed Plan and extending that period upon request, (4) provide the opportunity for a public meeting at or near the facility, (5) keep a transcript of the comments received at the public meeting, (6) including in the ROD Amendment a response to each significant comment, (7) publish a notice of the availability of the ROD Amendment in a major local newspaper of general circulation, and (8) make the ROD Amendment and supporting information available to the public in the administrative record and at the information repository prior to the commencement of the remedial action.

EPA mailed the Proposed Plan to the residential and business addresses within a half mile radius of the Site, soliciting input from the community through the public comment process. The mailing, including both English and Spanish versions, went out on Tuesday, January 16, 2007. It announced that the public comment period would run from January 20 to February 20, 2007, and that EPA would host a public meeting on January 24, 2007. EPA mailed out an additional announcement to the same parties on January 24, 2007, extending the public comment period to March 6, 2007.

On January 10, 2007, EPA sent an electronic copy of the administrative record, including the Proposed Plan, to the Petaluma Public Library. The administrative record contains the documentation supporting the Proposed Plan and ROD Amendment.

EPA placed a notice of availability of the Proposed Plan in a newspaper called the Petaluma Argus Courier on January 31, 2007. This newspaper is a major local newspaper of general circulation in Petaluma.

EPA held a public meeting on January 24, 2007, from 6:30 p.m. to 8:30 p.m., at the Petaluma Public Library at 100 Fairgrounds Drive, Petaluma. The purpose of the public meeting was to present the proposed clean-up plan amendment to the public, and solicit public comment. Only one person attended the meeting. EPA had the meeting recorded and produced a written transcript of the meeting.

Upon issuance of the ROD Amendment, EPA will make it available to the public by placing a copy in the Petaluma Public Library. EPA will then publish a notice of the availability of the ROD Amendment in the Petaluma Argus Courier.

# PART 3: THE RESPONSIVENESS SUMMARY

No member of the public submitted comments on the proposed plan.

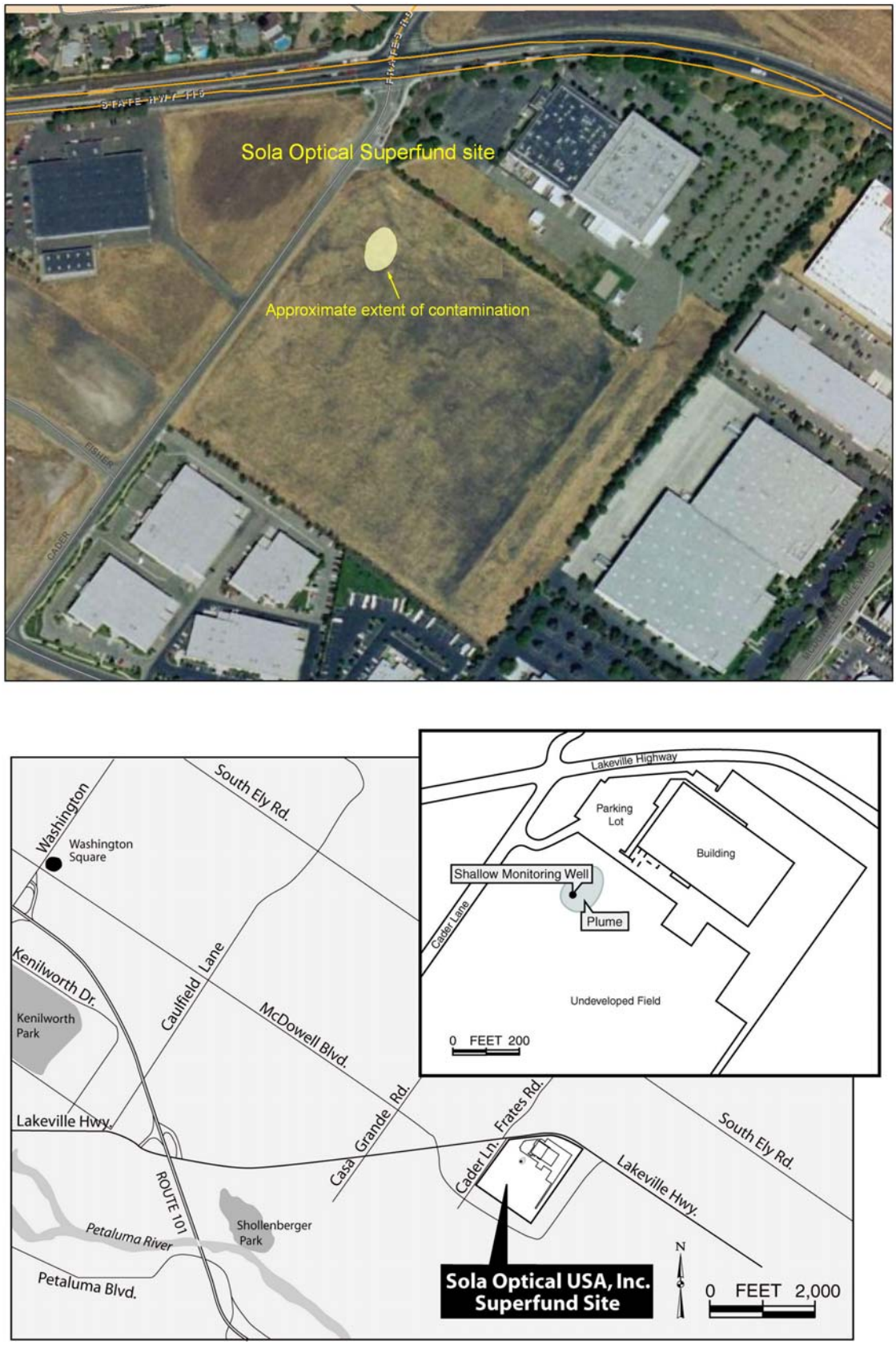


**FIGURE 1: Location and Extent of Contamination**
Sola Optical USA, Inc. Superfund Site, Petaluma, CA
December 2006