13. Specification of the Selected Remedial Action: Standards, Requirements, and Specifications

The remedial action implemented as selected by this ROD shall meet the standards, requirements, specifications, and provisions (hereafter, "provisions" unless otherwise noted) contained in this section. The remedial action shall be designed with the express purpose and intention of meeting these provisions. Discretion and latitude shall be preserved in designing the remedy within the range of possible designs meeting the requirements of this section. There are provisions which are established in other sections of this ROD. The provisions in this section apply *in addition* to, and not in lieu of, provisions which appear before or after this section of the ROD.

As previously established, this ROD selects differing remedial actions and objectives to apply to various areas of the groundwater at the Joint Site that are defined in this ROD. Some of the provisions vary depending on the hydrostratigraphic unit that is the subject of the provision. The reasons for this were established and discussed previously.

As discussed in Section 7.2 of this ROD, the term "plume" has a specialized use in this ROD. The formal definition of each plume is provided in this Section. "Plume" does not always refer to the entire distribution of a contaminant in groundwater, but rather refers to a particular portion of the distribution which espouses a certain set of physical characteristics and will respond to one set of remedial actions and objectives (See Section 7). The term "plume" applies to all hydrostratigraphic units within which a referenced plume occurs unless otherwise stated.

The following hydrostratigraphic units are referenced and addressed by this ROD:
Upper Bellflower, Middle Bellflower B Sand (MBFB Sand), Middle Bellflower C Sand (MBFC Sand), Lower Bellflower Aquitard, Gage Aquifer, Gage-Lynwood Aquitard, Lynwood Aquifer, Lynwood-Silverado Aquitard, and Silverado Aquifer.

For convenience and clarity, the provisions in this ROD are numbered and are segregated into subsections with headings.

PROVISIONS

1 Provisions Apply to the Joint Site.

All provisions below apply to the Joint Site. The term *Joint Site* was defined in Section 6 of this ROD. It is noted that the Joint Site includes any physical space within the groundwater to which contaminants may move, either vertically or laterally, during the course of the remedial action.

2 In-Situ Groundwater Standards (ISGS).

The particular in-situ concentration for each contaminant which this ROD requires be attained in groundwater at the conclusion of the remedial action is referred to by this ROD as the ***in-situ groundwater standard***, or ***ISGS.*** This ROD establishes the ISGS for the Joint Site groundwater as the lower of the State or federal Maximum Contaminant Level (MCL) as established under the Safe Drinking Water Act. In cases of contaminants where MCLs do not exist, the ISGS shall be EPA's Tap Water Preliminary Remediation Goals, which are based on the lower of a 10^{-6} cancer risk or a non-cancer hazard index of unity for residential exposure assumptions. The ISGS levels were shown in Table 9-1, and discussed in Section 9 of this ROD.

3 Definition of Plumes.

This remedy assigns differing provisions, remedial actions, and objectives to various areas of groundwater. Each such area is referred to as a "plume" by this ROD. Section 7.2 of this ROD, "Convention for Dividing the Contamination into Plumes," provides the basis for dividing the overall distribution of contamination in this fashion. Unless otherwise noted, the term *plume* as used in this section shall be defined under this provision. Provisions not specifying applicability to a specific plume shall apply to all groundwater at the Joint Site, unless otherwise noted in the provision.

3.01 **Chlorobenzene Plume.** The *chlorobenzene plume* shall include the entire distribution of chlorobenzene in groundwater at the Joint Site, *and* all other contaminants that are commingled with the chlorobenzene. Benzene, trichloroethylene (TCE), perchloroethylene (PCE), and a variety of other contaminants are present within the chlorobenzene plume. The chlorobenzene plume is present in the MBFB Sand (the UBF is unsaturated in the area where the chlorobenzene plume occurs), the MBFC Sand, the Lower Bellflower Aquitard (LBF), the Gage Aquifer, the Gage-Lynwood Aquitard, and the Lynwood Aquifer, based on data collected in the remedial investigation.

3.02 **Benzene plume.** The *benzene plume* shall include the portion of the distribution of benzene in groundwater at the Joint Site *that is not commingled* with chlorobenzene. Put another way, the benzene plume is that benzene within the Joint Site that lies outside the chlorobenzene plume. The benzene plume occurs in the UBF, the MBFB Sand, and the MBFC Sand, based on data collected in the remedial investigation. Benzene that is commingled with chlorobenzene is not considered to be part of the benzene plume, but is instead part of the chlorobenzene plume. The benzene plume includes ethyl benzene and naphthalene, among other contaminants.

3.03 **TCE.** The term *TCE,* unless otherwise noted, when used in reference to a plume or contaminant distribution in groundwater, shall represent a series of chlorinated aliphatic VOCs, including but not limited to TCE, PCE, dichloroethylene (DCE), trichloroethane (TCA), and any isomers of these compounds in groundwater at the Joint Site. The term does not include chlorobenzene or polychlorinated benzenes.

3.04 **TCE Plume.** The *TCE plume* shall include the portions of the distributions of any such contaminants in groundwater at the Joint Site *that are not commingled* with the chlorobenzene plume. The TCE plume occurs in the UBF, the MBFB Sand, and the MBFC Sand, based on data collected during the remedial investigation. The TCE plume in the UBF and MBFB Sand is commingled with the benzene plume. The downgradient extent of the TCE plume in these units does not exceed the extent of the benzene plume. The TCE plume in the MBFC Sand lies *under* the benzene plume in the MBFB Sand and north of the benzene plume in the MBFC Sand (See Figures 7-2 and 7-4). TCE (chlorinated solvent) contamination outside the chlorobenzene plume which may exist in the Gage Aquifer is not considered to be part of the TCE plume and will be addressed separately. TCE that is commingled with chlorobenzene is not considered part of the TCE plume but is part of the chlorobenzene plume.

4 Additional Data Acquisition

4.01 **TCE Plume.** The current downgradient extent of the TCE plume is bracketed by several downgradient wells that have non-detect values for TCE concentration. This, combined with its location relative to the benzene NAPL, allows for this remedy to address the TCE (See Section 11). However, additional data is necessary in order to complete remedial design for the remedy. It is noted that portions of the remedial design could be completed without this data. Sufficient monitoring wells shall be installed and sampled in the UBF, the MBFB Sand, MBFC Sand, and the Gage Aquifer to:

(1) identify and characterize the sources of chlorinated solvents in the TCE plume, including their location and the possible presence of NAPL associated with these sources, and

(2) define the distribution sufficiently to allow for a remedial design of the remedial action selected by this ROD.

4.02 **Benzene Plume in the MBFC Sand.** In the remedial investigation, monitoring wells were never installed in the MBFC Sand under or near-downgradient to the high concentrations of benzene which were eventually discovered in the MBFB Sand near what is today called the "WRC building" in the eastern portion of the benzene contaminant distribution. These wells shall be installed and sampled under this remedy during the remedial design phase. The number of wells, their location and construction design shall be established in the monitoring plan for the remedial action and shall be subject to the approval of EPA.

4.03 **Well Survey.** The well survey for the Joint Site shall be updated. Wells existing within one-half mile of the area of groundwater contamination at the Joint Site (including pCBSA contamination), shall be identified and mapped. The well survey shall be a document of public record on file with EPA Region IX. Well surveys shall be further updated as described in later subsections, below.

4.04 **pCBSA.** The extent of the contaminant para-chlorobenzene sulfonic acid, or pCBSA, downgradient and side-gradient from the Montrose property shall be determined by installation and sampling of additional wells. The extent shall be determined to a non-detectable concentration as determined and approved by EPA in its Monitoring Plan for the Joint Site remedy, which is required by this ROD. Production wells within 1 mile of the terminus (downgradient extent) of the pCBSA distribution and within one-half mile cross-gradient as determined by the midline of the pCBSA distribution shall be tested for pCBSA and the results shall be made available to the public. Additional monitoring requirements after the initial sampling are addressed below under Monitoring. Provisions for finding pCBSA in production wells are provided below under "Ensuring Protection of Human Health During the Course of the Remedial Action."

5 Containment Zone

5.01 Dissolved phase contamination in a specific zone of groundwater, defined in the provisions which follow, shall be contained and isolated indefinitely such that the contamination cannot escape the zone. This zone is referred to by this ROD as the ***containment zone***[1]**.** There shall be a single containment zone for the Joint Site. The basis for the size and configuration of the containment zone (and TI waiver zone) was discussed in Section 10, "Technical Impracticability Waiver and Containment Zone" in this ROD.

5.02 The containment zone shall surround the NAPL in a region of groundwater, defined in this ROD, to which remedial actions selected by this ROD shall be applied to prevent the escape of dissolved-phase contaminants. The containment zone shall be implemented such that dissolved phase contaminants within the containment zone, and contaminants dissolving from NAPL within the containment zone, shall be prevented from escaping the containment zone and from entering the groundwater outside the containment zone. The NAPL, and all contaminants within the containment zone, shall thereby be *isolated* from the groundwater outside the containment zone.

5.03 Dissolved phase contamination within the containment zone shall be considered contained when it is reliably prevented from moving outside the containment zone by the remedial actions selected by this ROD, in accordance with the specifications, requirements, and standards established by this ROD.

5.04 **Geographical Definition.** The technical basis for the size and shape of the containment zone was discussed in Section 10. Although its shape, size and extent were determined by EPA using a scientific basis, the containment zone is established by this ROD *geographically*. That is, the extent of the containment zone is not conditional but represents a fixed volume in space, defined by the boundaries herein described.

5.05 **Specification of Lateral Extent of the Containment Zone.** The lateral extent of the containment zone in the various hydrostratigraphic units shall be as depicted in Figure 10-1. The lateral extent of the containment zone differs by hydrostratigraphic unit, and is based on the various arguments provided in Section 10 of this ROD.

[1]The use of the term "containment zone" in this ROD does not reflect a formal establishment of a containment zone as that term is used in, and per the requirements of, California State Water Resources Control Board Resolution No. 92-49(III)(H).

5.06 **Lateral Extent of Containment Zone in the Lower Bellflower Aquitard (LBF).** The containment zone shall have the same lateral shape, size and extent in the LBF as in the MBFC Sand, *within the chlorobenzene plume*. The containment zone shall have no extent in the LBF outside the chlorobenzene plume.

5.07 **Depth of the Containment Zone Within the Chlorobenzene Plume.** The containment zone shall extend through the Gage Aquifer and all shallower hydrostratigraphic units *within the chlorobenzene plume*. The containment zone shall not include any extent in the Gage-Lynwood Aquitard or the Lynwood Aquifer.

5.08 **Depth of the Containment Zone Within the Benzene and TCE Plumes.** The containment zone shall extend through the MBFC Sand and all shallower hydrostratigraphic units *in the TCE and benzene plumes*. The containment zone shall exclude the Lower Bellflower Aquitard, the Gage Aquifer, and the Lynwood Aquifer in these plumes.

6 Technical impracticability ARAR waiver

6.01 Specific applicable or relevant and appropriate requirements (ARARs), which EPA has determined would otherwise apply to this remedy, shall be waived due to technical impracticability as provided by CERCLA at 42 U.S.C. §9621(d)(4)(C) and 40 C.F.R.-300.430(f)(1)(ii)(C)(3). This waiver shall apply solely and specifically to a zone of groundwater referred to in this ROD as the ***TI waiver zone***. Because the TI waiver is being applied exclusively to the containment zone defined in Provision 5 above, the terms *TI waiver zone* and *containment zone* are congruent and refer to the same physical space with respect to this remedy for the Joint Site. This waiver shall not apply to any other groundwater within the Joint Site. The basis for this waiver is discussed earlier in this ROD in Section 10 and is provided in detail as Appendix E of the JGWFS.

6.02 The ARARs to be waived based on technical impracticability for the TI waiver zone are identified in Appendix A of this ROD. The primary ARARs being waived under the TI waiver, where it applies, is the requirement that concentrations of contaminants in groundwater be reduced to at or below the MCL (promulgated drinking water standards), as discussed in Section 9 of this ROD.

6.03 The TI waiver is necessary because it will not be practicable to restore groundwater within the TI waiver zone to MCLs within a reasonable time frame as required by the National Contingency Plan (NCP). This is discussed in Section 10 of this ROD and in Appendix E of the JGWFS. This is due to the presence of NAPL under the specific site conditions it occurs at the Joint Site.

6.04 The TI waiver shall apply to all contaminants within the TI waiver zone, regardless of whether a particular contaminant provided the original basis for the waiver. This was discussed in the JGWFS and in Section 10 of this ROD.

7 Containment of the Overall Contaminant Distribution.

In addition to meeting all other provisions in this ROD (including but not limited to requirements to reduce the volume of the chlorobenzene plume that has concentrations exceeding the ISGSs for any contaminant), the remedy shall achieve containment of the overall contaminant distribution in that the physical size of the union of the chlorobenzene, benzene, and TCE plumes shall not increase from such point in time as the remedial action is initiated. As a corollary, the lateral extent of the overall contaminant distribution in each of the contaminated hydrostratigraphic units shall not increase, and the vertical extent of the overall contaminant distribution shall not increase. The chemical pCBSA shall not be subject to this provision for reasons discussed in Section 12 of this ROD.

8 Containment Within the Containment Zone.

8.01 Dissolved phase contaminants within the containment zone shall remain contained to the zone and shall not escape the zone. This condition shall be preserved indefinitely by this remedial action. Contaminants shall not leave the containment zone either laterally or vertically at any point along the three-dimensional boundary of the containment zone.

8.02 **Means by Which Containment Shall Be Achieved Within the Containment Zone**

8.02.01 **Chlorobenzene Plume.** Containment of the chlorobenzene plume within the containment zone shall be affected by hydraulic extraction of groundwater from one or more extraction wells, followed by treatment of extracted water, followed by aquifer injection of the treated water through one or more injection wells. Provisions for aquifer injection under the "Plume Reduction" section of provisions below shall apply to this injection. Hydraulic extraction and aquifer injection of water shall be optimized in remedial design to ensure that containment is achieved and that the other provisions in this ROD are attained.

8.02.02 **Benzene Plume in the UBF and MBFB Sand.** Containment of the benzene plume within the containment zone shall be effected by reliance on monitored intrinsic biodegradation. It is recognized that other natural processes may aid in the containment of the benzene in these units. However, it is the process of

intrinsic biodegradation which makes the reliance on natural processes for these units feasible from a remedial standpoint. The continued stability and containment of the benzene plume in the UBF and MBFB Sand shall be monitored as specified below, and if transgressions of containment occur, contingencies shall be implemented, as specified below.

8.02.03 **Benzene Plume in the MBFC Sand.** Containment of the benzene plume within the containment zone in the MBFC Sand shall be effected by hydraulic extraction of groundwater from one or more extraction wells, followed by treatment of extracted water, followed by discharge of the treated water. Discharge provisions are given below. Such hydraulic extraction shall independently establish the capture of the benzene plume within the MBFB Sand.

Other actions such as the adjustment of the locations and flow rates of injection and extraction wells being used for other elements of the remedy may be employed during the optimization of the remedial design to assist the hydraulic extraction in achieving containment of the benzene plume in the MBFC Sand. However, these actions shall not be taken *in lieu* of hydraulic extraction required under this provision.

It is recognized that intrinsic biodegradation is also occurring to the benzene in the MBFC Sand, and that this naturally-occurring process will, to a significant extent, assist the active processes to be implemented by this provision in containing the benzene plume in the MBFC Sand. However, by virtue of the analyses put forth in the JGWFS and earlier in this ROD, this ROD is explicitly selecting *active* hydraulic containment, as the remedial action for the benzene plume in the MBFC Sand. The optimization of aquifer injection being performed for the chlorobenzene plume shall also be performed during remedial design to limit the potential for transgressions of benzene containment.

8.02.04 **TCE Plume.** Containment of the TCE in the NAPL containment zone shall be partially accomplished by hydraulic extraction of groundwater from one or more extraction wells, followed by treatment of extracted water, followed by discharge of the treated water. Specifically, this groundwater extraction shall be undertaken at low pump rates close to the TCE sources which are indicated by existing data to lie within the containment zone but upgradient of the benzene NAPL. Additional data on TCE sources shall be collected as provided above prior to executing this response action. This action shall occur at low pump rates sufficient solely to:

1. Contain the immediate TCE source locations, and

2. Provide a control on the amount of mass leaving the sources and entering the greater TCE plume.

This action will not actively contain the entire TCE plume. Containment of the remainder of the TCE plume shall be accomplished by the contingencies provided below. Such contingencies shall be activated if the extent of the TCE plume currently within the containment zone/TI waiver zone comes to exceed the containment zone/TI waiver zone.

During remedial design, the overall remedial system shall be designed to take advantage of injection and other hydraulic controls so as to limit the movement of the TCE in response to hydraulic extraction being undertaken under this remedy for the chlorobenzene and benzene plumes.

8.02.05 **Optimization.** In the remedial design phase of the remedy, the remedial wellfield and relative pump rates among wells in the wellfield shall be optimized so as to limit the lateral and vertical movement of TCE. Such optimization in design shall also be performed so as to maximize the certainty of containment of contamination within the containment zone. However, such optimization shall not counter or override meeting any of the other requirements and provisions in this ROD.

8.03 **Monitoring and Monitoring Plan for Containment**

A monitoring plan shall be developed and approved by EPA for matters related to the containment of the dissolved phase contaminants surrounding NAPL in the containment zone. At a minimum, this plan shall provide for sampling of monitoring wells sufficient to meet the objectives stated below in this provision and any additional goals identified in the approved monitoring plan. Additional monitoring wells shall be installed, as necessary, to achieve the objectives of the monitoring plan. Continual monitoring shall be conducted as part of this remedy in accordance with the EPA-approved Monitoring Plan for as long as the containment zone is in effect as part of the remedy.

8.03.01 **Minimum Objectives of the Monitoring Plan with Respect to Containment Zone.** The monitoring plan shall provide for, at a minimum:

- Confirmation that contaminants within the containment zone have not left the zone;

- Data sufficient to reliably evaluate compliance with any and all requirements, standards, and provisions in this ROD;

- Reliable evaluation of the lateral and vertical movements of all contaminants of concern within the containment zone;

- Reliable evaluation of the lateral and vertical movements of benzene, TCE, and chlorobenzene in response to hydraulic extraction in the overall system;

- Evaluation of the effectiveness of partial containment of the TCE plume by hydraulic extraction and the degree of movement of TCE toward the boundary of the containment zone;

- Data sufficient to determine groundwater levels, hydraulic gradients, reliable groundwater elevation contour maps, effects of any local pumping both on and off the Joint Site, and groundwater flow velocities within all of the affected hydrostratigraphic units at the Joint Site;

- Verification and evaluation of the zones of capture of extraction wells and the radii of influence of extraction and injection wells;

- Reliable evaluation of gradient control measures;

- Data sufficient to measure and verify drawdowns in the immediate vicinity of the NAPL sources due to pumping;

- Evaluation of efforts to optimize the wellfields and pump rates associated with hydraulic extraction and aquifer injection of treated water so as to provide the greatest certainty of long-term containment, and reduce the potential for plume interactions and adverse migration of NAPL and dissolved contaminants;

- Reliable concentrations of contaminants in treatment system influent and effluent, and treatment streams so as to assess the effectiveness and performance of the treatment system; and

- Additional aquifer tests including but not limited to aquifer stress, pumping, and recovery tests, such as to provide estimates of local or

general parameters such as hydraulic conductivity, storativity, specific yield, as determined necessary in the monitoring plan.

8.03.02 **Monitoring Wells.**. The approved Monitoring Plan shall establish the monitoring objectives, which shall include but not be limited to the objectives specified in this ROD, and shall list the monitoring wells serving each objective. During the remedial design phase of the remedy, the wells necessary to meet each objective shall be identified, taking into account the location, construction, and other circumstances associated with all existing wells. Should EPA determine that additional wells are necessary to meet the objectives in the approved Monitoring Plan, such wells shall be installed and sampled.

8.03.03 **Monitoring Wells in Regard to Containment.** Sufficient monitoring wells shall be placed around the periphery of the containment zone in each hydrostratigraphic unit where the containment zone occurs to ensure that failures of the remedial actions to contain contaminants to the containment zone (transgressions of containment) will be promptly detected. Sufficient numbers of monitoring wells also shall be placed in the hydrostratigraphic units below the containment zone to determine that contaminants have not migrated vertically out of the containment zone. Monitoring well construction and locations shall be approved by EPA as part of the remedial design and additional wells may be added as determined necessary by EPA during the remedial action and operation and maintenance (O&M) phase. This may include wells in either aquifers or aquitards.

8.03.04 **Monitoring frequency.** The frequency of monitoring for all wells in the monitoring network shall be specified and justified in the approved Monitoring Plan, in accordance with the ability to attain the stated monitoring objectives. Any changes to the monitoring frequency for one or more wells shall be approved by EPA by means of an amendment to the Monitoring Plan which states the justification for the changes.

8.03.05 **Monitoring Analytes, Sampling Protocols, and Methods**. EPA shall approve one or more field sampling plans (FSPs) and Quality Assurance Project Plans (QAPPs) which shall establish the sampling protocols, analytical protocols, quality assurance and quality control parameters and protocols, data quality objectives, and sample rotation. Such plans shall be in accordance with all applicable EPA regulations, policy, and guidance. The FSP(s) and QAPP(s) may be incorporated into or attached to the Monitoring Plan as approved by EPA. Modifications to the sampling and analytical protocols shall be accompanied by the appropriate modification to the FSP or QAPP.

8.03.06 **Direct Monitoring of Intrinsic Biodegradation**. The continued reliability of intrinsic biodegradation to contain the benzene plume in the UBF and the MBFB Sand shall be verified by actual periodic confirmation of the biological activity in the benzene plume. The degree, frequency, types of testing, etc. of such monitoring shall be established in the approved Monitoring Plan. The frequency may be modified as approved by EPA in amendments to the Monitoring Plan. The monitoring shall include, but shall not be limited to, one or more of the following:

- Analysis of samples from monitoring wells along a transects running from the center to the outside of the benzene plume for dissolved oxygen, nitrate, sulfate, and methane, to be followed by evaluation of the degree of biodegradation in the context of electron donor-acceptor pairs and benzene biodegradation mechanisms.

- Analysis of groundwater or saturated zone soil samples to establish biodegrader counts.

- Analysis of groundwater samples for biodegradation interim by-products.

- Systematic measurements of benzene intrinsic biodegradation rate.

The frequencies of any such tests may vary according to the approved Monitoring Plan.

8.04 Contingent Actions

In the event that EPA determines that the actions selected by this ROD have not contained contaminants within the containment zone contingent actions shall be taken to (1) restore the condition of containment, (2) meet all remedial action objectives and ROD standards, and (3) meet ARARs where not waived, including attaining ISGS levels in groundwater. Contamination which leaves the containment zone also leaves the TI waiver zone; such contamination is not subject to the TI waiver and is subject to cleanup to ISGS levels as is all contamination outside the TI waiver zone.

It is not possible in advance to specify in detail the design particulars of all contingent actions, because the number of possible types of transgressions is large. Therefore, contingent actions are specified on a conceptual basis. "Transgressions of Containment" in this subsection refers to the condition upon which EPA has determined that

contaminants within the containment zone have not been contained as required by this ROD. "Rectifying" transgressions of containment in this subsection refers to restoring the condition of containment after the transgression, meeting all remedial action objectives and ROD standards, and meeting all ARARs after a transgression.

8.04.01 **Chlorobenzene Plume.** Under this ROD, containment of the containment zone in the chlorobenzene plume is accomplished by active hydraulic extraction. Transgressions of containment in the chlorobenzene plume shall be rectified by adjustments to this active hydraulic means, which shall include (1) adjusting the pumping rates of one or more extraction and injection wells, and/or (2) installation of additional extraction and/or injection wells.

8.04.02 **Benzene Plume in the MBFC Sand.** Under this ROD, containment of the benzene plume in the MBFC Sand is accomplished by active hydraulic extraction. Transgressions of containment in the benzene plume in the MBFC Sand shall be rectified by adjustments to this active hydraulic means, which shall include (1) changing the pumping rates of one or more extraction and injection wells, and/or (2) installation of additional extraction and/or injection wells.

8.04.03 **Benzene Plume in the UBF and MBFC Sand.** Under this ROD, containment of the benzene plume in these units is contained by reliance on monitored intrinsic biodegradation with a contingency for active hydraulic extraction. Transgressions of containment shall be rectified by active hydraulic means, which shall include (1) changing the pumping rates of one or more existing extraction and injection wells, and/or the installation of extraction wells and initiation of hydraulic extraction specifically to rectify the transgression.

8.04.04 **Limitations on Contingent Actions.** Unless there is no other option, activation of a contingent action:

- Shall not reduce the rate of cleanup of the chlorobenzene plume;
- Shall not reduce the certainty of the containment of chlorobenzene, benzene, or TCE within the containment zone;
- Shall be effective in rectifying the transgression in a timely manner.

8.04.05 **Rectifying the Transgression**. Contingent actions shall reduce the concentrations of contaminants in the groundwater affected by the transgression to the levels which existed prior to the transgression. If no detectable contamination

existed at the point of the transgression outside the containment zone, then the contingent action shall reduce the concentrations at that point to below detectable levels. Contingent actions shall also reduce contaminant migrations within the containment zone such that the transgression will not continue.

9 Plume Reduction

9.01 **Basic Requirement**.

The volume of groundwater within the Joint Site that is *outside* the containment zone at concentrations that exceed ISGS levels for any contaminant as identified by this ROD shall be reduced to zero in a reasonable time frame. This process shall be referred to as "plume reduction." The concentrations of contaminants in all groundwater at the Joint Site outside the containment zone shall be reduced to concentrations below the ISGS for each contaminant present in groundwater. ISGS values are specified on a contaminant-specific basis.

9.02 **Means of Plume Reduction and Requirement of Aquifer Injection for the Chlorobenzene Plume**

Plume reduction shall be achieved by hydraulic extraction and treatment. This shall include a series of hydraulic extraction wells from which water will be pumped to a treatment unit or units for treatment, followed by treated water discharge. For the chlorobenzene plume that is outside the containment zone, aquifer injection shall be implemented as the treated water discharge option. Feasibility Studies have shown that aquifer injection is necessary in conjunction with the plume reduction of the chlorobenzene plume to achieve the gradient control necessary to (1) reduce the potential for induction of movement of NAPL, and (2) limit the possibility of adverse migration of contaminants both within and from outside the Joint Site, within the context of meeting all remedial action objectives of this ROD. Accordingly, aquifer injection of treated water shall be applied in such a way as to achieve these goals and in accordance with the provisions in this Section of the ROD. Aquifer injection shall be accomplished by a series of aquifer injection wells.

9.03 **Performance Criteria for Plume Reduction of the Chlorobenzene Plume**

The following performance criteria with respect to plume reduction of the chlorobenzene plume shall be met by this remedial action. The reduction of the concentration of

contaminants in groundwater outside the containment zone to levels below in-situ groundwater standards shall occur in a reasonable time frame.

9.03.01 **All of the Provisions Shall Be Met.** No one of these provisions is merely a focus for attaining one or more of the other provisions. All provisions shall be met, even if doing so will result in one or more provisions not only being met, but exceeded. As an example, provisions below require a certain pump rate, a certain pore volume flushing rate, and a certain minimum overall rate of reduction of the plume. These provisions independently apply. Thus, even if the minimum rate of reduction of the plume would be exceeded by attaining the pump rate and pore volume flushing rate specified, these shall still be attained.

9.03.02 **Pump Rate**. Hydraulic extraction shall be occur at a combined pump rate of approximately 700 gpm, mostly in the MBFC Sand and the Gage Aquifer. This ROD recognizes that pilot testing, design adjustments, and optimization modeling will occur during the remedial design phase, and the intent of this provision is not to overly limit design. However, it is intended that hydraulic extraction take place at a rate as close as feasible to the 700 gpm rate shown effective in the feasibility study for Alternative 4, and that this rate be departed from only if shown necessary and if approved by EPA.

9.03.03 **Hydrostratigraphic Units Affected by Hydraulic Extraction.** The MBFC Sand, the Gage Aquifer, and the Lynwood Aquifer shall be subject to direct hydraulic extraction. The MBFB Sand, the LBF, and the Gage-Lynwood Aquitard shall be subject to hydraulic extraction only to the extent shown necessary in remedial design to meet all other provisions, standards, goals and requirements of this ROD.

9.03.04 **Plume Reduction Rate Design and Early Time Performance.** The remedy shall be designed such that, at a minimum, the rate of plume reduction achieves the following performance criteria ***when modeled*** by a remedial design model approved by EPA (Provision 11):

The following performance standards shall apply:

- 33% of the volume of the chlorobenzene plume outside the containment zone with concentrations above ISGS levels plume shall be removed in 15 years;

- 66% of the volume of the chlorobenzene plume outside the containment zone with concentrations above ISGS levels plume shall be removed in 25 years;

- 99% of the volume of the chlorobenzene plume outside the containment zone with concentrations above ISGS levels plume shall be removed in 50 years.

The simulations of the rate of plume reduction to evaluate compliance with this reduction rate at the time of design shall be based on the modeling done during the remedial design effort. The model and its construction shall be approved by EPA and run using the specific well fields and pump rates in the design. It is recognized that actual cleanup times may be longer than those simulated by the model and that the model may not be able to correct for such deviations. Where practical, however, the design shall minimize the influence of those factors which lead to such modeling deviations.

9.03.05 **Early Time Performance Principle**. The total time frames envisioned as part of this remedy are quite long (50 to100 years), by necessity. In order to ensure that the remedy achieves the standards of this ROD in a reasonable time frame, it is an explicit objective of this remedy that it achieve significant reductions in the volume of contaminated groundwater outside the containment zone in the early time period (first 25 years). It is typically the last 25 percent of contamination which takes the longest to remove; hence, if a remedial system is properly designed, a large percentage of the volume of contaminated groundwater can be removed early in the implementation of the remedial action even if the total time to reach compliance with all objectives is long. The design of this remedy shall not be compromised in such a way that little cleanup is achieved in the first 25 years.

9.03.06 **Pore Volume Flushing Rates.** Flushing is the process by which contaminants are pushed from the ground during hydraulic extraction. The remedial action shall be designed in such a way that (1) in the MBFC Sand and Lynwood Aquifer, *at least* 1 net pore volume of water per year; and (2) in the Gage Aquifer, *at least* 0.5 net pore volumes of water per year; be exchanged throughout the area of groundwater remaining that has concentrations of any contaminant in excess of ISGS levels. This minimum annual net pore volume flushing rate may not be sufficient to meet the other provisions in this ROD and the pore volume flushing rate may need to be adjusted upward either at specific locations or all locations within the plume during the remedial design or remedial action phases of this remedial action.

9.03.07 **Well Replacement.** As the volume of water that is contaminated above ISGS concentrations shrinks during plume reduction, it may occur that the downgradient portion of the plume is eliminated before the portion of the plume located more proximally to the NAPL sources. The most downgradient hydraulic extraction wells may then come to be located beyond the toe of the plume. If this occurs, extraction from these wells will be discontinued. These wells shall be replaced with new hydraulic extraction wells inside the remaining plume, if EPA determines this is possible without compromising any other objectives of the remedial action as required by this ROD. The pump rate and locations for the replaced wells shall be established in adjustments to the remedial design, and shall be subject to EPA approval. In this manner, the capacity of the remedial system will be utilized to its maximum capacity and cleanup rates will be maintained.

9.04 Monitoring and Monitoring Plan for Plume Reduction

9.04.01 **Monitoring and Monitoring Plan**. A monitoring plan shall be developed and approved by EPA for matters related to plume reduction. This may be done in the same physical plan as the monitoring plan for the containment zone. At a minimum, this plan shall provide for sampling of monitoring wells sufficient to meet the objectives stated below in this provision and any additional goals identified in the approved monitoring plan. Additional monitoring wells shall be installed, as necessary, to achieve the objectives of the monitoring plan. Continual monitoring shall be conducted as part of this remedy in accordance with the EPA-approved Monitoring Plan until such time as the remedial action for plume reduction is determined complete by EPA.

9.04.02 **Minimum Objectives of the Monitoring Plan with Respect to Plume Reduction.** The monitoring plan shall provide for, at a minimum:

- Data sufficient to reliably evaluate compliance with any and all requirements, standards, and provisions in this ROD;
- Reliable estimates of the rate that the volume of contaminated groundwater with concentrations of contaminants above ISGS levels is being reduced;
- Reliable estimates of the rate that mass of contaminants is being removed from the groundwater;

- Reliable estimates of the pore volume flushing rates throughout the remaining plume that is contaminated with concentrations of contaminants in excess of ISGS levels;

- Reliable evaluation of the lateral and vertical movements of all contaminants of concern within the plume reduction zone;

- Reliable evaluation of the lateral and vertical movements of benzene, TCE, and chlorobenzene in response to hydraulic extraction in all hydrostratigraphic units;

- Data sufficient to determine groundwater levels, hydraulic gradients, reliable groundwater elevation contour maps, effects of any local pumping both on and off the Joint Site, drawdowns, and groundwater flow velocities within all of the affected hydrostratigraphic units at the Joint Site;

- Verification and evaluation of the zones of capture of extraction wells and the radii of influence of extraction and injection wells;

- Reliable evaluation of the effectiveness of vertical and horizontal gradient control measures;

- Data sufficient to measure and verify drawdowns in the immediate vicinity of the NAPL sources due to pumping;

- Evaluation of efforts to optimize the wellfields and pump rates associated with hydraulic extraction and aquifer injection so as to provide the greatest certainty of long-term containment, and reduce the potential for plume interactions and adverse migration of NAPL and dissolved contaminants;

- Reliable concentrations of contaminants in treatment system influent and effluent, and treatment streams so as to assess the effectiveness and performance of the treatment system; and

- Additional aquifer tests including but not limited to aquifer stress, pumping, and recovery tests, such as to provide estimates of local or general parameters such as hydraulic conductivity, storativity, specific yield, as determined necessary in the monitoring plan.

9.04.03 **Monitoring Wells.**. The approved Monitoring Plan shall establish the monitoring objectives, which shall include but not be limited to the objectives specified in this ROD, and shall list the monitoring wells serving each objective. During the remedial design phase of the remedy, the wells necessary to meet each objective shall be identified, taking into account the location, construction, and other circumstances associated with all existing wells. Should EPA determine that additional wells are necessary to meet the objectives in the approved Monitoring Plan, such wells shall be installed and sampled.

9.04.04 **Monitoring Frequency.** The frequency of monitoring for all wells in the monitoring network shall be specified and justified in the approved Monitoring Plan, in accordance with the ability to attain the stated monitoring objectives. Any changes to the monitoring frequency for one or more wells shall be approved by EPA by means of an amendment to the Monitoring Plan which states the justification for the changes.

9.04.05 **Monitoring analytes, sampling protocols, and methods**. EPA shall approve one or more field sampling plans (FSPs) and Quality Assurance Project Plans (QAPPs) which shall establish the sampling protocols, analytical protocols, quality assurance and quality control parameters and protocols, data quality objectives, and sample rotation. Such plans shall be in accordance with all applicable EPA regulations, policy, and guidance. The FSP(s) and QAPP(s) may be incorporated into or attached to the Monitoring Plan as approved by EPA. Modifications to the sampling and analytical protocols shall be accompanied by the appropriate modification to the FSP or QAPP.

10 Limiting Adverse Migration of Contaminants Within Context of Remedial Objectives

10.01 **Limit Adverse Migration of NAPL.** This remedial action shall limit the *induction*[2] of NAPL migration by limiting hydraulic drawdowns and changes in vertical gradients in the physical space where the NAPL occurs. While the JGWFS has shown that it should be feasible to adequately limit adverse migration of NAPL or dissolved phase contaminants and still meet remedial action objectives, it is possible that some adverse migration could occur during remedial implementation. In the event this occurs, the remedial design shall be adjusted to reverse and contain the adverse migration. Limiting

[2]The migration of NAPL that occurs naturally is not eliminated by this remedial action; this action does limit inducing further such movement, however. See Section 4 of this ROD.

adverse migration of NAPL shall not take preeminence over the other performance criteria and remedial action objectives of the selected remedial action. Rather, limiting adverse migration shall take place within the context of meeting all such requirements, including but not limited to attaining ARARs in a reasonable time frame, and attaining the required rate of reduction in the volume of the chlorobenzene plume outside the containment zone. Further discussion of this matter occurs in Section 11.1, including the definition of adverse migration.

10.02 **Limit Adverse Migration of Dissolved Phase Contamination.** The concept of adverse migration of contaminants was discussed in Section 11.1 of this ROD. The remedial action shall be designed to limit adverse migration of dissolved phase contaminants within the context of meeting all other provisions of this ROD. While the JGWFS has shown that it should be feasible to adequately limit adverse migration of dissolved contaminants and still meet remedial action objectives, it is possible that some adverse migration could occur during remedial implementation. In the event this occurs, the remedial design shall be adjusted to reverse and contain the adverse migration. Limiting adverse migration of contaminants shall not take preeminence over the other performance criteria and remedial action objectives of the selected remedial action. Rather, limiting adverse migration shall take place within the context of meeting all such requirements, including but not limited to attaining ARARs in a reasonable time frame, and attaining the required rate of reduction in the volume of the chlorobenzene plume outside the containment zone. The objective to limit adverse migration of dissolved phase contamination shall not supercede or take preeminence over the other performance provisions of this ROD. Further discussion on this matter appears in Section 11.1, including the definition of adverse migration. At a minimum, adverse migration of dissolved phase contaminants in the following forms shall be limited as part of the design of this remedial action:

- Adverse movement of chlorobenzene to areas not presently affected by chlorobenzene;

- Adverse movement of chlorobenzene, or TCE in the chlorobenzene plume, from shallower to deeper hydrostratigraphic units, including but not limited to (1) from the MBFC Sand into the LBF and the Gage Aquifer, (2) from the Gage Aquifer to Gage-Lynwood Aquitard and into the Lynwood Aquifer;

- Adverse movement of benzene from the MBFB Sand into the MBFC Sand in the benzene plume;

- Adverse movement of benzene in the benzene plume from the MBFC Sand into the LBF and the Gage Aquifer;

- Adverse movement of benzene currently in the chlorobenzene plume into lower hydrostratigraphic units, especially from the MBFC Sand into the LBF and the Gage Aquifer;

- Adverse movement of benzene currently in the benzene plume in the MBFC Sand toward the interface of the benzene and chlorobenzene plumes, and subsequently into the chlorobenzene plume;

- Adverse movement of the TCE (and related chlorinated solvents) in the MBFB Sand and MBFC Sand of the benzene plume laterally toward to south or west and hence closer to the containment zone (TI waiver zone) boundary;

- Adverse movement of TCE (and related chlorinated solvents) from the MBFB Sand of the TCE plume into the MBFC Sand;

- Adverse movement of TCE (and related chlorinated solvents) from the MBFC Sand of the TCE plume into the LBF and into the Gage Aquifer;

- Adverse movement of TCE (and related chlorinated solvents) from sources off the Joint Site to the north and to the west toward the Joint Site.

10.03 **Vertical Gradient Control Wells.** Where necessary to offset the vertical gradient imposed by pumping in a lower hydrostratigraphic unit, hydraulic extraction shall take place in the hydrostratigraphic unit overlying that unit, in order to prevent or minimize the movement of contaminants from the upper to the lower unit in response to the induced vertical gradient. As an example, even though pumping is not required in the MBFB Sand of the benzene plume to contain the benzene plume in that unit because intrinsic biodegradation is being relied upon for that purpose, some limited pumping may have to take place in the MBFB Sand in order to offset vertical gradients induced by pumping in the MBFC Sand. The need for and placement of such wells shall be determined in remedial design.

10.04 **Non-Interference.** The remedial design shall be optimized to the extent possible to minimize potential interference from sources of contamination not presently being addressed as part of the Joint Site. The design objective to limit such interference shall not supercede or take preeminence over the other performance provisions of this ROD. Rather, limiting the potential for such interference shall take place within the context of

meeting all such requirements, including but not limited to attaining ARARs in a reasonable time frame, and attaining the required rate of reduction in the volume of the chlorobenzene plume outside the containment zone.

While it has not been determined necessary at the time this ROD is issued, it may be found, either during remedial design or in the course of the remedial action, that additional remedial actions are necessary at the locations of such off-site sources in order to prevent interference from those sources. As determined necessary by EPA, EPA may either (1) issue administrative non-interference orders (see Provision 15, below) to parties associated with such sources requiring that such they cease and/or desist from interfering with the remedy, or (2) amend this ROD to select specific remedial actions for such sources as part of the Joint Site.

11 Flow and Transport Modeling and Optimization of the Remedial Action

11.01 **Computer Model.** A computer-based groundwater flow and contaminant transport model shall be developed, as necessary, and used during the remedial design, and also used as needed during the remedial action and O&M phases of the remedy for the purposes of (1) assisting in evaluating the potential for adverse migration of NAPL and dissolved phase contaminants, (2) assisting in verifying the compliance with performance requirements, (3) *assisting* in optimizing the remedial design to maximize the effectiveness of the remedial action, and (4) any other purposes determined necessary during the remedial design effort. The computer model developed during the feasibility study shall be utilized as appropriate in developing the remedial design model. EPA shall review and approve the model used and all aspects of the development and site-specific construction of the model prior to its use. The model shall be used only as appropriate, given its limitations and uncertainties, to complete the remedial design.

11.02 **Optimization during Remedial Design and During Remedial Implementation.** The wellfield used in the remedial action, including the location of hydraulic extraction wells and aquifer injection wells, and the relative pumping rates among the wells and hydrostratigraphic units, shall be determined and optimized in the remedial design phase. Optimization shall be performed as determined necessary by EPA, in the remedial design. Optimization shall also be performed as determined necessary by EPA during the remedial action, whenever (1) extraction or injection wells are being added or removed, (2) pump rates are being adjusted, (3) adjustments are necessary to rectify a transgression of the containment zone, or (4) other times as required by EPA.

The computer-based groundwater flow and contaminant transport model discussed in Provision 11.01 shall not be the exclusive means of optimizing the remedial design or remedial action. Rather, pilot testing, and adjustments and hydraulic response tests using actual hydraulic extraction and injection systems, shall be employed in conjunction with modeling simulations to optimize and adjust the remedial action. (See EPA Response ✍344 in the Response Summary; Response to Del Amo Respondents for further discussion).

Optimization is a process by which the remedial design and action is adjusted to attain maximum effectiveness with respect to meeting the requirements of this ROD; optimization does not represent an evaluation of *whether* to meet such requirements.

The remedial design and action shall be optimized:

- For the efficiency and rate of removal of contaminants;
- For pore volume flushing;
- For the rate of reduction of the volume of groundwater with concentrations of contaminants in excess of ISGSs;
- For early time performance (See Sections 11 and 12 of this ROD);
- For meeting all performance provisions above with respect to reduction of the plume outside the containment zone;
- For the certainty of containment of contaminants in the containment zone and the overall chlorobenzene plume; and
- To limit the potential for adverse migration of contaminants and NAPL during the course of the remedial action;

while meeting all provisions and objectives of this ROD.

12 Provisions for para-Chlorobenzene Sulfonic Acid (pCBSA)

The following provisions shall apply to pCBSA. A detailed discussion of this contaminant is provided in several sections earlier in this ROD. There are no promulgated health-based standards and there are insufficient toxicological data to determine provisional standards for this contaminant. pCBSA is not a hazardous

substance under CERCLA, but is a "pollutant or contaminant" (See CERCLA Section 101). pCBSA shall be subject to the monitoring plan requirements 9.04.01, 9.04.03, 9.04.05 and 9.04.06, as well as all provisions in this subsection. pCBSA shall not be subject to the other provisions in this Section. The following provisions shall apply to pCBSA:

12.01 **pCBSA Injection Limits**. No water containing pCBSA at concentrations exceeding 25,000 micrograms per liter (µg/L) shall be injected into the ground in the course of this remedial action. Micrograms per liter is the equivalent of parts per billion (ppb) for water. The State of California holds that 25,000 µg/L can be considered a provisional health standard for pCBSA with respect to injected groundwater. This requirement is a non-promulgated standard of the State of California (See Section 8 of this ROD), however, it is selected by this ROD as a performance standard for injected groundwater.

pCBSA shall not be injected into the Gage-Lynwood Aquitard, the Lynwood Aquifer, nor any point at lower elevation than these hydrostratigraphic units during the course of this remedial action.

12.02 **Additional Monitoring Requirements for pCBSA**. Provisions given above for additional data acquisition require that the toe and sides of the pCBSA plume be identified during the remedial design phase. The following additional monitoring shall be performed for pCBSA as part of this remedial action.

- Continued monitoring of the downgradient extent of the pCBSA distribution in all hydrostratigraphic units in which it occurs so that EPA can evaluate its proximity to production wells;

- Continued monitoring of the side-gradient extent of the pCBSA distribution in all hydrostratigraphic units where it occurs so that EPA can evaluate the effect of aquifer injection of treated water which still contains some pCBSA.

- Periodic measurements of pCBSA concentrations within the core of the pCBSA distribution to assess the effects of redistribution and dilution that occur as a result of aquifer injection of treated water which still contains some pCBSA.

- Monitoring of water from the production wells in nearest proximity to the downgradient toe of the pCBSA distribution as identified in the approved monitoring plan.

13 Treatment for Extracted Groundwater

The following provides the requirements for treating water removed as part of the hydraulic extraction systems described in this remedial action. Groundwater shall be treated according to ARARs identified in Appendix A of this ROD prior to discharge. This ROD does not limit the treatment of extracted groundwater to a single technology. This ROD selects several technologies which are hereby considered "available" to the remedial design. ARARs applicable to each of these technologies have been identified in Appendix A.

Provision 13.01 and 13.02 pertain to primary treatment technologies which are designed to address the primary contaminants at the Joint Site. Provision 13.03 pertains to ancillary technologies, which reduce concentrations of ambient substances in groundwater to allow treated water to meet discharge standards, when the primary technologies are insufficient to do so. Provision 13.04 pertains to supplementary technologies, which can be used in modular fashion as necessary to assist in meeting remedial goals.

Primary, ancillary, and supplemental treatment technologies, and treatment trains, were discussed at the end of Section 11.4 of the Decision Summary of this ROD.

13.01 **Primary Treatment Technologies for the Chlorobenzene and Benzene Plumes**. The following primary technologies shall be considered available for the remedial design for treatment of the chlorobenzene and benzene plumes:

- Adsorption including liquid phase granular activated carbon (LGAC);
- Air Stripping plus LGAC polishing;
- Circulating Fluidized Bed Reactor (FBR) plus LGAC polishing

The JGWFS demonstrated that, based on data from the Remedial Investigation Reports, adsorption operating alone would be the most cost-effective primary technology for treatment of extracted groundwater. Air Stripping and FBR, if utilized, requires an LGAC polishing step to be effective in attaining all discharge requirements, as well as to ensure efficient progress in attaining ISGS levels in-situ for the Joint Site.

13.02 **Primary Treatment Technologies for the TCE Plume**. The following primary technologies shall be considered available for the remedial design for treatment of the water from the partial containment of the TCE plume (near the TCE sources near the upgradient end of the former Del Amo plant):

- Adsorption including liquid phase granular activated carbon (LGAC);

- Air Stripping plus LGAC polishing.

The JGWFS demonstrated that, based on data from the Remedial Investigation Reports, adsorption operating alone would be the most cost-effective primary technology for treatment of extracted groundwater. Air Stripping, if utilized, requires an LGAC polishing step to be effective in attaining all discharge requirements, as well as to ensure efficient progress in attaining ISGS levels in-situ for the Joint Site.

13.03 **Ancillary Technologies**. Ancillary technologies are those required to treat extracted groundwater to reduce the concentration of naturally-occurring species in the water to meet regulatory standards and engineering requirements associated with the discharge of the water. Such technologies shall be applied, when necessary, in addition to the primary treatment technologies. It is anticipated by the JGWFS, based on water quality data, that the ancillary technologies may be necessary. For example, naturally occurring copper must be reduced to meet surface water discharge standards if the wellfields assumed in the JGWFS are utilized. These ancillary technologies shall be utilized, to the extent that EPA determines them necessary during the remedial design phase. Ancillary technologies are listed in Table 11-3, in Section 11 of the Decision Summary of this ROD.

13.04 **Treatment Trains.** The JGWFS considered a set of treatment trains that were identified in Section 11.4 of this ROD, as listed in Table 11-4 of the Decision Summary of this ROD and in the JGWFS. However, treatment trains composed of any combination of available primary and ancillary technologies, as specified above, may be designed and utilized for this remedial action.

13.05 **Supplemental Technologies.** Liquid Gravity Separation, and Advanced Oxidation Processes, may be used, in supplemental fashion, as part of the remedial action as determined necessary in remedial design. It is not intended that these technologies wholesale replace those selected as available for the remedial action as specified above; however, they may be added or used at appropriate times or in appropriate places as necessary. This was discussed in Section 11 of the Decision Summary of this ROD.

13.06 **Number of Treatment Plants.** The JGWFS evaluated the situation where there were three treatment plants, one for each plume. Provided all provisions and ARARs specified in this ROD are met, however, the number of treatment plants is not specified by this ROD and shall be determined in remedial design. All ARARs identified in this ROD, and all independently applicable requirements, if any, which pertain to the discharge of treated water shall be attained by the treatment plants prior to discharge. The number of

treatment plants shall be determined by the needs of the design in attaining these requirements.

13.07 **Treatment Plant Locations and Access**. The precise treatment plant locations are not specified by this ROD; however, the remedial design shall provide security measures designed to prevent public access.

13.08 **Conveyances.** Necessary easements, agreements or other actions shall be obtained as necessary to maintain the conveyances (pipelines) which carry water from the extraction wells to the treatment plant(s) and from the treatment plant(s) to discharge points such as aquifer injection wells.

14 Treated Water Discharge and Ancillary Technologies

Treated groundwater shall be discharged as follows.

14.01 **Chlorobenzene Plume.** Groundwater shall be re-injected into the aquifers from which it was withdrawn, in such a way as to limit adverse migration of contaminants and plume interactions as per the provisions already given. Aquifer injection shall be accomplished by aquifer injection wells. The hydraulic control afforded by this injection is required to meet the objectives of this remedial action.

14.02 **Benzene Plume.** Treated groundwater from the benzene plume shall be discharged by one of two methods:

- Discharge to the storm drain, and
- Aquifer injection.

Discharge by aquifer injection shall be allowed only if, upon remedial design, the concentrations of total dissolved solids in the extracted water will be low enough to meet regulatory and engineering requirements for aquifer injection. If this is not the case, then the treated groundwater shall be discharged to the storm drain.

14.03 **TCE Plume**. Treated water from the TCE plume shall be discharged by aquifer injection, with the express purpose of creating hydraulic control and gradients to limit the migration of the TCE.

14.04 **Discharge Requirements**. The discharge requirements that shall be attained prior to discharge by any of the applicable discharge methods are identified in Appendix A of this

ROD. All ARARs and independently applicable standards pertaining to groundwater discharge shall be attained.

The ISGS levels established in Section 9 of this ROD apply to the in-situ groundwater. However, in order to ensure protectiveness of human health and the environment, and ensure progress toward meeting ISGS levels in-situ in groundwater, treated groundwater shall not be injected into aquifers at the Joint Site as part of this remedial action at concentrations which exceed the ISGS levels.

15 Operation and Maintenance Plan and Remedial Action

15.01 **Operation and Maintenance (O&M) Plan.** An Operation and Maintenance Plan (O&M Plan) shall be written and approved by EPA prior to initiation of the remedial action. The O&M plan shall establish, at a minimum, all operating aspects, maintenance requirements, schedules, efficiency checks and tests, contingencies, monitoring requirements, performance verification, and compliance verification testing required for the implementation of the remedial action. The remedial action shall be implemented in accordance with the EPA-approved O&M Plan.

15.02 **O&M Plan Contents**. The O&M Plan shall address, at a minimum, the following. "System" refers to the treatment plant, conveyances, extraction wells, aquifer injection wells, monitoring wells, and all related equipment, unless otherwise noted.

- System operating procedures and contingencies
- System maintenance requirements
- System maintenance schedule
- Minimum qualifications of system operating and maintenance personnel
- Frequency, procedures, and protocols for testing treatment plant influent, effluent, and mid-treatment streams including specification of all analytes
- Frequency, procedures and protocols for testing, handling and disposing of all waste streams from the System, including specification of all analytes
- Standard shutdown procedures
- Alarms, notification schedule, and emergency shut-down procedures

- All environmental measurements, including but not limited to ambient air and noise levels within and near the System, the procedures, frequency, schedule, and personnel required for such measurements

- Extraction well maintenance, inspection and sampling schedule and protocols, with specification of all analytes

- Injection well maintenance, inspection, and sampling protocols and methods of assessing and increasing efficiency of injection, with specification of all analytes

- Management of all easements necessary for conveyance lines

- Maintenance and inspection of all conveyance lines

- All tests and procedures related to verification of the efficiency of the System

- All tests and procedures related to verification of compliance with ARARs and all other provisions of the ROD

- All tests and procedures related to evaluation of System performance in attaining cleanup standards.

The O&M Plan need not have a structure corresponding directly to these contents.

15.03 **Additional Engineering Documentation**. The following additional documentation shall be required. These plans may be issued separately or as content/sections within the O&M Plan as approved by EPA. The remedial design shall address, detail, and fully identify the contents of these plans. Plans shall meet any applicable EPA guidances and directives for the development of such documents, unless otherwise approved by EPA. All such plans shall be subject to EPA approval.

- *Site Management Plan,* describing the management of the grounds and area in which the system will operate;

- *Health and Safety Plan* in accordance with all regulations of the Occupational Safety and Health Administration (OSHA), including but not limited to standards found at 29 C.F.R.1910.120;

- *Quality and Assurance Plan* and *Field Sampling Plan* for all samples of water collected for purposes of monitoring, effluent or influent testing, or assessment of system design or performance;

- *Pollution Control and Management Plan* for any and all wastes or waste streams associated with the system; this plan shall ensure compliance with all requirements and ARARs in this ROD as well as any independently applicable standards, if any.

- *Construction Quality Assurance Plan*, for construction of the system;

- *Pilot Test Plan*, outlining all procedures evaluations, reports, and activities related to pilot tests which may be necessary during remedial design or remedial action;

- *Start-up Monitoring Plan*, outlining procedures to start up the system and determine that it is fully functional and operational.

The remedial design shall identify other planning documents and elements, as necessary for the successful design of the system.

15.04 **Completion of the Plume Reduction Portion of the Remedial Action.**

The containment of the containment zone will continue indefinitely and this ROD does not envision its shutdown. However, the chlorobenzene plume with concentrations above ISGS levels outside the containment zone will be eliminated. The following shall apply to the determination that the remedial action has attained ISGS levels and is complete. The following provisions apply *only* to the remedial action operating outside the containment zone.

15.04.01 **Engineering Practices, Rebound, and Minimum Compliance Period.** The O&M Plan shall establish a plan for utilizing appropriate engineering practices to ensure that concentrations of contaminants to not rebound above ISGS levels at any point in the plume after shutdown of the hydraulic extraction and treatment system effecting plume reduction. After the shutdown of the system, concentrations of contaminants shall not again rise above ISGS levels for a period of time to be specified in the O&M Plan and approved by EPA. During this time period, the remedial system, including wells, conveyances, treatment, and discharge systems, shall be maintained and ready to be reactivated in the event that concentrations of contaminants rebound to levels above ISGS levels.

15.04.02 **Additional Requirements.** EPA shall establish any additional requirements and conditions as may be necessary to confirm the completion of the remedial action, in addition to those listed here, in the approved O&M Plan.

16 Institutional Controls and Ensuring Short Term Protection

Institutional controls are discussed in Section 11.3. Only the actions selected are stated here. As part of this action, EPA will:

16.01 **Continue Existing Restrictions.** EPA will coordinate with the appropriate agencies regarding the existing legal and regulatory prohibitions and restrictions on groundwater use for the affected groundwater at the Joint Site.

16.02 **Non-Interference Orders.** At EPA's sole discretion and within its authority, EPA will issue administrative non-interference orders to appropriate parties to prevent contaminant sources presently outside the Joint Site from interfering with the remedial action (discussed in Section 11.3);

16.03 **Well Surveys.** Well surveys will be performed to monitor groundwater use within the area of groundwater affected by contamination at the Joint Site. As part of each statutorily-required 5-year review of the remedial action, and at other times as determined necessary by EPA, a well survey shall be performed for (1) the area within which groundwater contamination exists at concentrations exceeding ISGS levels, (2) the area in which pCBSA concentrations exist at detected concentrations, and (3) the area within one-quarter mile of the areas previously identified. Such well surveys shall identify public or private wells which exist, whether or not they are in operation. The well survey shall be a public record on file with EPA Region IX.

16.03.01 **Sampling of Wells.** For each previously-unidentified well identified in each periodic well survey, the well shall be sampled upon EPA's receipt of permission of access to the real property. Results of sampling shall be made available to the well owner as well as to any property owner who requests such results. Analytes for this sampling shall include the contaminants of concern for the Joint Site, including pCBSA.

16.03.02 **Actions If Contamination Is Found.** For each new well sampled as identified by the well survey, if contaminants of concern are found at concentrations exceeding ISGS levels, or if pCBSA is found at any concentration, the following shall occur:

- EPA shall inform the users and owners of the well of the findings, the health risks that may be associated with use of the water and, if appropriate, provide recommendations to the user as to how to avoid or eliminate those risks.

- EPA shall inform the State Department of Health Services, the State Department of Toxic Substances Control, the Regional Water Quality Control Board, and the Office of the Watermaster of the finding and ask that these agencies review the case of the well to see whether action under their own authorities can be used to prevent further exposure to contaminated water.

- EPA may issue non-interference orders, at its discretion, to prevent or limit operation of wells which may be found to exist within the contaminated groundwater at the Joint Site in the future.

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