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Record of Decision:

BROWN & BRYANT, INC. (ARVIN PLANT)
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July 1994

EPA Superfund
Record of Decision:

Brown and Bryant Arvin Facility
Site, Arvin, CA

BROWN & BRYANT, ARVIN FACILITY

FIRST OPERABLE UNIT

RECORD OF DECISION

PART I: DECLARATION

PART II: DECISION SUMMARY

PART III: RESPONSIVENESS SUMMARY

BROWN & BRYANT, ARVIN FACILITY SUPERFUND SITE
ARVIN, CALIFORNIA

United States Environmental Protection Agency
Region 9 - San Francisco, California

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PART I - DECLARATION
BROWN & BRYANT, ARVIN FACILITY
ARVIN, CALIFORNIA
CAD052384021

Statement of Basis and Purpose

This decision document presents the selected remedial action for the Brown & Bryant, Arvin facility in Arvin, California, which was chosen in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for the site.

The State of California concurs with the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the response action selected in the Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare or the environment.

Description of the Selected Remedy

This operable unit is the first of two planned operable units for this site. The first operable unit addresses the surface soil, the subsurface soil and the shallowest groundwater unit, the A-zone groundwater. The function of this operable unit is to address the principal threat at the site, the A-zone groundwater, and to address the surface soil exposure threat.

The major components of the selected remedy include:

- Extraction, treatment and reinjection of the shallowest groundwater unit;
- Consolidating contaminated surface soil on a 1.2 acre portion of the site and constructing a Resource Conservation and Recovery Act (RCRA) Subtitle C cap over it; and
- Capping the remaining portion of the site with a basic cap.

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy uses permanent solutions and alternative treatment technology to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted every five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

11-8-93
Date

John Wise
Deputy Regional Administrator

PART II - THE DECISION SUMMARY
BROWN & BRYANT, ARVIN FACILITY
ARVIN, CALIFORNIA

I. Site Name, Location and Description

The Brown & Bryant (B&B) Arvin facility Superfund Site is located at 600 South Derby Street in Arvin California, approximately 30 miles southeast of Bakersfield, California. A location map is shown on figure 1. Brown & Bryant was a pesticide reformulator and custom applicator facility from 1960 to 1989. Arvin is an agricultural community with a population of approximately 9,300 people. The site is located in a light industrial and commercial area, with a residential area located across the street.

The site includes a former waste pond in the southeast corner and a former sump area that has been excavated and replaced with clean fill.Run-off drains to the southern portion of the site between the waste pond and the sump and to a lesser extent to the southwest corner. The site is enclosed by a fence. A site map is shown on figure 2.

The site geology has been divided into two zones: the A-zone and the B-zone. The A-zone includes the unsaturated soil between the surface soil and the first groundwater, and the first groundwater unit, referred to as the A-zone groundwater. The B-zone includes unsaturated soil below the A-zone and the second groundwater unit, the B-zone groundwater. The B-zone extends to a depth of at least 250 feet and ends at a clay layer known as the Corcoran Clay which confines the drinking water aquifer below it. A conceptual site cross-section is shown on figure 3.

There are no wetlands or surface water within a half-mile of the site. Contamination at the site does not impact any surface water feature.

II. Site History and Enforcement Activities

Brown & Bryant was a pesticide mixer and custom applicator facility from 1960 to 1989. Contamination of the soil and groundwater resulted primarily from poor housekeeping, spills and leaks from a surface pond and sumps. In 1981, the facility was licensed under RCRA as a hazardous waste transporter. In 1983, the State of California required Brown & Bryant to conduct a site investigation and dispose of contaminated soil.

In October 1989, the Brown & Bryant site was listed on the National Priorities List. EPA immediately conducted an emergency response assessment and identified two areas needing immediate attention, a dinoseb spill area, and the groundwater which appeared to pose an imminent and substantial endangerment to the municipal drinking water. EPA treated the dinoseb-contaminated soil in the winter of 1991 under its emergency response authorities. The investigation of the threat to the municipal water well was conducted in the spring of 1991 by the Railroads, as described below.

At the time EPA became involved at the site, the State of California was evaluating a settlement with Brown & Bryant and its insurers to pay for past costs incurred by the State and the future costs of clean-up. EPA entered the negotiations to recover federal costs. The negotiations ceased in 1991, when the civil complaint filed by Brown & Bryant against its insurers in state court was dismissed for failure to prosecute.

In October 1990, EPA issued general notice letters to two other site property owners, Atchison, Topeka and Santa Fe Railway and Southern Pacific Transportation Company (the Railroads). In January 1991, EPA issued the Railroads an administrative order to conduct certain investigations of the groundwater at the site. The work was completed in August of

1992. While the emergency removal work and Railroad-conducted work were underway, EPA conducted a Remedial Investigation and Feasibility Study of the surface soil, subsurface soil and the first groundwater zone. The RI/FS report was completed in May 1993.

A final investigation covering the remaining groundwater zones was initiated in the fall of 1992 and is still in progress.

III. Highlights of Community Participation

The CERCLA requirements for public participation include releasing the RI/FS report and the proposed plan to the public and providing a public comment period for those documents. EPA satisfied these requirements by placing these documents, along with other administrative record documents, in the public information repositories at the Beale Library in Bakersfield and the EPA document center in San Francisco. EPA also mailed the proposed plan to interested individuals on the mailing list. Furthermore, EPA conducted a public meeting on July 6th, 1993 in Arvin where the proposed plan was presented and comments were accepted from the public. The notice of the public meeting was published in the Arvin Tiller on June 23, 1993 and El Mexicalo on June 24, 1993.

In addition to the statutory community participation requirements, EPA also sponsored several community outreach events to keep the community informed. This included three community interviews in February 1990, September 1991, and April 1992. The first and third community interviews were conducted to distribute factsheets and answer questions from the adjacent neighbors of the Brown & Bryant facility. The second community interview reached out to the larger Arvin community in order to determine the community's needs and interest. EPA also distributed four fact sheets to the community. The first three sent in February 1990, April 1991 and March 1992, explained the clean-up activities currently underway or expected to be started soon at the site. The final fact sheet included the proposed plan and was sent June 25th, 1993.

This decision document presents the selected remedial action for the first operable unit at the Brown & Bryant, Arvin facility site in Arvin California, chosen in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Contingency Plan. The decision for the site is based on the administrative record.

IV. Scope and Role of Operable Unit within the Site Strategy

EPA has divided the site into two operable units. The first operable unit includes the current source of contamination, the A-zone groundwater, and the surface and sub-surface soils. The second operable unit includes the deeper groundwater units.

The response actions selected in this ROD address the first operable unit. Response actions for the surface soils constitute a final remedy for the surface soils. The actions for the subsurface soil and the first groundwater are interim actions.

The primary objective for the subsurface soils and the A-zone groundwater response action is to control migration of the contamination in this zone to deeper groundwater. Based on the water production rates, the A-zone groundwater is not legally classified as a potential drinking water source. However, the B-zone groundwater is classified as a potential drinking water source. Therefore, the clean-up goal is to reduce the contamination levels in the A-zone to levels that would protect the B-zone groundwater. The A-zone has caused chemical levels in the B-zone groundwater to exceed maximum contamination levels set by EPA.

The A-zone groundwater is classified as a principal threat at the site. A principal

threat is characterized as a waste that cannot be reliably controlled in place, such as liquids and high concentrations of toxic compounds (e.g. several orders of magnitude above health based levels). The response action for the A-zone groundwater satisfies the statutory preference for remedies employing treatment that reduces toxicity, mobility, or volume as a principal element.

The primary objective of the surface soils response action is to prevent human and ecological exposure to the contaminated soil. The most contaminated soil was addressed in an emergency response removal in 1991. The remaining surface contamination is not considered a principal threat because it is not highly mobile, is not several orders of magnitude above health based levels and can be effectively controlled in place. The response action for the surface soils includes consolidation of soils exceeding health-based levels onto the southern portion of the site, containment (capping) and institutional controls.

V. Summary of Site Characteristics

The geology at the site is an alluvial deposit of alternating layers and mixtures of unconsolidated sands, silts and clay. The stratigraphy is very heterogeneous and layers tend to be discontinuous. The site geology has been divided into two zones. The A-zone includes unsaturated soil to 65 to 75 feet below ground surface (bgs) and includes the first groundwater unit, the A-zone groundwater. The base of the A-zone is a thin sandy clay layer from 75 to 85 feet bgs. The clay layer and the A-zone groundwater occur under the entire site but disappear within 900 feet south of the site. The B-zone includes unsaturated soil below the A-zone and the second groundwater or the B-zone groundwater at 150 to 155 feet bgs. The B-zone extends to at least 250 feet bgs and ends at a clay layer known as the Corcoran Clay which confines the drinking water aquifer below it. The thickness of this clay layer at the site is unknown. (See figure 3 for Conceptual Cross-section)

Surface Soil

Surface soil is defined to include the upper seven feet of soil. This depth includes a "construction zone", a depth where excavation might occur in the future for utility work. Sampling results from the surface soil identified dinoseb as the only contaminant of concern. The principal hot spot of dinoseb contamination occurs in the location of a former spill, along the east fence-line. High concentrations of dinoseb in surface soils were also found scattered in three other locations on-site and low concentrations were found over much of the site. The area of highest dinoseb contamination in the dinoseb spill area was cleaned in 1991; however, some soil contamination exceeding health-based levels still remains in this area.

Subsurface Soil

Soil contamination from a depth of seven feet down to the A-zone groundwater was found over much of the site, but was primarily concentrated under three areas: the sump area, the dinoseb spill area, and the waste pond and a topographic low area between the pond and the large storage tank in the southwest corner of the site. Within these three areas and over the entire site, six chemicals were identified as occurring at highest concentrations and to the greatest extent within the A-zone soils. These chemicals are 1,2-dichloropropane (1,2-DCP), 1,3-dichloropropane (1,3-DCP), dibromochloropropane (DBCP), 1,2,3-trichloropropene (1,2,3-TCP), ethylene dibromide (EDB), and dinoseb. All of these chemicals except for dinoseb are volatile organic chemicals.

Dinoseb was found concentrated in the top 30 feet of the spill area and then declined significantly in concentration down to the A-zone groundwater. In the pond and sump areas, the concentrations were significantly less than in the spill area.

Volatile organic contaminants were found in the subsurface over the entire site but were found in highest concentrations in the sump area. One boring in particular, boring I (located in the center of the sump), stands out for its exceptionally high concentrations. These contaminants were also found at significant levels in the area of the waste pond, and then were found in only relatively small concentrations elsewhere at the site. In the sump area, concentrations were highest from 20 and 30 ft bgs, but were also found at concentrations greater than 1,000 ug/kg over most of the A-zone within this area. 1,2-DCP was the volatile contaminant found at highest concentrations, followed by DBCP, TCP, EDB, and 1,3-DCP. In the area of the pond, concentrations were highest from 30 to 40 ft bgs, but in general were found fairly evenly distributed over the A-zone.

A-zone Groundwater

The same six chemicals found in the subsurface soils plus chloroform, were found in high concentrations in the groundwater. EPA's investigation determined that the total mass of contamination in the A-zone groundwater is significantly larger than was found in any other contaminated media at the site. Concentrations for each of the seven contaminants, except for 1,3-DCP, were found at levels as high as 1,000 to 100,000 ug/l. The highest concentrations were consistently observed in well AMW-2P, located near the sump, and at well WA-6, which is directly west of the sump, and at wells AMW-1P, EPAS-2 and EPAS-3, which are all located near the pond. The distribution of contaminants was consistent with the locations of the major source areas and follow a pattern consistent with the groundwater flow in the A-zone. In general, contamination was observed at slightly higher levels at wells near the pond when compared with the wells near the sump; 1,2-DCP was a notable exception.

1,2-DCP was found to be the most wide ranging contaminant in the A-zone groundwater and was at higher concentrations than any other contaminant. It was found over an area of approximately 5 acres at concentrations greater than or equal to 50 ug/l, or ten times the maximum contaminant level (MCL), and was detected at concentrations as high as 100,000 ug/l in well WA-6. The other six contaminants were also found over large portions of the A-zone groundwater unit, though to lesser extent than 1,2-DCP.

Groundwater in the A-zone flows in a generally southern direction, with some mounding of the water table observed from the southwest corner of the site extending south. Water levels measured during the RI have shown a steady decline in the water table, probably as a result of the long drought in California. The saturated thickness of the A-zone groundwater is from 0 to 10 feet. The hydraulic conductivity in this zone was measured at low levels of 10[-4] to 10[-6] cm/s, and from a slug test the groundwater velocity was estimated at 53 feet/year. Extraction of contaminated A-zone groundwater for site remediation is expected to be difficult due to its low permeability and thinness. Slug test results suggest that a yield of less than 100 gallons per day can be expected for wells in this groundwater unit.

B-zone Groundwater

The B-zone groundwater is actually composed of a series of groundwater units. All of the new wells in the B-zone were installed in the B-2 groundwater unit, located at approximately 170 feet bgs. The direction of flow in this unit is to the south, and the gradient is very flat (0.0004). Permeabilities are much higher than for the A-zone groundwater. The pump test indicted that wells could be pumped at 7 gpm for an extended period.

In the B-zone, 1,2-DCP was also observed at levels significantly higher than any other contaminant and was observed at least once in every well. The highest observed concentration of 1,2-DCP in the B-zone was 1,700 ug/l in well WB2-1, which is directly south of the site (the MCL for 1,2-DCP is 5 ug/l). Except for chloroform, the other principal contaminants from the A-zone

groundwater were also observed in the B-zone, though all at concentrations below 100 ug/l.

Fate and Mobility

The fate and transport of contaminants at the site are controlled by chemical specific properties and environmental characteristics and the interaction of these factors. Except for dinoseb, which is non-volatile, the key site contaminants are all volatile organic chemicals. All of the contaminants are relatively mobile in the environment. The volatile contaminants are transported in the environment as gases or in solution, whereas dinoseb is transported primarily in solution in the subsurface and in either solution or adsorbed to soil at the surface. All of the chemicals are weakly absorbed in soil, although the adsorption of dinoseb is pH dependent.

Probably the most important environmental factors influencing the fate and transport of contaminants at the site are the geology and the amount of water infiltrating into the A-zone. The site geology is a heterogeneous mixture of different soil types characteristic of an alluvial geology typical of that region. This type of geology results in a high degree of variability both vertically and laterally in the permeability of the soil material, which in turn results in spacial variability in the rate of contaminant transport at the site. Within the A-zone it was generally observed that finer grained sediments are more common below 30 feet until the A-zone groundwater is encountered. The base of the A-zone is a thin, mostly sandy clay unit that retards downward water movement.

Groundwater flow within the A-zone is very slow as a result of a low hydraulic conductivity. However, local variations in flow are expected due to difference in the lithology of this water bearing unit over the site; higher hydraulic conductivities are expected at the south-east side of the site where more sand was observed within this unit. Patterns of contaminant distribution in the A-zone groundwater are generally consistent with the direction of groundwater flow. The exact nature of water movement between the A-and B-zone is not known. The A-zone is expected to be leaky and it may be that there are preferential downward flow paths where the clay layer at the base of the A-zone thins out. At a soil boring located 900 feet south of the site this clay layer and the A-zone groundwater were not observed.

The infiltration of water into the A-zone is important because of its impact on contaminant movement in the vadose zone and as a source for the groundwater in the A-zone. The transport of dinoseb in particular is directly related to the amount of water infiltration because of its high solubility and low volatility.

VI. Summary of Site Risks

Site risks were formally characterized for the surface soil. A screening risk assessment was conducted for these areas to analyze only the dominant pathways and contaminants that may significantly contribute to site risk. Risks from ingestion of contaminated surface soil were characterized for a child and young adult, and risk from ingestion of contaminated soil in the construction zone was characterized for an adult worker. Each of these exposure scenarios exceeded the threshold for deleterious effects to human health for the maximum detected concentration and only the child exposure scenario exceeded the threshold for the average detected concentration.

The other dominant pathway of concern at B&B is potential exposure from ingestion of contaminated groundwater either as a result of contamination reaching the city well or from future use of the B-zone groundwater; there is no current exposure to contaminated groundwater above health levels. The screening risk assessment did not characterize this risk. Instead, concentrations in groundwater and predicted impacts from the modeling results were compared to drinking water maximum contaminant levels (MCLs) or other published health-based levels where

MCLs are not available. Contaminant levels in the B-zone groundwater exceeded MCLs in two wells for both 1,2-DCP and DBCP. Concentrations in the A-zone groundwater exceeded MCLs by orders of magnitude; however, because the A-zone groundwater is not a potential drinking water source, the concentrations are more important for characterizing the A-zone groundwater as a contaminant source that threatens the B-zone groundwater.

Based on data from the city well closest to the site, B-zone contamination is not currently impacting drinking water above health-based levels.

There is no significant ecological risks associated with the site.

VII. Description of Alternatives

This section provides the specific components of each alternative and explains the remediation goals and Applicable or Relevant and Appropriate Requirements (ARARs) as they apply to the specific alternative.

ARARs

The specific requirements that are applicable or relevant and appropriate for the Brown & Bryant site can be classified into chemical-specific regulations and action-specific regulations. There are no location-specific ARARs at this site. The ARARs at Brown & Bryant are:

State Water Resources Control Board, Resolution 68-16 (Anti-degradation policy).

Environmental Health Standards for the Management of Hazardous Waste,CCR Title 22, Div. 4.5, Chptr. 15

Article 9, Section 66265.170 - 66265.177 (Containers)
Article 10, Sections 66265.190 - 66265.200 (Tanks)
Article 11, Sections 66265.228 (Surface Impoundments, Closure)

Underground Injection Control Regulation, 40 CFR Parts 144-147

Although the A-zone is not a potential drinking water source, water re-injected into the A-zone should be treated to be protective, as required by State Board Resolution 68-16. This resolution offers a narrative description of anti-degradation policy. EPA believes that reinjection of water containing pesticides at the Maximum Contamination Levels (MCLs) under the Safe Drinking Water Act would comply with Resolution 68-16.

Title 22 of the California Code of Regulations (CCR) contains the State's RCRA-equivalent regulations. Although Brown & Bryant did not apply for interim status under RCRA, disposal of waste water into the sump and waste pond at the site constituted RCRA activities. Therefore, Brown & Bryant should have been classified as an interim status facility and the State RCRA regulations would be applicable. Specifically, the waste pond and the sump area are considered RCRA surface impoundment units and must be closed and monitored pursuant to 22 CCR [Para]66265.228.

Other RCRA-equivalent requirements for specific treatment units such as tanks, containers, etc. would be applicable, if used. The UV/Oxidation (UltraViolet/Oxidation) system, and the Granulated Activated Carbon (GAC) system if used, would be considered tanks. A variance for the secondary containment requirements in Title 22 CCR [Para]66266, will be invoked when design and placement of the tanks do not pose a substantial hazard to human health and the environment.

Underground Injection Control Regulations under the Safe Drinking Water Act regulate operation of underground injection wells. 40 CFR [Para]144.13 exempts actions under a CERCLA response from the prohibition against reinjection of treated hazardous waste into or above underground sources of drinking water. Therefore, reinjection into the A-zone is permitted. The part of the regulations (40 CFR [Para]144.12) that discuss well construction, operation and abandonment are relevant and appropriate.

Land disposal restrictions (LDRs) in 22 CCR [Para]66268 et seq are applicable in certain circumstances whenever there is placement of soil containing listed waste on the land. At Brown & Bryant, the soil contains listed waste. However, LDRs are not applicable if contamination is consolidated within one area of contiguous contamination. The Brown & Bryant facility is considered one area of contiguous contamination because the dinoseb surface contamination is prevalent all over the site without any specific operational boundaries. Therefore, the surface soil can be consolidated within the facility without triggering LDRs.

All the proposed action alternatives comply with the ARARs.

Remediation Goals

The A-zone groundwater is not a potential drinking water source; nor is the A-zone soil (excluding surface soil) a direct ingestion threat. Clean-up standards for these zones are developed by weighing the cost-effectiveness of cleaning up the zones to levels where they will no longer be a threat to the B-zone groundwater as compared to treating the contamination when it reaches the B-zone groundwater.

The strictest goal for the A-zone groundwater would be under the scenario where most of the contamination is captured in the A-zone and the remaining contamination would not be a threat to the B-zone groundwater. Two vadose models were run, one to model the volatile movement through the A-zone groundwater to the B-zone groundwater, and one to model the movement of dinoseb. A different model was chosen for dinoseb because it is non-volatile and watersoluble, and therefore has different transport characteristics (refer to the Remedial Investigation Report). Based on these models, clean-up goals for the A-zone groundwater have been set at ten and one hundred times the respective MCLs in order to keep contamination levels in the B-zone at or below MCLs.

<Figure>

Again, the ultimate goal at the site is to protect the B-zone groundwater in the most cost-effective manner. After the remedial investigation of the B-zone is complete and the extraction system in the A-zone is in operation, the final remediation levels for this zone will be determined within the above-stated range that takes into account the cost-effectiveness of meeting the strictest goals in the A-zone groundwater clean-up range. The final remediation levels will be set in the final ROD.

The subsurface soil contaminant levels were also evaluated with respect to protecting the B-zone groundwater. The vadose zone modelling showed that only one contaminant, 1,2-DCP, would pose a risk to the B-zone if a cap is installed. This contaminant could be captured in the A-zone groundwater prior to reaching the B-zone groundwater. EPA determined that it would be more cost-effective to capture the contamination when it reached the A-zone groundwater.

The remediation levels for the surface soil are based on health calculations considering the human ingestion pathway. Dinoseb was the only chemical found in the upper 7 feet in appreciable amounts. Since dinoseb is a systemic toxicant, the clean-up level was developed

based on the most sensitive subgroup, young children. The level for dinoseb, 80 milligrams per kilogram, was developed assuming a child ingests 0.2 mg/day of soil over a five-year period using calculations for RCRA no-action (Proposed Subpart S - Federal Register Vol. 55, No. 145, July 1990).

Alternatives

On the basis of the results of the remedial investigation, EPA identified six alternatives for addressing the soil and A-zone groundwater at Brown & Bryant. Detailed descriptions of these alternatives are provided in the RI/FS report which is located in the information repository. Costs for the alternatives are included in table 1.

EPA believes that controlling the A-zone groundwater is essential to protect against further B-zone groundwater degradation. Therefore, all the alternatives, except the no-action one, contain an extraction, treatment and reinjection system in this zone. Although EPA is confident that extracting contaminated water from the A-zone will be effective, there is uncertainty as to the number of wells and time frame required for remediation of the A-zone groundwater. Based on the current data, EPA estimates that it will take ten years to remediate the A-zone to the remediation goals and up to a five acre area of groundwater will be treated.

EPA intends to phase in the extraction/treatment/reinjection system to optimize design and control cost. The initial phase of the clean-up will include a limited number of wells. The limited system will be monitored to determine extraction effectiveness and the impact of reinjection on the formation. Expansion of the initial system will be made after the evaluation of the initial phase is complete. The time frame for remediation and area of attainment may change after investigation of the B-zone and completion of the initial phase of treatment.

The extracted A-zone groundwater will be treated using UV/Oxidation. Based on comments received during the public comment period, EPA will consider during the remedial design, the use of Granulated Activated Carbon (GAC) as either a post-treatment to the UV/Oxidation or as a primary treatment. Preliminary costs estimates indicate that the two systems are comparable in costs. A detailed cost estimate will be performed in the remedial design. If GAC is significantly cheaper, EPA will re-evaluate its decision on UV/Oxidation. EPA will also evaluate if it is cost-effective to treat the majority of the chemicals using UV/Oxidation and then use GAC for low contaminant concentrations where UV/Oxidation becomes less effective.

The extracted groundwater will be treated until it meets Maximum Contamination Levels established by State and Federal Regulations. After treatment, the extracted water will be reinjected into the contaminated portion of the A-zone to help flush out the remaining chemicals. Excess treated water will be discharged into the sewer system. The following table lists the contamination levels that the treatment system must meet before reinjection or discharge into sewer system.

<Figure>

Another element common to all the action alternatives is a multilayered/basic cap combination. Since the State Hazardous Waste Control Law (HWCL) is applicable and clean closure is not technically feasible, the RCRA Subtitle C landfill closure requirements will be implemented. This includes a RCRA Subtitle C multilayered cap encompassing the sump area, the waste pond area, and the dinoseb spill area, which is estimated to be 1.2 acres. The remainder of the property will be covered with a basic cap, such as asphalt, to minimize infiltration. To assure that the site remains safe after EPA completes the clean-up, deed restrictions or other institutional controls will be placed on the portion of the property having a RCRA cap to ensure that the cap remains safely intact and that the soil under the cap remains undisturbed in the

future.

What differentiates the alternatives considered are the actions proposed for addressing contaminated surface soil and subsurface soil. The alternatives include either consolidation of contaminated surface soil under the RCRA cap, treatment of contaminated surface soil and disposal off-site, or treatment of contaminated surface soil and disposal on-site. Also, the subsurface soil may be treated, under alternatives 5 and 6, using soil vapor extraction depending on the added value and cost of this additional treatment.

The selected remedy will undergo a review every five years to insure protection of human health and the environment as required by EPA when waste is left in place.

Alternative 1 - No Action

Superfund regulations require EPA to include consideration of a no action alternative for comparison with the other alternatives (#2 #6). EPA presumes that even if the no action alternative was selected, site monitoring would continue.

The Selected Alternative - Alternative 2 - Consolidation of Contaminated Soil, RCRA/Basic Cap, Extraction and Treatment of A-zone Groundwater

Under this alternative, like all the action alternatives, a RCRA Subtitle C cap will be placed on the southern 1.2 acres and a basic cap will be placed on the remaining property. Deed restrictions will be recorded to assure the cap remains intact. This alternative varies from the other alternatives in its handling of soil containing dinoseb in excess of the remediation level of 80 mg/kg. Approximately 70 cubic yards will be consolidated from the area outside the RCRA Subtitle C cap to that area. In addition, approximately 570 cubic yards of contaminated surface soil and 48,000 cubic yards of subsurface contaminated soil currently in the southern portion of the site will be covered by the RCRA Subtitle C cap. Included in this alternative, as well as all the other action alternatives, is an injection and extraction system that will flush the A-zone groundwater and treat it using UV/Oxidation prior to reinjection. It is estimated that ten pore volumes (approximately 35 million gallons) will be needed to reach the remediation goals.

Alternative 3 - Off-site Treatment of Some Surface Soil, RCRA/Basic Cap, Extraction and Treatment of A-zone Groundwater

Alternative #3 is similar to alternative #2 because it also includes a RCRA cap on the southern portion of site containing the sump and the waste pond, a basic cap on the remaining property, deed restrictions, and an injection and extraction system that will flush the A-zone groundwater and treat the extracted water prior to reinjection. This alternative differs from alternative #2 in that the dinoseb contaminated surface soil in the portion of the site not covered by a RCRA Subtitle C cap would be excavated and treated off-site rather than consolidated on-site.

Alternative 4 - On-site Treatment of all Surface Soils, RCRA/Basic Cap, Extraction and Treatment of A-zone Groundwater

Alternative #4 is also similar to alternative #2. However, instead of consolidation or off-site treatment of some of the soil as envisioned in the earlier alternatives, alternative #4 will treat on-site all surface soil with dinoseb in excess of health-based standards by soil washing. The treated soil will then be replaced back on-site. The volume to be treated is estimated at 570 cubic yards. All other aspects would be the same as described in Alternative #2, including a RCRA Subtitle C cap on the southern portion of site containing the sump and the

waste pond, a basic cap on the remaining property, deed restrictions, and an injection and extraction system that will flush the A-zone groundwater and treat the extracted water prior to reinjection.

Alternative 5 - Off-site Treatment of Some Surface Soil, RCRA/Basic Cap, In-situ Treatment of Deeper Soils, Extraction and Treatment of A-zone Groundwater

Alternative #5 is identical to alternative #3, except it includes an additional treatment technology, Soil Vapor Extraction, to remove volatile compounds in deeper soil (25 to 40 feet). All other aspects would be the same as described in Alternative #3, including off-site treatment and disposal of a small quantity of contaminated surface soil, a RCRA Subtitle C cap on the southern portion of site containing the sump and the waste pond, a basic cap on the remaining property, deed restrictions, and an injection and extraction system that will flush the A-zone groundwater and treat the extracted water prior to reinjection.

Alternative 6 - On-site Treatment of all Surface Soils, RCRA/Basic Cap, In-situ Treatment of Deeper Soils, Extraction and Treatment of A-zone Groundwater

Alternative #6 is identical to alternative #4, except it includes anadditional treatment technology, Soil Vapor Extraction, to remove volatile compounds in deeper soil (25 to 40 feet). All other aspects would be the same as described in Alternative #4, including on-site treatment of all contaminated surface soil, a RCRA cap on the southern portion of site containing the sump and the waste pond, a basic cap on the remaining property, deed restrictions, and an injection and extraction system that will flush the A-zone groundwater and treat the extracted water prior to reinjection.

VIII. Summary of Comparative Analysis

Overall Protection of Human Health and the Environment

The overall protection of human health and the environment criterion assesses each alternative to determine its effectiveness in reducing risks at the Site.

Alternative 1 offers no protection other than natural degradation and attenuation. All the other alternatives (2, 3, 4, 5 & 6) contain a technology to remove contamination from the A-zone groundwater in order to protect the B-zone groundwater. Without removing the contamination in the A-zone groundwater, the contamination would need to be captured in the B-zone groundwater. Alternatives 5 and 6 add an incremental protection by treating the A-zone soil. This incremental protection can also be achieved in alternatives 2, 3 and 4 by capturing the contamination when it reaches the A-zone groundwater.

Alternative 2 eliminates the exposure to highly contaminated soil by placing a RCRA cap over the southern third after all contaminated soil had been consolidated beneath the cap. Alternatives 3, 4, 5 and 6 also reduces the potential exposure to surface soils by either treating the highly contaminated surface soils before placing a RCRA/basic cap combination or placing a RCRA cap over the hot-spots. Alternatives 4 and 6 removes and treats the most highly contaminated soil.

Therefore, alternative 2 through 6 are protective of human health and the environment.

Compliance with ARARs

All alternatives, except alternative #1, will comply with the substantive requirements of the identified ARARs.

Long-term Effectiveness and Permanence

Alternatives are assessed for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will be successful. The alternatives that remove and treat the greatest amount of contamination will be the most permanent (alternative 5 & 6). However, all alternatives, except no action, treat the largest source of continuing contamination, the A-zone groundwater, and leave some contamination in the soil behind. Alternatives 2, 3 and 4, also offer a high degree of long-term effectiveness because the surface soil threat is addressed by removal and treatment or containment of the contamination. Also in alternatives 2, 3 and 4, the A-zone soils are controlled by limiting the movement of contamination in this zone. The long-term effectiveness of the alternatives that leave levels of contamination exceeding health-based levels beneath the RCRA-cap (alternatives 2, 3 & 5) is determined by the long-term maintenance of the cap.

All the alternatives that treat the surface soil (alternatives 3, 4, 5, & 6) have a strong probability of success because the treatment has already been demonstrated on-site to be successful. It is uncertain how the water-bearing zone will respond to the horizontal flushing and extraction component of alternatives 2, 3, 4, 5, & 6. It is anticipated that a significant volume of contamination can be removed. Finally, the effectiveness of the soil vapor extraction component in alternatives 5 and 6 is uncertain due to the heterogeneity of the soil layers.

Reduction of Toxicity, Mobility, or Volume Through Treatment

The alternatives are assessed on the degree to which they employ recycling or treatment that reduces toxicity, mobility or volume, especially with respect to the principal threats at the site. There are two principal threats at the site, the threat the surface soils pose to human exposure and the threat the A-zone groundwater poses to the B-zone groundwater, which is the first potential drinking water source at the site.

All alternatives except no action, alternative 1, actively address the principal threat to the B-zone groundwater by horizontal flushing and extracting contaminated A-zone groundwater. The extracted water will be treated to destroy the contaminants. The degree of reduction of the contaminants in the A-zone groundwater is unknown due to the uncertainty of the flushing/extraction process in a geologic formation containing clays. It is expected that the contaminated groundwater and the readily removable contamination on the soils in the saturated zone can be removed.

Alternatives 3, 4, 5 and 6, all actively reduce the volume to surface soil contamination by excavating the contamination and either, treating it on-site and returning the treated soil to the site, or treating a portion off-site and disposing of it at a hazardous waste landfill. Alternative 3 & 5 treat a relatively small volume of contaminated soil compared to the volume left beneath the RCRA cap. Alternatives 2, 3 & 5 reduces the toxicity of the surface soil contamination by eliminating potential exposure by installing a RCRA cap. The cap also reduces mobility of the contamination.

Alternatives 2, 3 and 4 reduce the mobility of the contamination in the A-zone soils by reducing infiltration. The A-zone soil contamination is a minor threat to B-zone groundwater. Alternatives 5 and 6 actively reduce the volume of volatiles contamination in the A-zone soil by removal with Soil Vapor Extraction (SVE). The degree of expected reduction in volume by active treatment is difficult to judge because of the heterogeneity of the geological formations in the A-zone soils. SVE will not remove dinoseb.

Short-term Effectiveness

Short-term effectiveness assesses for each alternative the short-term risks to workers and the community during implementation of an alternative, potential short-term environmental impacts of the alternative and the time until protection from any short-term risk is achieved.

The alternatives that propose excavation of contaminated surface soils (Alternative 2, 3, 4, 5 and 6) may pose a short-term fugitive dust risk to workers and the community. Dust control measures should be implemented. Alternatives 3 and 5 contain off-site transportation of hazardous waste which pose a short-term risk to the communities en route. Alternative 2 requires the minimal amount of soil handling; therefore, it poses the least significant short-term risk.

The flushing/extraction process for the A-zone groundwater proposed in alternatives 2, 3, 4, 5 and 6 poses no short-term risk to the community and the workers. It is estimated that it will take ten years to remediate the A-zone groundwater; however, neither the A-zone groundwater (which is not a potential drinking water source) nor the A-zone soil pose an immediate risk to the community or to the workers.

In-situ installation and operation of SVE in alternatives 5 and 6 requires little handling of contaminated soils, and thereby limits the risk of exposure to workers and the public.

Implementability

The ease or difficulty of implementing the alternatives are assessed with respect to technical feasibility, administrative feasibility and availability of services. All the alternatives that address surface soil contamination use either standard, proven technologies (alternative 2, capping and alternatives 3 & 5, off-site treatment and disposal, and capping), or an innovative technology (alternatives 4 & 6, soil washing and alternatives 5 & 6, soil vapor extraction). Soil washing was proven successful at the site by an EPA removal action. All these technologies are implementable.

The horizontal flushing/extraction procedure proposed in alternatives 2, 3, 4, 5 & 6, consists of installing extraction and injection wells. The installation of these wells are standard procedures. However, operation details such as recovery of injected fluid will require adjustment during the operation and may require a longer time for remediation.

The technical feasibility of soil vapor extraction is dependent on the ability to pull air through the silty sand and silt layers in the soil profile. These layers between 25 and 35 feet in depth contain the highest concentrations of 1,2-DCP.

Cost

Cost estimates for the six alternatives are presented in Table 1. The costs for the action alternative range from $9,193,000 to $10,923,000.

State Acceptance

The State of California through its Department of Toxic Substances Control, has been active participants throughout the RI/FS process. The State has been interested in protecting all he waters of California, and as a consequence, has been most interested in formulation of alternatives that protect the B-zone groundwater. Only alternative #1 does not actively address the source of contamination for the B-zone groundwater. The State would like to see an early action pump and treat on the B-zone groundwater.

The State concurs with the selected remedy.

Community Acceptance

Public comments on the proposed plan are presented in the "Responsiveness Summary" of this ROD. The comments received from the Arvin-Edison Water Storage District and the City of Arvin express concern with the cost of the selected alternative. Two other alternatives addressing the contamination were suggested by the Arvin-Edison Water Storage District, none of which included treating the water after extraction. Given that 1) the cost for the Water Storage District's proposal would probably not be significantly different from EPA's proposal, 2) the proposed alternative is not protective of human health and the environment, and 3) there is the statutory preference for treatment, EPA continues to prefer its selected alternative. The alternative selected has what EPA believes is the minimum amount of removal and treatment of contamination necessary to protect human health and the environment and comply with ARARs.

IX. Selected Remedy

Alternative #2 is the selected remedy for the first operable unit at the site. The goal of this remedial action is to prevent exposure to soil contaminated above health-based levels and to control the source of contamination to the B-zone groundwater. Based on the information obtained during the remedial investigation and analysis of all the remedial alternatives, EPA believes the selected remedy will be able to achieve this goal. Specifically the selected remedy is as follows:

- Move contaminated surface soil from the area not included in the RCRA Subtitle C cap to the waste pond and adjacent area where the RCRA Subtitle C cap will be placed. Remaining soil will be tested to confirm that all surface soil containing pesticides above health-based levels has been moved. In addition, the surface soil surrounding the site will be tested to assure that levels of contamination off-site do not exceed health-based levels. If any soil is found exceeding health-based levels, that soil will be consolidated under the cap.

- After consolidation of the contaminated soil to the southern portion of the site, the northern and western portion of the site will be regraded and covered with a basic cap, such as asphalt. The purpose of the basic cap is to control storm water runoff. This portion of the site will be considered clean.

- Institutional controls will be implemented which will consist of deed restrictions precluding residential use of the site and assuring that the RCRA cap area is maintained.

- A RCRA Subtitle C cap will be installed on the waste pond, sump area, dinoseb spill area and adjacent areas. The cap will be designed to prevent exposure and minimize infiltration.

- All capped areas will be maintained as appropriate.

- The A-zone groundwater will be extracted. After extraction, the water will be treated using UV/Oxidation, and/or possibly, GAC and then reinjected into the A-zone groundwater. Reinjection will be carefully monitored to ensure control of the extracted water. If the water required for reinjection is less than the water produced during treatment, the additional treated water will be discharged to the sewer system.

- The extraction/reinjection system will be phased in to allow for optimal design of the system. Reinjection rates will be monitored to prevent build-up of excess head of water that might spread contamination further. The number of extraction/reinjection

wells, location of these wells, and extraction and reinjection rates for the initial phase will be establishing during the remedial design. Expansion of the system will be considered after evaluating the effectiveness of the initial system.

- After completion of the remedial investigation of the second operable unit and the extraction and treatment system has been in operation long enough to estimate rate of contamination removal, an analysis of the cost-effectiveness of further A-zone treatment versus capturing in the B-zone shall be made.

- As required by the State Hazardous Substances Control Act, the period of groundwater monitoring will not be less than thirty years.

X. Statutory Determinations

Under CERCLA, EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. Additionally, the selected remedial action must comply with ARARs established under federal and state environmental laws unless a statutory waiver is justified. The selected remedy also must be cost-effective and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that permanently and significantly reduces the volume, toxicity, or mobility of hazardous waste as their principal element. The following sections discuss how the selected remedy meets these statutory requirements and preferences.

Protection of Human Health and the Environment

Threats to human health and the environment include ingestion and contact with contaminated soil and potential exposure to contaminated groundwater. The selected remedy partially addresses the threat of exposure to contaminated groundwater by controlling the greatest source of contamination, the A-zone groundwater. This source of contamination will be extracted and treated to maximum contaminant levels then re-injected into the A-zone groundwater. The A-zone groundwater will be treated to levels that no longer pose a threat to the deeper groundwater; or if the contamination can be more cost-effectively extracted from the B-zone, the A-zone groundwater will be treated to levels that are easily and quickly achieved.

The selected remedy addresses the threat of exposure to contaminated soils by consolidating all contaminated soil in one portion of the site, capping this portion with a high-quality, RCRA Cap, then implementing institutional controls.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

The selected remedy complies with all federal and state ARARs identified for the site. ARARs are discussed in more detail in the Description of Alternatives section.

Cost-Effective

While compiling the alternatives, EPA determined that source control was paramount to the overall clean-up of the site. If the A-zone groundwater could be remediated before the contamination reaches the B-zone, then the overall site clean-up costs should be greatly reduced. Extraction of a large mass of the chemicals early in the clean-up process should also reduce the time needed to clean up the site. In general, the less time needed to clean up, the less it costs. Because all the action alternatives contain this approach to treatment, the costs are comparable.

With respect to the subsurface soil contamination, the selected remedy addresses it by reducing contaminant migration with a cap and capturing any contamination in the A-zone groundwater if it migrates there. Since the treatment would already be in place, the cost for treating the additional contamination is nominal. It is the most cost-effective of the subsurface soil alternatives.

The selected remedy for the surface soil provides comparable overall effectiveness at the lowest cost.

Use of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy uses permanent solutions and treatment technologies for the principal source of contamination to the maximum extent practicable. The selected groundwater remedy will result in a reduction of volume, toxicity and mobility through groundwater extraction, treatment and reinjection of the groundwater. Continued monitoring will be conducted to ensure that the groundwater remedy is protective of human health and the environment. UV/Oxidation system is considered an alternative treatment technology.

While the selected remedy does not offer as high degree of long-term effectiveness and permanence for subsurface and surface soil as some of the alternatives that proposed aggressive treatment of these zones, it will significantly reduce the hazards associated with the contaminated soil. Since the remaining soil contamination will be capped, the impact to human health and the environment will be minimal as long as the cap is properly maintained.

Preference for Treatment as a Principal Element

By treating the A-zone groundwater, the selected remedy addresses the principal threat posed by the site through the use of treatment technology. Therefore, the statutory preference for remedies that employ treatment as a principal element is satisfied.

XI. Documentation of Significant Changes

The only significant change to the Brown & Bryant first operable unit (OU) interim remedy proposed in the Proposed Plan fact sheet dated June, 1993, involves the possible use of liquid phase GAC treatment technology in addition to or in instead of UV/Oxidation.

As a result of comments received during the public comment period, EPA preliminarily evaluated the use of a Granulated Activated Carbon (GAC) as post-treatment to UV/Oxidation or for primary treatment. Preliminary cost estimates show that the GAC and UV/Oxidation are comparable in cost. However, a more detailed cost comparison will be done in the remedial design. In addition to cost, EPA is required to consider other factors when selecting the alternative. CERCLA [Para]121(b) states "Remedial actions in which treatment permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances .. as a principal element, are to be preferred over remedial actions not involving such treatment." In addition, "The President shall select a remedial action that is protective of human health and the environment, that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable."

After the detailed cost comparison is completed, EPA will evaluate the selected technology, UV/Oxidation, with respect to cost as well as other statutory preferences. EPA may modify the use of UV/Oxidation to include GAC.

The impact of this potential change is cost. The time to complete the project, the clean-up goals and the reinjection levels will remain unchanged.

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Figure 3: Brown & Bryant Media of Concern
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PART III - RESPONSIVENESS SUMMARY
BROWN & BRYANT, ARVIN FACILITY
ARVIN, CALIFORNIA

This section provides EPA's response to comments received on the proposed plan for cleanup of the first operable unit at the Brown & Bryant site. The responsiveness summary includes two parts. The first part is a summary of major issues and concerns raised by the comments and a summary of EPA's response. The second part includes verbatim each comment received and EPA's detailed response to each comment. Comments from the local community are included from page 29 to 34, comments from the State of California are included from page 34 to 39, and comments from the Potentially Responsible Parties (or their representatives) are included from page 39 to 83. In the event of any conflict or ambiguity between the two parts, refer to the detailed analysis in the second part.

SUMMARY OF RESPONSE TO COMMENTERS' MAJOR ISSUES AND CONCERNS

Summarized below are EPA's response to major issues and concerns from the public in and around Arvin, the State of California, and Potentially Responsible Parties for the site.

An alternative cleanup proposal was received from the Arvin-Edison Water Storage District, and was supported by the Arvin City Council and State Assemblyman Jim Costa. The proposal calls for diluting the contaminated A-zone groundwater with irrigation water used for local irrigation or with irrigation water two and a half miles away in the Arvin-Edison South Canal, a larger water volume than available in local irrigation canals. The commenter estimates that its proposal would cost approximately $100,000; the letter gives special emphasis to the cost saving, which, if true, are substantial. The proposal emphasizes that the contaminants in question have for years been used at much higher concentrations on local farmlands. Also, the proposal requests a variance from any regulations that may preclude its approval.

EPA's response to this proposal focused on three concerns: the actual cost of the proposal, the possibility for dilution of the contaminants to safe levels, and specific legal issues regarding the proposal.

As to the actual cost of this proposal, EPA believes that the estimated cost does not take into account some important cost factors. Specifically, the cost estimate does not include the cost of extracting the contaminated groundwater, capping the site, and monitoring and maintenance for these two remedy components; all of these costs are still required under the commenter's proposal. EPA estimates these costs at approximately $5.5 million. EPA also calculated rough cost estimates for construction of a two and a half mile pipeline and maintenance of the pipeline for ten years. EPA's cost estimate used a simple PVC pipe which would not meet hazardous waste handling laws and it excluded right-of-way costs. With these cost limitations, EPA estimated the commenter's proposal would cost at a minimum, $6.2 million, or approximately $3 million less than the EPA preferred alternative.

EPA also evaluated whether the flow in the south canal would provide enough water to dilute the contamination to levels equal to the drinking water maximum contaminant levels (MCLs). EPA's analysis found that at high flow rates the canal does not provide enough water to meet the MCL for ethylene dibromide (EDB), and at low flow rates, such as during the winter, other contaminants would not be diluted enough.

Finally, there are regulatory requirements in Federal and State laws that would prohibit this disposal option. EPA would not be able to waive these regulations.

EPA also received a request from the Arvin Community Services District, which supplies the

city's drinking water, for EPA to consider replacing city well #1, located near the site. EPA will consider this proposal as part of the second operable unit RI/FS for the site. This investigation will give a better picture as to the threat contamination may pose to the city well. However, EPA's current policy prefers treatment of contaminated drinking water at the well head rather than relocating the well.

Finally, EPA received comments from the Sierra Club, Kern-Kaweah Chapter. Its comments consisted of three questions. One question regarding the potential impact of storms or earthquakes on the cap, a second regarding the future uses available for the site, and a third regarding the safety of diluted dinoseb. EPA responded to each of these questions in the detailed response to comments.

Comments were received from one State agency, the Department of Health Services, which is currently preparing a follow-up to a 1989 health assessment. Most of its comments concern the possibility that EPA did not adequately evaluate other areas of the site or other chemicals in determining the risks associated with the site. Its concerns involve off-site contamination at the surface and subsurface, on-site waste piles, and the evaluation of risks from probable human carcinogens at the site. EPA believes that a significant risk at the site has not been overlooked; however, detailed analysis of all potential contaminant pathways was intentionally limited in the Remedial Investigation/Feasibility Study (RI/FS) Report. EPA focused on the principal threats at the site in its RI/FS Report. Largely in an effort to use its limited resources as efficiently as possible, EPA limited the level of investigation it put into the pathways that showed little or no probable concern, or when the pathway did not alter the proposed remedy or the cleanup standards.

The majority of comments were received from Potentially Responsible Parties (PRPs) for the site or their representatives. Comments on the Remedial Investigation (RI) Report focused in particular on EPA's modeling of contamination in the subsurface soil, and EPA's analysis of site geology and hydrology.

Both comment letters contend that EPA overstated the potential impact from soil contamination as a result of conservative and/or oversimplified assumptions made in modeling the contaminant transport. The comments contend that EPA arrives at more stringent cleanup requirements than are necessary as a result of its analysis. In response, EPA points out that the remedy EPA selected does not call for treatment of contaminated soil; therefore, the conclusion that EPA established overly stringent cleanup requirements for soil is false. EPA's only treatment remedy for the soil is to cap the contaminated soil. The cap is also required by RCRA regulations.

Comments on the site geology and hydrology generally contend that EPA's analysis is deficient or incomplete. EPA recognizes that the geology and hydrology at Brown & Bryant is complicated. However, with data available from approximately 100 soil borings and 25 groundwater wells, EPA believes that the data and analysis in the RI Report is adequate for the purpose of selecting a remedy. EPA recognizes that additional information or analysis is needed in order to complete the design of the remedy. This analysis will occur in the design phase of remediation.

Comments on the Feasibility Study (FS) Report focused on a number of potential factors that may come into play in the ultimate design of the remedy. The comments generally raise specific concerns that will be addressed during the remedial design, but do not need detailed analysis at this point. However, in recognition of the number of complicated variables that will go into the design of the remedy, EPA has proposed to phase in the remedy so that the design can be perfected as it is implemented.

One comment on the FS Report questioned whether granulated activated carbon (GAC) might be a more cost effective technology for treatment of the A-zone groundwater. In response, EPA reviewed cost estimates for GAC and determined that the costs are comparable to UV/Oxidation. As a result, EPA will conduct a more detailed analysis of GAC during the remedial design phase and may also consider the use of GAC as a post-treatment to UV/Oxidation

Finally, the PRPs commented that action on the A-zone should be delayed until the B-zone RI/FS is complete so that the entire site can be evaluated together. EPA is opposed to delaying action on this first operable unit because it addresses the portions of the site were the most contamination occurs. EPA has given priority to this action in order that the contamination problem does not spread to a wider area and potentially result in even greater cleanup costs.

DETAILED RESPONSE TO COMMENTS

Comments from the Arvin-Edison Water Storage District:

1. The Arvin-Edison Water Storage District consists of 132,000 acres in the Southeastern portion of the San Joaquin Valley. The community of Arvin lies within the District.

We have followed EPA's activities related to the Brown and Bryant Superfund Site in Arvin, the last of which was a public meeting held in Arvin, July 6, 1993. In addition, we have reviewed in detail the material handed out at that meeting and submit the following as a much less expensive means of disposing of the contaminated water. We believe that our suggested alternatives could be accomplished by an expenditure of approximately one hundred thousand dollars, a fraction of the ten million dollars estimated in your outline.

ALTERNATIVE A.

Pump the contaminated water, transport it east and south to the adjacent farming areas and commingle it with irrigation water applied to crops at dilution rates which will provide assurances that it will not present a health hazard or contaminate the underlying aquifers.

ALTERNATIVE B.

Pump the contaminated water, transport it east approximately two and a half miles to the Arvin-Edison South Canal and commingle it with canal water at much greater dilution rates than possible under Alternative A.

We understand from discussions with EPA staff that dilution as a means of dissipating contaminants is not acceptable to EPA. In this regard, we would like to emphasize that for many years the materials listed as contaminants at the Brown and Bryant Site were widely used in all farming areas at much higher concentrations than would be present in a diluted form if one or both of the methods described herein are used, yet they cannot be detected today. Further, we believe that if EPA regulations preclude the use of the dilution method, it is logical that some sort of variance could be obtained.

What is outlined herein is intended to be conceptual and will require more study before it can be properly evaluated. Among other things, studies will need to confirm that the commingling supply would not be harmful to crops which we are confident can be demonstrated. In addition, EPA or others would be required to indemnify those involved in the disposal process from any liability arising out of the use of the commingled water.

If the above conditions can be met, Arvin-Edison, would like to assist in restoring the Brown and Bryant superfund Site if one or both of the concepts outlined above would be acceptable to

EPA. District activity could also possibly include an alternative to RCRA's cap.

In summary, we believe that Arvin-Edison has a vested interest in this activity because of its responsibility in protecting the groundwater underlying the District. Further, we believe that the District Engineering and Field Staff, by virtue of its training experience, and local knowledge has the ability to assist in the clean-up of the Brown and Bryant Superfund Site a substantially less cost than that estimated by EPA.

Response: This proposal was evaluated with respect to technical and legal considerations. The technical considerations were cost and protection of human health and the environment. EPA evaluated whether the flow in the canal would be sufficient to dilute the contaminated water to or below the maximum contamination levels. Even under the most favorable scenario, high summer flows and expected average concentrations, EDB would never be diluted to MCLs. Two other chemicals, DBCP and 1,2-DCP, would be sufficiently diluted in high flows but not during the low flows in the winter.

The aspects of EPA's alternative that would change under the commenter's proposal is the treatment system (cost $650,000) and the operation and maintenance of such system (cost $3.62 million). The costs in common to both EPA's alternative and the commenter's proposal, the extraction system, the cap, monitoring and O&M, would remain at $5.96 million. EPA estimates that a pipeline would cost $370,000 and have a present worth value of annual costs of $350,000. Therefore, the total cost for the commenter's proposal is $6.68 million, approximately $2.5 million less than EPA's selected alternative (See comments 59 & 62 concerning revisions to EPA's alternative original cost estimate). The pipeline envisioned during EPA's cost estimate would not comply with State or Federal requirements for pipelines transporting hazardous substances, nor does it include right-of-way costs. Compliance with such regulations and acquiring right-of-way would drastically increase the cost.

There are also many legal implications that would arise as a result of the proposal to commingle contaminated, untreated water extracted from the A-zone groundwater into the Arvin-Edison South Canal for irrigation uses. For example, regulations under the Resources Conservation and Recovery Act (RCRA) would apply because: 1) dinoseb is a listed hazardous waste under RCRA (40 CFR Part 261.33) and 2) the activity at the site would constitute disposal as defined by RCRA. Disposal of dinoseb contaminated water, in particular, triggers a number of significant RCRA requirements. As a result, EPA would be prevented from simply dumping the untreated water into the canal as a means of dilution. At the very least, EPA would be required to haul off-site the dinoseb contaminated water to a proper treatment, storage or disposal facility.

Additionally, the State and Regional Water Boards are authorized to take enforcement action to protect the quality of waters of the State, such as the Arvin-Edison South Canal, based on various environmental regulations. For example, the State Board has established Regional Water Quality Control Plans that set forth beneficial uses and numerical and narrative standards to protect surface water quality. Additionally, State Board Resolution No.68-16 (Antidegradation policy) states that the disposal of wastes into the waters of the State shall be so regulated to achieve highest water quality consistent with maximum benefit to the people of California. This policy generally serves to restrict discharges from reducing the water quality of surface waters even though such a quality reduction might still allow the protection of the beneficial uses associated with the water prior to the quality reduction.

Secondly, with respect to the concept of disposing of the contaminated water in the canal as a selected remedy, EPA is guided by the statutory preference that treatment of contamination rather than non-treatment be achieved. Section 121 of CERCLA states: "Remedial actions in which treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances, pollutants, and contaminants is a principal element, are to be

preferred over remedial actions not involving such treatment." 44 U.S.C. [Para] 9621. Because treatment of dinoseb is available for the Brown & Bryant site, dilution would not be the preferred remedy.

Finally, the proposal notes that EPA may be required to indemnify those involved in the disposal process from any liability arising out of the use of the commingled water. EPA does not enter into indemnification agreements for reasons including that such an agreement would constitute an unauthorized appropriation of federal funds.

Comments from Arvin Community Services District:

2. The Arvin Community Services District's well #1 has been a concern of the U.S. EPA, the California State Health Department, and the Kern County Health Department, as well as the Arvin Community Services District, for a number of years because of the close location of the Brown and Bryant site to the well. The well has been sampled by the Arvin C.S.D. and EPA for a number of years for contaminants that were found at the Brown and Bryant site as well as other pesticides, organics and inorganics. I first began testing well #1 in 1985 at the request of the Kern County Health Department for contaminants found at the Brown and Bryant site. Although the drinking water produced by well #1 has not currently been affected by the contamination at the Brown and Bryant site, there is still a concern that the drinking water could some day be affected by that contamination.

Because of this concern the Arvin Community Services District would like to request that some of the funds that have been appropriated for the clean up of the contamination of the Brown and Bryant site be used to relocate well #1 to another location in Arvin that would be further from the Brown and Bryant site. A map has been enclosed to show one possible location as to where to relocate the well. Other locations may also need to be looked at as possible relocation sites because of the travel effects of the contaminants found at the Brown and Bryant site. In any effect another location to replace well #1 would help eliminate a lot of the present concerns about the close proximity of well #1 to the Brown and Bryant contamination.

Response: The purpose for this proposed remedial action is to address the source of contamination, the A-zone groundwater, and the surface soils. The deeper groundwater layers will be addressed in the next proposed plan. Well #1 draws indirectly from the deeper groundwater; therefore, it will be addressed in the next proposed plan.

In the past, EPA has selected remedial actions that reguire relocation of municipal wells that were impacted by contamination. However, EPA has written a new policy with regard to municipal wells where EPA would pay for cost associated with treating the contaminated water from the municipal well, not relocate the well. Since well #1 is not currently impacted from the contamination, EPA presently would not relocate the well.

Comments from the Sierra Club, Kern-Kaweah Chapter:

3. Could the cap be disturbed by windstorms, like the one we had here 12/77, or an occasional earthquake, or another Caliente Stream Group flood? If so, would there be any danger? Would costly repairs be needed? Who would pay for the repairs?

Response: The RCRA cap proposed for the site will be a multilayer cap designed to meet the Federal and State requirements for such caps. A RCRA cap is commonly used at hazardous waste sites around the State and country. Damage to the cap may occur during a very unusual storm event or large earthquake; however, severe damage would be very unlikely. Any damage to the cap would be repaired in accordance with State RCRA regulations; the costs associated with such repairs will vary depending on the type of repair. The State has requested that the cap be

designed to minimize as much as possible the long term maintenance and monitoring costs. Any damage to the cap is not expected to pose any short term danger to the public and prompt repair will ensure that there is no long term impact.

4. After clean up, is there any agricultural, industrial, residential or recreational or wildlife use for this area? Does usefulness vary with the alternative chosen?

Response: The future use of the property will be different for the portion of the site under the RCRA cap as compared to the rest of the site. More than likely, the area with the RCRA cap will not be available for any future use for at least 100 years, after the required cap maintenance period is over. The remainder of the site should be available for any type of use after clean up. Most likely, the area will be used for light industrial or commercial purposes, which is consistent with current land use in the area of the site. The different alternatives do not affect the future land use because all alternatives include the capping requirements.

5. A recent Bakersfield Californian article says the Arvin-Edison Water Storage District would dilute the contaminated water. Has exposure to diluted dinoseb been shown to be safe for pregnant women, infants, and all genetic varieties of other people, including those exposed to unknown amounts of other substances humans did not evolve with?

Response: A discharge of dinoseb to the environment, such as was proposed by the Arvin-Edison Water Storage District, would require that dinoseb concentrations be reduced to at least the drinking water Maximum Contaminant Level of 7 ug/l. This concentration is the lifetime health advisory determined for dinoseb. The lifetime health advisory is considered protective of noncarcinogenic adverse health effects over a lifetime exposure. It is derived from the no-observed-adverse-effect-level (NOAEL) for dinoseb developed from animal studies and assumes a lifetime exposure. The level is further reduced by taking into account uncertainty factors and assuming that exposure from other sources may also occur during a lifetime.

Long-term health effects on humans from exposure to dinoseb have not been documented. The health effects data used to develop the lifetime health advisory was based on animal studies. At high levels, dinoseb is toxic to humans. Animal studies also suggest that dinoseb, at concentrations well above the lifetime health advisory level, affects liver and kidney functions and fertility, and may cause birth defects in pregnant women. Dinoseb has not been shown to be a possible carcinogen.

Please also see our response to the Arvin-Edison Water Storage District's proposal.

Comments from the California Department of Health Services:

6. During our site visit, we observed that the north gate had become removed from its hinges and a portion of the fence on the south border of the site was bent so that trespassers could easily enter the site from either side. Graffiti was observed on the walls of the warehouse office, attesting to the presence of trespassers. Better security measures are needed to ensure that trespassers, especially children, are not exposed to surface soil contamination from the site.

Response: EPA has already taken measures to better secure the gate and will inspect the rest of the fence and make additional repairs as needed. We will also continue to monitor for evidence of trespassers and openings in the fence so that appropriate measures can be taken to help prevent trespassing.

7. A large pile of soil was observed at the northeast corner of the site. No vegetation was growing on it, in contrast to a similarly large soil pile at the center of the site. The

pile was not marked or covered and it was not clear whether it had been sampled for contaminants. If this pile contains high levels of Dinoseb (or other contaminants), it could create an exposure pathway of fugitive dust inhalation exposure to neighboring workers or children playing near the site. We recommend that the pile be covered with a tarp until sampling shows that contaminant levels are low, or it is remediated.

Response: The soil pile in the northeast corner of the site is from drill cuttings that had low levels of contamination. This pile was treated with a soil sealant to minimize dust dispersion. The second pile is from berm material that was used during the emergency response clean up activities; it is nonhazardous. Since the first pile has been previously sampled and also treated with a sealant, EPA does not plan to place a tarp over it. However, these piles will be put under the on-site RCRA cap for final disposal.

8. No off-site surface soil sample results were analyzed in this RI/FS, even though the two highest surface soil results for dinoseb on the site were each located within approximately one foot of the south and east fence line (figure 4.1). These samples (locations #110 and #C) showed concentrations of 5200 mg/kg (Table 6.1) and 7400 mg/kg (Table 6.2) respectively. The only indication of off-site soil sampling is Figure 2.3, the Kennedy Jenks Soil Boring Location Map. However, the RI/FS states that U.S. EPA chose not to incorporate these results "due to resource limitations and because the data K/J collected was not within the scope of EPA's RI/FS" (p. RI 2-7).

Given these high surface soil levels so close to the fence line, a critical data gap exists as to the levels of surface soil contaminants outside the fence lines. Additional off-site surface and subsurface soil sampling needs to be done in order to determine whether a current completed exposure pathway exists for children or other residents and neighboring workers to off-site surface soil contaminants. This data is essential to determining whether the proposed RCRA cap needs to be extended off-site or other types of remediation need to be considered.

Response: EPA did collect soil boring samples from the top one foot at off-site locations. These samples are from soil borings V, Z and AA, located near the dinoseb spill area, and soil borings T, HH, MM and NN, located south of the site (see Table 4.3 and Figure 2.1 of the RI Report). Concentrations from these samples were all well below the cleanup standard of 80 mg/kg for dinoseb proposed in the Feasibility Study. However, to ensure that off-site areas located near to dinoseb hot spots are at acceptable concentrations, EPA will collect additional off-site samples during the remedial design phase for the remedy.

9. The RI/FS does not evaluate migration patterns of soil contaminants off-site. Based on Figures 2.1 through 2.5, it appears that essentially no off-site subsurface soil samples were taken by U.S. EPA since the Emergency Response sampling event ending in May 1990. Kennedy Jenks off-site soil samples taken between June 1991 and April 1992 were not evaluated as part of this RI/FS. This data gap is of particular importance in determining whether a potential future exposure pathway exists to nearby residences. In particular, soil gas emission from volatile organic chemicals in subsurface soils should be considered.

The U.S. EPA's preferred Alternative #2 does not directly remediate subsurface soil, stating that "horizontal soil flushing will also treat the readily removable contamination from the soil in the saturated zone" (pg. FS-5-2) If off-site subsurface soil migration of chemicals, particularly suspect human carcinogens, is moving southwesterly toward the nearby residences (as is the pattern for A-zone groundwater contaminants), direct soil remediation, such as the soil vapor extraction method included in Alternatives #5 and #6 may be required. In addition, evaluation of off-site subsurface soil contamination is needed to determine whether the proposed RCRA cap should be extended off-site.

Response: Based on existing data from EPA's Emergency Response sampling, EPA believes that there is no threat to nearby residences from soil gas emissions and that additional data or analysis is unnecessary. Four soil borings (T, HH, MM & NN) were sampled by EPA between the nearby residences and the site (see figure 2.1 in the RI Report). None of the target volatile chemicals were detected in soil at a depth less than 60 feet. A similar pattern is found in the Kennedy-Jenks data. Based on the absence of contamination from the EPA soil borings, additional data collection or analysis of this pathway was determined to be unwarranted. Subsurface soil contamination also does not migrate laterally at the speed and to the extent that contamination in groundwater migrates laterally. Some contamination will migrate upwards from the groundwater, but because of the depth of the A-zone groundwater, it would not be expected to pose a threat to nearby residences; furthermore, the A-zone groundwater remediation would address such a threat by reducing the source for the vapor emissions.

10. Dinoseb, a non-carcinogen, was the only chemical of concern evaluated in this RI/FS. Several contaminants found in surface and subsurface soil are classified by U.S. EPA as B2 carcinogens (probably human carcinogens). These include 1,2-dichloropropane, chloroform, hexachlorobenzene, DBCP and ethylene dibromide. Risks from these chemicals were not evaluated in the risk assessment portion of the RI/FS. Inclusion of these carcinogens in the risk assessment would likely increase the overall potential risks to the public significantly, and would provide a more accurate basis on which to make remedial decisions.

Response: The risk assessment performed by EPA for B&B includes elements that are part of an ongoing effort by EPA to develop more streamlined and cost effective investigations at Superfund sites. In evaluating the risks from surface soil contamination (i.e., the contamination in the top 7 feet of soil), EPA chose to analyze only the most dominant pathways and contaminants. Two factors were considered in taking this approach. First, EPA chose to focus its investigation on the pathways and contaminants that produce a potential risk sufficient to meet the statutory requirement that an unacceptable risk be present in order to take a remedial action. Additional analysis of the risks would not change this finding. Second, EPA felt that additional analysis of the risks would only be appropriate if the analysis might change the proposed remedies.

Dinoseb was identified as the only contaminant of concern for surface soils after first screening out all contaminants that were not surveyed at the site at greater than 5% frequency, and then screening out any remaining chemicals that were not detected in surface soils at concentrations above health-based levels of concern. Only dinoseb remained after conducting this screening. Of the chemicals mentioned in the comment, only DBCP, hexachlorobenzene and 1,2-dichloropropane were detected at greater than 5% frequency in surface soils. Because the highest concentrations observed for these chemicals do not pose a significant health risk in surface soil (see section 6.1 of the RI Report), no further analysis for these chemicals was conducted.

As for the risks associated with contaminants within the remainder of the A-zone, the only exposure route of concern identified by EPA is the potential exposure that may result from the contaminants reaching the B-zone groundwater, a potential drinking water aquifer, or from contamination of the nearby City well. Instead of conducting a risk assessment for this exposure pathway, EPA relied on drinking water Maximum Contaminant Levels (MCLs) or other health based levels for evaluating the potential risks associated with these chemicals. By this approach, EPA does include the
potential carcinogens found at the site in its analysis. The proposed cleanup for the A-zone groundwater is intended to address the risks from the variety of organic chemicals found in this groundwater zone and not just dinoseb. A groundwater risk assessment may be a component of the second operable unit RI/FS for the site.

11. The A-zone aquifer was eliminated as a pathway because water production was shown to be 90 gal/day, well below the EPA guidance of a minimum of 200 gal/day to be defined as a public water system. However, the slug tests for water production were taken before the rainy season of 1992-1993 and therefore sample results may be atypically low. In addition, no well survey was made to determine whether nearby residential irrigation or drinking water wells were in use.

Response: While the slug test was conducted during the extended California drought, EPA does not believe that the results would change significantly based on the following observations: First, this water bearing unit is characterized by thin bedded clays, silts and sands, that inhibit the ability of this formation to produce and sustain a substantial flow of water. Second, the A-zone has consistently shown evidence of low water production as indicated by how some A-zone wells were consistently purged dry during sampling and exhibited poor recovery, with little difference observed seasonally and over time. Finally, while there may be seasonal changes in water production from the A-zone, EPA believes that the 200 gal/day criteria needs to be attainable year round. Based on these factors, EPA maintains that the A-zone is not a drinking water zone.

As for other wells located near the site, EPA has compiled drilling logs from these wells. However, none of these wells actively pump water from either of the A or B-zones, so they would not influence the results of the slug test.

12. The B-zone aquifer was not evaluated in this RI/FS because U.S. EPA has decided to consider this aquifer as a second operable unit. However, since it is a potential drinking water source and is potentially connected to the deeper drinking water aquifer via City Well #1, it needs to be fully characterized and remediated as soon as possible. A timetable for addressing B-zone remediation needs to be established and cleanup initiated in the near future.

Response: EPA has already begun the B-zone RI/FS and expects to begin field work this fall. A proposed plan for remediation of this zone is planned for the end of next year. EPA is also considering some early action on the B-zone to address the area of highest contamination.

Recent data collected on the B-zone indicates a dramatic decrease in concentrations at the most contaminated well, WB2-1. Concentrations of 1,2-dichloropropane have decreased steadily from a high of 1,700 ug/l in April 1992 to 50 ug/l in June 1993. No significant increases in contamination have been observed over the same time period in any of the B-zone wells.

13. The RI/FS states that "deed restrictions or other institutional controls would be placed on the property to ensure that the cap remains safely intact and that the soil under the cap remains undisturbed in the future" (p. FS-1-2). These deed restrictions need to be spelled out to ensure that future commercial use of the property does not result in exposure to surface or subsurface soil contamination. For example, under what conditions will a future owner be allowed to disturb either of the caps covering the site? Will buildings with foundations be allowed? Will EPA or other regulatory agencies oversee future site activities? Who will be responsible for upkeep of the caps, and for how long?

Response: The details of deed restrictions for the site will be developed during the remedial design for the caps. It is anticipated that construction will be prohibited on the RCRA cap and that this area will be kept off-limits from future use, at least through the completion of cap maintenance. The cap will be maintained in accordance with the State RCRA regulations that require 30 years of monitoring and 100 years of maintenance of a RCRA cap.

The remainder of the site containing the "basic cap" will include at least short term deed

restrictions to ensure that the cap is maintained to control surface water drainage. New structures will likely be allowed as long as the drainage control is not impacted. Following the completion of the A-zone groundwater cleanup it may not be necessary to keep this cap in place; such a decision will probably be deferred until that time. Both EPA and the State will have input to future site activities. EPA is required to conduct a five year review of the site every five years from when the remedy construction starts.

Comments from Southern Pacific Transportation Company and The Atchison, Topeka and Santa Fe Railway Company:

14. In general, the Draft RI is deficient because it does not present a sufficiently developed conceptual model of the geology and hydrology of the Site, and because the fate and mobility modeling conducted to evaluate the potential effects of chemicals found in soils and groundwater is overly conservative and overstates the potential for additional migration.

The critique presented herein focuses on factual errors in the text and tables of the report and on deficiencies in the basic assumptions utilized in fate and mobility modeling. Because of these errors and the incorrect assumptions utilized, the conclusions made by the EPA regarding potential impacts to groundwater and consequent soil cleanup criteria are incorrect. Therefore, the Draft RI does not present a sound or adequate basis for the recommended remedial activities.

Response: EPA stands by its analysis of site conditions in the RI Report and has responded to each detailed comment on the RI Report below. The comments focus in particular on the vadose zone modeling conducted by EPA and challenge the assumptions used by EPA in its modeling. The comment incorrectly concludes that EPA draws overly conservative cleanup requirements from the modeling. As explained below, EPA in fact concluded not to select the soil cleanup remedy for the A-zone soils. In addition, EPA relied primarily on data collected in the field, not the modeling results, to determine the appropriate action for the groundwater.

15. The RI text and figures are inconsistent with regard to direction of groundwater flow. For example, in the Executive Summary (page 2) the groundwater in the A-zone is stated to flow "in a generally southern direction". On page 3-5 of the RI, the direction of groundwater flow is stated to be "to the south and west". A detailed analysis of the direction of groundwater flow indicates that there is an apparent mound or limb of groundwater extending from the southwest corner of the B & B Site.

Response: Section 3 of the RI Report does provide a more detailed analysis of the flow patterns in the A-zone groundwater. Figures 3-6 and 3-7 include maps of the water table that show the varied flow patterns of the site, and the text in section 3.5.2 identifies the possible mounding of groundwater on-site. Generalized statements elsewhere in the text are not used as substitutes for the more detailed analysis presented in section 3.

16. The groundwater velocity in the A-zone is given as 53 ft/year on page 3-7 of the RI. For the A-zone, utilizing a hydraulic conductivity of 4 X 10[-4] cm/sec (pages 3-5, RI), a porosity of 40% (page 3-5, RI) and a gradient of 0.007 (page 1 of Appendix I), the value for groundwater velocity calculated is 7.2 ft/year. The derivation of the groundwater velocity value of 53 ft/year is unclear.

Response: The groundwater velocity of 53 ft/year is based on a hydraulic conductivity of 4 x 10[-4] cm/sec, which was obtained from the slug test, an effective porosity of 26% estimated from literature values (the laboratory results were not available at the time; however, the effective porosity is typically less than the porosity measured in a laboratory), and a gradient of 0.034, which is a localized gradient for the wells used in the pump test. The gradient used

in the modeling (0.007) was an estimate over a larger area of the site. The RI report states that the reported velocity is an estimate for the wells included in the slug test. Over the entire site the velocity will vary considerably; however, the velocities are all expected to be relatively slow. For the RI/FS, the general characterization of the A-zone groundwater as a slow moving, low producing water bearing unit with localized variation in hydrology is the most important observation.

17. In several instances data presented in Table 4.9 of the RI present average concentrations for chemicals which are of a greater magnitude than the highest concentration reported. Examples of this are the concentration reported for 1,3 DCP at 41 to 65 feet and DBCP at 0 to 10 and 31 to 41 feet. An average concentration of 1,3 DCP of 32 ug/kg was reported as contrasted with a high concentration of 12 ug/kg for the 41 to 65 foot depth interval. An average concentration of DBCP of 10 ug/kg was reported as contrasted with a high concentration of 6 ug/kg for the 0 to 10 foot depth interval. An average concentration of DBCP of 183 ug/kg was reported as contrasted with a high concentration of 110 ug/kg for the 31 to 40 foot depth interval.

In several instances data presented in Table 4.10 of the RI present average concentrations for chemicals are of greater magnitude than the highest concentration reported. Examples of this are the concentration report for 1,3 DCP at 0 to 10 feet and DBCP at 0 to 10 feet, 41 to 65 feet, and 66 to 85 feet. An average concentration of 1,3 DCP of 16 ug/kg was reported as contrasted with a high concentration of 15 ug/kg for the 0 to 10 foot depth interval. An average concentration of DBCP of 16 ug/kg was reported as contrasted with a high concentration of 15 ug/kg for the 0 to 10 foot depth interval. An average concentration of DBCP of 77 ug/kg was reported as contrasted with a high concentration of 72 ug/kg for the 41 to 65 foot depth interval. An average concentration of DBCP OF 423 ug/kg was reported as contrasted with a high concentration of 120 ug/kg for the 66 to 85 foot depth interval.

Response: Average concentrations were derived by averaging the detected values with the quantitation limits for samples that were non-detect. It is EPA's policy to use the quantitation limit or half that value instead of 0 for values that are not detected. In some cases, this resulted in an average concentration greater than the highest observed result because of relatively high quantitation limits among some samples. Where there were no detected concentrations, the average was put in parentheses.

18. The organic carbon distribution coefficients for 1,2 DCP and DBCP presented in RI Table 5.3 are incorrect. The organic carbon distribution coefficient for 1,2 DCP should be 51 ml/g. The organic carbon distribution coefficient for DBCP should be 129 ml/g.

Response: The comment is correct that the organic carbon distribution coefficients were mistakenly switched in Table 5.3 for 1,2-DCP and DBCP. However, the correct coefficient was used in the VLEACH modeling.

19. Many of the basic assumptions utilized in the fate and mobility modeling conducted by and for the EPA utilized incorrect assumptions regarding conditions at the B & B Site or the characteristics of the chemicals of concern. The net result of these deficiencies is that the results of the modeling misrepresent the potential for further migration of chemical through the vadose zone into groundwater.

Response: All modelling involves generalizations and assumptions that may result in inaccuracies or biased modeling results. For this reason, EPA used the modeling results as only one of a number of factors considered in arriving at appropriate remedial alternatives. For the Brown & Bryant Site, the modeling results were used, along with other data, to decide what remediation option to consider for the A-zone soils and whether or not to select the A-zone soil

remediation option. EPA's preferred alternative does not include soil remediation for the deeper A-zone soils. This decision was made by weighing the results of the screening models used in the RI/FS, the cost of the treatment, and how best to protect the B-zone groundwater. EPA concluded that treatment of the A-zone groundwater and the cap are a sufficient remedy for protecting the B-zone and that treatment of the soil with soil vapor extraction is not warranted.

The modeling during the RI/FS was conducted primarily for the above purpose. It was also considered in making estimates of the interim cleanup level range for the A-zone groundwater. A range for cleanup levels was established in part because of the general inaccuracies inherent in modeling. EPA believes that information obtained during the implementation of the A-zone groundwater treatment will ultimately provide the best estimates for a specific cleanup standard within the range established in the FS Report.

The comment contends that EPA misrepresents the potential for migration of chemicals through the vadose zone into groundwater by generally overestimating the potential impact. EPA disagrees. As pointed out above, EPA has chosen not to treat the A-zone soils. As for the potential impact from A-zone groundwater on the B-zone groundwater, EPA has based its concern about this threat primarily on observed contamination in the B-zone in excess of drinking water standards. This B-zone contamination demonstrates a connection between the A and B-zones and is a primary reason for EPA's proposal to treat the A-zone groundwater. The modeling provides estimates of the potential magnitude of impacts from the A-zone groundwater over time, which were considered along with the observed concentrations.

20. Although descriptions of the lateral and vertical heterogeneities that exist in vadose zone soils are described in many sections of the Draft RI (see for example, Executive Summary page 1, RI pages 3-3 through 3-5, 5-4), all model simulations for chemical transport utilize one dimensional models. Therefore, lateral heterogeneities are not accounted for in any water, and vertical heterogeneities are lumped into gross classifications. The effect of these gross lateral and vertical stratigraphy simplifications on model results is not discussed anywhere in the RI. For example, the lateral movement of chemicals due to stratigraphic barriers (clays and silts) is not assessed in the modeling. This would result in the results of the modeling overestimating concentrations of chemicals of concern which may occur in groundwater. This error then results in the development of unnecessarily stringent soil cleanup criteria.

Response: A one dimensional model of the type used for this RI/FS is typically used at many Superfund sites. Although, it may result in an overestimate of the potential impact, this factor was considered in the recommendations made from the RI/FS. It is unclear why the commenter believes that EPA has set unnecessarily stringent soil cleanup criteria, given that EPA did not set numerical cleanup standards for the deeper soil (see section 3.1.3.2 of the FS Report), and the final remedy selected does not involve direct remediation of the vadose zone soil.

21. The RI (and modeling report, see below) does not use current degradation rates available in the literature, correct assumptions regarding degradation pathways, and in general, does not include adequate assessment of the effects of degradation on chemical fate and mobility.

Response: Degradation rates used for the modeling were based on literature values<Footnote>1 Handbook of Environmental Degradation Rates, P.H. Howard et al., 1991.</footnote>. Because these values may not reflect site conditions, EPA used a range of degradation rates and did not rely on a single value. As noted in the RI Report, the model normally assumes no degradation. EPA included a degradation factor to make the results more realistic. EPA believes that the

assessment of chemical degradation is adequate considering how the results were used and what other factors were considered in the remedy selection.

22. RI page 5-6 states that, "relatively low expected oxygen levels" are expected in the subsurface at the site. Therefore, the RI continues, conditions at the site do not favor most degradation processes. The basis of these statements are not given. In fact, elevated nitrate and sulfate concentrations in A-zone groundwater suggest that conditions are far from anaerobic (methane producing). In addition, the critical process which the RI suggest controls the migration of volatile organic chemicals in soils at B&B (i.e., diffusion in soil gas), controls the movement of oxygen from the atmosphere into the soil. The RI, therefore, is not consistent with comments regarding movement of gases in vadose zone soils. Assumptions regarding the low expected oxygen levels lead to overestimated concentrations of chemicals of concern predicted to occur in groundwater resulting in unnecessarily stringent soil cleanup criteria.

Response: The statement regarding oxygen levels was not intended to imply that site conditions are anaerobic. The main point of the comment seems to be that EPA has used the assumption of low oxygen levels to overestimate the impact of vadose zone contamination resulting in overly stringent soil cleanup levels. This is incorrect. As pointed out above, numerical soil cleanup levels were not established and EPA is not proposing to cleanup the vadose zone. The range of degradation rates used in the modeling factor in changes in degradation that may result from different site conditions, including differences in degradation rates resulting from different oxygen levels.

23. Degradation half-lives for DBCP are quoted to be between 0.5 years to 141 years. The long half-life is quoted for hydrolysis. Recent studies conducted by Deely et. al., (1991) found for typical groundwater conditions in groundwater from one site in the Fresno. California areas demonstrated that the half-life for DBCP is 6.1 years, much shorter than the 141 years quoted in the RI. Therefore, the assumption of a long-half life for DBCP is inappropriate and leads to an overestimation the concentration of a DBCP predicted to occur in groundwater resulting in unnecessarily stringent soil cleanup criteria.

Response: Again, EPA did not consider only a single half-life but considered a range of half-lives. The range considered for DBCP was 1, 2 and 10 years (see Table 5.5 of the RI Report), which is less conservative than considering just a 6 year half-life.

24. The RI provides degradation rates for all chemicals found in A-Zone groundwater on page 5-6. These degradation rates are not taken into account in the fate and mobility modeling. The degradation times are short relative to the hundreds of years given as transport time from vadose zone soils to the A-zone groundwater. Therefore, significant reductions in chemical concentrations would be expected to occur due to degradation as chemicals migrate through the vadose zone. Consequently, all of the model simulations overestimate the concentrations of chemical of concern predicted to occur in A-Zone groundwater resulting in unnecessarily stringent soil cleanup criteria.

Response: The comment that "degradation rates are not taken into account" is incorrect. EPA did take into account the degradation rates for the volatile chemicals modeled by VLEACH. The results are included in Table 5.5 of the RI Report.

25. Water solubilities for chemicals of concern listed in RI Tables 5-2 and 5-3 were measured for a pure solvent in contact with water. The water solubility for a given chemical in a mixture of solvents is lower than that for the pure chemical. The use of pure chemical water solubility results in overestimation of the chemical concentration dissolved in water. Therefore, the use of pure phase water solubilities for chemicals of concern

result in overestimation of groundwater concentrations and unnecessarily stringent soil clean up levels.

Response: EPA agrees that solubilities would be lower in mixtures as compared to pure chemicals and that this does make for a small overestimate of the predicted impacts of the modeling results. However, this impact is even smaller since gas phase transport was typically found to be more critical than solute transport, especially with the assumption that the site will be capped. However, as discussed previously, this impact does not affect soil cleanup levels nor would it change the decision not to cleanup the vadose zone soil.

26. The fate and mobility modeling conducted by AScI for the EPA also utilized incorrect basic assumptions. The overall effect of these deficiencies is that the conclusions made regarding soil cleanup levels and potential effects on groundwater quality are incorrect.

Response: The basic premise for all of the comments regarding the modeling conducted by AScI is that EPA made incorrect or overly conservative assumptions that resulted in overly conservative conclusions and excessively stringent cleanup levels for dinoseb. These comments ignore the basic conclusions made by EPA from the modeling results. EPA concluded that treatment of dinoseb in the vadose zone is unnecessary because the cap will significantly retard the movement of dinoseb as a result of cutting off the infiltration of water. No cleanup standard is proposed for dinoseb in subsurface soil in FS Report.

27. As noted above, all model simulations ignore degradation (AScI page 21, 22). This results in the prediction of unrealistically elevated concentrations of chemicals of concern in A-zone groundwater, which in turn results in the establishment of soil cleanup levels more stringent than necessary to protect groundwater quality.

Response: See comment 19 regarding modeling assumptions and soil clean-up levels.

28. Although descriptions of the lateral and vertical heterogeneities that exist in vadose zone soils are described in many sections of the Draft RI, all model simulations conducted by AScI to evaluate chemical transport utilize one dimensional models. Therefore, lateral heterogeneities are not accounted for in any way, and vertical heterogeneities are lumped into gross classifications. The effect of these gross lateral and vertical stratigraphy simplifications on model results is not discussed. The oversimplification of the stratigraphic setting results in the development of unnecessarily stringent soil cleanup criteria.

Response: See comment 19 regarding modeling assumptions and soil clean-up criteria. The assumptions used in modelling did not result in the conclusion stated in the comment. See also the response to comment 20.

29. Unrealistically elevated concentrations of Dinoseb were used as MULTIMED model input. As described on page 17 of the AScI report, the only field measurements used in the development of the average concentrations for the source input for the different depth intervals were those greater than 100 ug/kg. In addition, calculation of Dinoseb in the top 0 to 25 feet ignored field data when the concentration measured was below 1000 ug/kg. This averaging created unrealistically elevated concentrations of Dinoseb for use in simulations and resulted in overestimation of possible groundwater concentrations of Dinoseb and unnecessarily stringent soil cleanup levels.

Response: The values used were for characterizing the worst portions of the site. It was for these areas that EPA was trying to make a remediation decision using the modeling results. See comment 19 regarding modeling assumptions and clean-up levels. This approach did not result in

the conclusion stated in the comment.

30. The comparison between model results and field data is presented on pages 14 and 70. The report states that there are significant differences between the observed and estimated concentrations. Possibilities for this discrepancy which have been ignored include facts such as the commingling of plumes from multiple release sites is different than what is modeled, and the release of large volumes of water during the original release of chemical (e.g. from the ponds and sumps on B & B property) means that release conditions are not being adequately represented in the model scenarios.

Response: The purpose of the modeling was not to model historical conditions that led to the current problem. Instead, the modeling was conducted to evaluate the current and future potential impacts from soil contamination currently found at the site. The model results differ from the field data in that the model predicted a smaller impact than what has been actually observed in the field. This difference is due in large part to the model's focus on current conditions.

31. The organic carbon content of the "perched zone aquifer" is given as 0.005% (0.00005 mg/kg). The basis for this estimated organic carbon content is not given. This unrealistically low organic carbon content, given without backup, results in overestimating groundwater concentrations of Dinoseb and the development of unnecessarily stringent soil clean up levels.

Response: The organic carbon value was established by extrapolating the decrease in organic carbon observed with depth from existing data. However, this conservative assumption did not result in the conclusion stated in the comment (see above discussion).

32. The infiltration rate used in VLEACH model simulations (possibly used in MULTIMED simulations, see below) was given as 25% total maximum rainfall. The basis of the estimation of infiltration rates of 25% was not described. This infiltration rate is likely to be 5 to 50 times greater than what would actually be occurring in a climate as dry as that at the B&B site (Stone, 1986; Nichols, 1987; Phillips et al., 1988). Use of unrealistically high infiltration rates leads to the overestimation of predicted concentrations of chemicals of concern in groundwater and, therefore, the development of unnecessarily stringent soil cleanup criteria.

Response: See comment 19 regarding modeling assumptions and soil clean-up levels. In should be noted that the VLEACH results also included a modeling scenario with an infiltration rate of one tenth the value quoted here.

33. Infiltration rates used in model simulations are not clear. The statement is made on page 24 of the AScI report that the infiltration rate utilized is based on maximum rainfall. The maximum rainfall given on page 25 of the AScI report is 16 inches/yr. Simulations utilize 25% of this as the infiltration rate or 4 inches/year or 0.33 ft/year, or 0.1 m/yr. However, the statement is made on page 25 that 0.032 m/year (25% of minimum precipitation) is used for recharge rates. It is unclear if there is a difference between infiltration rate and recharge rate in model simulations, or if this is the same parameter, which value was used. A infiltration rate of 0.33 ft/year was used in VLEACH model simulations presented in Section 5 of the RI. It is unclear if VLEACH and MULTIMED simulations use the same infiltration values.

Response: In the Multimed model there are separate values for recharge rates and infiltration rates, whereas in the VLEACH model only an infiltration rate is utilized. The same infiltration rate was used for both models except that the VLEACH modeling also used an infiltration rate of 0.033 for modeling scenarios that assumed a cap.

34. In a layered soil stratigraphy, the infiltration rate would be controlled by the soil layer with the lowest saturated intrinsic permeability. In the case of the soil system described at B&B, layer 4, with a reported saturated intrinsic permeability of 1 x 10[-8] cm/sec (RI page 3-5), would control infiltration rates. However, much higher saturated intrinsic permeabilities were used in model simulations. Therefore, concentrations of chemicals of concern have been overestimated in groundwater resulting in the development of unnecessarily stringent soil cleanup criteria.

Response: EPA disagrees. The thickness of the various layers is also a factor, not just the permeability of the finest grain layer. See also response to comment 32.

35. The air entry pressure head value and van Genuchten ALFA coefficient used in model simulations as reported on page 25 of the AScI report, represent gravels rather than the finer grained soils common on the site. The use of parameters which represent gravels creates a very conservative model simulation. Therefore, the concentration of Dinoseb is overestimated resulting in the development of unnecessarily stringent soil cleanup criteria.

Response: See comment 19 regarding modeling assumptions and soil clean-up levels.

36. The area given for Dinoseb source soils is 50 by 200 meters (10,000 square meters, page 25 of AScI report). This area is much larger than any known source area on the B&B site. In addition, this area is much larger than the source area sizes reportedly used for VLEACH modeling as presented in the RI (2090 square meters for the pond area and 930 square meters for the sump area, Appendix I of RI). The unrealistically large area used as input for the MULTIMED simulations causes an overestimate of the concentration of Dinoseb which might occur in groundwater. This overestimation of Dinoseb concentration causes the development of unnecessarily stringent soil cleanup criteria for Dinoseb.

Response: The comment has identified an error in the modeling report. The size of the source area should have been 50 by 200 feet. However, since the model is a one-dimensional model, it does not take into account the size of the source area so the error has no impact. See also above discussion regarding cleanup criteria for dinoseb.

37. The hydraulic conductivity for the 40 to 65 foot interval reportedly used in MULTIMED model simulations as stated on page 25 of the AScI report was 1 x 10[-4] cm/sec. Hydraulic conductivity values reported on page 3-5 of the RI are lower, ranging from a maximum of 1 x 10[-4] to 1 x 10[-6] cm/sec. This use of the maximum possible hydraulic conductivity causes the model to overestimate the concentrations of chemicals of concern which might occur in groundwater. Soil cleanup criteria developed utilizing these estimates are unnecessarily stringent.

Response: Because not all of the RI data was available at the time of the modeling, some assumptions are conservative. See comment 19 with regards to modeling assumptions and clean-up levels.

38. The SUMMERS Model does not allow for any sorption, degradation, dispersion, volatilization or decay in the aquifer. This model was utilized by AScI to evaluate groundwater concentrations which would result from introduction of unsaturated zone leachate, as estimated utilizing MULTIMED, to upgradient groundwater. In the SUMMERS Model, regarding chemical behavior in the aquifer no partitioning, is allowed between the aquifer solid matrix and the water. Therefore, the SUMMERS Model will result in the overestimation of groundwater concentrations. These overestimates are utilized to develop unnecessarily stringent soil cleanup levels. In fact, on page 6 of the AScI report, it is stated that

"the results (predicted by the SUMMERS Model) may be too conservative at times and if sufficient data are available a more sophisticated approach is suggested to arrive at a cleanup standard which is more economical".

Response: See comment 19 regarding modeling assumptions and soil clean-up levels.

39. This review of the recommended groundwater remedial actions presented in the Draft FS was performed by following guidance documents provided by the U.S. EPA for remedial projects being conducted in conformance with the pertinent criteria in the 6 February 1990 National Oil and Hazardous Substances Pollution Contingency Plan ("1990 NCP"), section 300.430(e). Specifically, the following U.S. EPA guidance documents (the "Guidance Documents") offer explanations of the technical analyses expected in a Feasibility Study completed consistent with the 1990 NCP:

- EPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, OSWER Directive No. 9355.3-01, October 1988 (Interim Final);

- Guidance on Remedial Actions for Ground Water at Superfund Sites, OSWER Directive No. 9283.1-2, December 1988 (Interim Final).

The Draft FS does not provide the level of technical information and analysis of remedial alternatives specified in the Guidance Documents.

In particular, all action alternatives in the Draft FS include identical A-zone groundwater remedial actions and costs. The RI/FS Guidance documents state that alternatives should be developed which achieve ARARs or health-based levels within varying time frames using different methodologies. The Draft FS does not present such alternatives for groundwater extraction. This document focuses on several areas of potential problems associated with the recommended groundwater remedial action. Since no alternatives to the recommended action are presented in the Draft FS, it is beyond the scope of this critique to propose alternative actions in detail. However, a general alternative is presented in the conclusions which should be considered before proceeding with the EPA's recommended action.

In addition, the EPA's recommended groundwater alternative is not described in detail in the Draft FS. Given this extraordinary ambiguity in the Draft FS, the following assumptions had to be made in this document to provide a basis for an evaluation of EPA's proposed system design:

- The assumption was made that the area of A-Zone groundwater to be remediated was approximate 5.6 acres. The details of the groundwater extraction and reinjection system are not described. On page FS-3-9, the estimated area and volume of A-zone groundwater containing 1,2-DCP greater than 10 times its MCL are stated to be 5.6 acres and 3,650,000 gallons, respectively; this area appears to constitute the assumed area of A-zone groundwater requiring remediation in all action alternatives.

- The assumption was made that the extraction/injection system would consist of 75 wells arranged in 8 rows. It is stated on page FS-4-4 that the groundwater system would consist of "alternating rows of injection wells and extraction wells". In Appendix A, an internal U.S. EPA Memorandum from Michelle Simon to Cynthia Wetmore, dated 12 February 1993, states that the groundwater extraction system will consist of "75 wells arranged in 8-400 ft. rows, 9 wells each row; each well will [be] used for both extraction and injection, separate piping system to each well for extraction & injection." To facilitate review and visualization of the proposed A-zone groundwater remediation scheme, one possible interpretation of the proposed well network is shown on the attached figure. This figure shows 72 wells on a grid of 67 feet between rows and 50 feet between wells in each row. Most wells are located

off-site of the Brown & Bryant site.

- The proposed groundwater treatment system is assumed to be an innovative technology consisting of a UV/hydrogen peroxide oxidation treatment unit, utilizing a proprietary additive, ENOX 510, supplied by Solarchem. All action alternatives include a capital cost of $650,000 for this treatment system, which appears to correlate with the estimated cost for the 10 gallon per minute ("gpm") system designed to reduce ethylene dibromide ("EDB") to "non-detectable" levels in the treated groundwater (see Appendix A, U.S. EPA Memorandum from Vance Fong to Cynthia Wetmore, dated 20 November 1992).

- The assumption was made that the cleanup goal for water treatment prior to reinjection was "non-detectable levels". However, the June 1993 U.S. EPA public notice/fact sheet states that "the groundwater will be treated until it meets maximum contamination levels established by state and federal regulations."

- The assumption was made that the extraction rate for the system was 10 gpm, although this estimate appears high. The extraction rate from each A-zone extraction well is estimated to be 100 gallons per day ("gpd") on page RI-3-7 of the Draft RI. However, at 100 gpd (0.069 gpm) and assuming that half of the 75 wells are used as extraction wells, the aggregate average extracted groundwater flow rate would be only approximately 2.6 gpm, not 10 gpm.

- The assumption was made that the reinjection flow rate per well is 100 gpd. There is no discussion in the Draft FS of the design of the reinjection wells, water conditioning prior to reinjection, injection well maintenance, or the planned injection rate in each well. Because the appended U.S. EPA memorandum imply that the number of injection wells will equal the number of extraction wells and no surface discharge options are discussed, it is assumed that the proposed reinjection flow rate per well is identical to the extraction rate, i.e., 100 gpd.

Response: Although the above section is intended for introductory purpose and not as specific comment, it contains erroneous assumptions which gave rise to incorrect comments that follow. The comment stated that EPA did not follow its guidance document because only one technology was proposed for the remediation of the A-zone groundwater. EPA guidance[2] does not suggest that a minimum number of alternatives must to be carried from the screening level to the detailed analysis of alternatives; it only suggests the number of alternatives should not exceed ten. EPA believes evaluation of more than one remedial alternative would provide flexibility in the remedial selection process. EPA does not and should not carry non-viable technologies past the screening stage solely for the purpose of having a specific number of alternatives. At some sites, there are circumstances where there are not several technologies that are feasible. At Brown & Bryant, the site-specific contamination has rendered many treatment technologies/process options non-applicable, see Figure 3.6 of the Feasibility Study Report.

Additionally, the comment erroneously assumes that the estimates used in the cost analysis are the proposed design of the selected alternative. The Superfund process includes three phases: the remedial investigation and feasibility study phase; the remedial design phase; and the remedial action phase. "The objective of the RI/FS process in not the unobtainable goal of removing all uncertainty, but rather to gather information sufficient to support an informed risk management decision regarding which remedy appears to be most appropriate for the given site." <Footnote>1 EPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, OSWER Directive 9355.3-01, October 1988</footnote> It is the purpose of the remedial design phase to provide the specific technical detail such as well design, well spacing, extraction and reinjection rates, etc. Apparently, when the commenter could not find

the technical specifics usually reserved for the remedial design in the body of the feasibility study, he used estimates in the cost analysis appendix or made assumptions included in the comment's introduction and commented on those assumptions as if they were design specifications.

The comment incorrectly states that the clean-up goal for water prior to re-injection is non-detect. The June 1993 factsheet and the ARAR analysis in the feasibility study both state that the clean-up level prior to re-injection is maximum contamination levels established by state and federal regulations. EPA will address other "assumptions" the comment made as they pertain to the specific comment.

40. Preliminary analysis suggests that the proposed extraction/injection system may cause a spreading of existing contamination. This potential is of particular concern given the lack of characterization of geologic and hydraulic characteristics of the A-zone and given the lack of analysis of the possible realistic response of the system. In particular, the following issues have not been addressed:

- effectiveness of "clays" at the base of the A-zone on limiting migration of impacted groundwater to the B-zone under reinjection.

- effect of heterogeneity of A-zone sediments on engineering control of extracted and injected groundwater, and

- effect of changes on groundwater flow paths under the effects of extraction and injection pulling contaminants into previously clean areas.

Response: The comment bases the concern for lateral and vertical spread of contaminants on erroneous assumptions of what the remedial design will look like (see response to comment 39). A properly designed extraction and reinjection system can prevent lateral spread by, for example, placing the extraction wells on the perimeter of the system. Vertical spread can be controlled by monitoring the water levels in the reinjection wells such that they do not place excess pressure on the A-zone clay. Lateral and vertical spread, as well as other design considerations, will be considered in the design phase. In addition, EPA plans to phase in the treatment system by installing and operating a small number of extraction and reinjection wells, then monitoring and studying the A-zone groundwater's response to the system. Therefore, the contaminant extraction can be maximized and contaminant spread can be minimized.

The comment also suggests that geologic and hydraulic characterization of the A-zone is insufficient. EPA contends that sufficient information exists to proceed with a phased-in system. The geology under the site is very heterogeneous and as a consequence not every minor geologic feature can be known. The amount of information known and presented in the remedial investigation report is sufficient to make a decision and to move into the next phase of the clean-up.

41. The "sandy clay" layer which forms the base of the A-zone is an imperfect seal. In general, the understanding of the continuity of the clay is based upon very little data (less than 40 data points). At all locations, boring logs prepared by Kennedy/Jenks Consultants describe the Layer 4 clays as "moist", indicating that groundwater penetrates these silty to sandy clays.

Mounding produced near the injection wells would increase the vertical leakage potential at these locations and thereby would increase the potential for increased uncontrolled vertical migration of chemicals into soils beneath the A-zone. For example, if the head in a given area were doubled as a result of injection, the rate of groundwater flow through the clay would double.

Therefore, given the heterogeneity of the unit and the general permeabilities of the silty/sandy clays within the unit, it is possible that injection over a wide, regularly-spaced grid into the A-zone may actually result in a net increase of migration of contaminants to the B-zone.

Response: See response to comment 39 and 40.

42. If injection wells are placed at locations where highly heterogeneous conditions occur, then it is possible that the proposed "regular spacing" of extraction wells may not effectively capture the additional groundwater flow due to injection, especially for injection wells placed at the perimeter of the extraction well network. Given the fact that no conceptual geologic or hydraulic model has been presented which provides a basis for evaluation of these potential effects, there is no information by which to judge whether the system may cause additional lateral spreading of existing contamination.

Response: The comment confuses the assumptions used for the cost estimate, such as "regular spacing", as remedial design specifics. See response to comment 39 and 40.

43. Since no hydraulic analysis is presented for the effects the operation of the system might have on groundwater flow paths, it is possible that operation of the system may draw contaminants laterally into previously clean areas.

Response: See response to comment 40.

44. No critical analyses of the potential short-term or long-term effectiveness of the proposed groundwater extraction/reinjection system are presented in the Draft FS. In order for any evaluation of the potential effectiveness of the proposed remedial system to be considered complete, a detailed conceptual model which addresses the geologic and hydraulic controls on the migration of chemicals and demonstrates good agreement with existing data is necessary.

The following issues would need to be addressed in order to demonstrate the potential effectiveness of the proposed remedial measure:

- effect of limited volumes of groundwater on system performance,
- predicted capture zones of individual wells,
- effectiveness of reinjection as a method for removing chemicals from A-zone sands.

Response: Again, the comment seeks specific remedial design details not required in the RI/FS, such as how the extraction/reinjection system would handle variations in water levels, temporary dewatering, low flow rates, etc. (See responses to comment 39 & 40). EPA expects that there may be temporary dewatering and variable flowrates in the A-zone groundwater and a system will be designed that is flexible and able to respond to these condition.

45. The Draft FS should evaluate how the proposed system would deal with dewatering, low flow rates, large variations of water level in short periods (i.e., following rainfall events), or intermittent operation.

Given the lack of understanding regarding the sources of water to the A-Zone and the fact that the saturated thickness is low (ranging between approximately 4 to 10 feet during the period of time monitored to date - 1991 to 1992), additional evaluation is necessary to determine if groundwater extraction could be maintained in the A-Zone. If the sources of water to the A-Zone are intermittent (irrigation percolation or seasonal rainfall), continuous extraction may not be feasible. Hydrographs for A-zone monitoring wells on the adjacent to the site presented as Figure 3.10 of the Draft RI illustrate a steadily declining groundwater thickness over the past

two years. It is possible, if the source of the A-Zone water is irrigation infiltration and if irrigation is curtailed in the local area, that the A-Zone will naturally dewater within 1 to 2 years. If so, there is no reason to install and operate a groundwater extraction system in the A-Zone. In any case, there is no analysis to confirm that the effects of pumping will not result in a dewatering of the A-zone even with the proposed reinjection of all produced water.

No discussion is included in the Draft FS that would suggest how the proposed system would deal with dewatering, low flow rates, large variations of water levels in short periods (i.e., following rainfall events), or intermittent operation. Given the existing data, it appears likely that all three of these circumstances could occur during operation of the system.

Variations in the flow rates and chemical concentrations would also impact the performance and costs of any associated treatment facility.

Response: See Response to comment 44 with regard to dewatering comment. The comment states that if irrigation is curtailed, the system will naturally dewater in 1 to 2 years. Without any backup for such claim, it is difficult for EPA to respond quantitatively. However, limited containment options such as purchasing and capping adjacent farmland was considered in the development and screening phase of the feasibility study (see Feasibility Study Report). It was rejected because it would require indefinite maintenance of a possible large area. EPA is also concerned that with the removal of the irrigation, the A-zone groundwater under the site might get water from other sources such as irrigation and infiltration from the residential area to the east.

Also, EPA believes that treatment is the preferred means by which principal threats, such as the A-zone groundwater, are addressed. Containment is reserved for situations where there is large volumes of low concentrations or where treatment is not possible.

46. The capture zone calculations, in a memorandum from Ralph Lambert of Ecology & Environment to Cynthia Wetmore and Tom Huetteman of the U.S. EPA, dated 3 November 1992, utilized the Modified Nonequilibrium Equation (Cooper & Jacob), and the Equilibrium Well Equation. The Modified Nonequilibrium is a simplification of the Theis equation which assumes a uniform, infinitely extensive and "confined" aquifer. The A-zone is not a confined aquifer and the use of the Modified Nonequilibrium Equation is inappropriate. The Equilibrium Well Equation does assume unconfined aquifer conditions; however, this equation is not appropriate because the simplifying assumptions are not met.

Response: EPA agrees that the A-zone groundwater is a unique feature that classic equations will not apply. In fact in the cited memo it states "please keep in mind that ... the water bearing zone at B&B does not meet many of the conditions that these formulas were based." However, for the purposes which the calculations were used, namely the cost estimate, the modified non equilibrium equation is suitable. The reason for calculating the capture zone in the FS is to make an estimate as to the number of wells solely for cost purposes. In the remedial design, a capture zone will be calculated based on the well design and other necessary considerations chosen in the remedial design phase.

47. No evaluation of the effectiveness of the proposed extraction/injection process at reducing contaminant concentrations to the desired levels was presented. In fact, recent studies have shown that pump and treat methodologies are not effective at reducing contaminant concentrations where high concentrations of chemicals adhere to and desorb from fine grained sediments. Given the properties of the contaminants in the A-zone and the heterogeneities of the geohydrologic setting, it will be difficult to demonstrate whether the operation of the proposed system would be capable of producing a reduction of chemical concentrations in the saturated A-zone which would be cost-effective at achieving

the EPA goal of protecting the B-Zone groundwater.

Response: The comment questions the effectiveness of pump and treat where chemicals have adhered to the soil within the groundwater. Its reference to studies indicating ineffectiveness is somewhat misleading. Studies done at long-term pump and treat Superfund sites have shown that initially large amounts of contamination can be removed. However, after the initial success, pump and treat is not effective at reducing concentrations to low levels when chemicals are adsorbed to the soil. Simply put, pump and treat systems reach a point of equilibrium, not necessarily at health-based levels, and further reduction in contamination concentrations is difficult.

EPA contends that extract and treat in the A-zone groundwater would be effective. First because of the high concentrations in the water, there is a significant mass of contamination not adhered to the soil. Second, the chemical dinoseb is water soluble and would not as readily adhere to the soil as other chemicals. EPA believes that a significant mass of chemicals, especially dinoseb, can be removed. If, however, there comes a point in the system operation where it appears that extraction is no longer effective, EPA will re-evaluate the entire site clean-up operations.

48. The proposed extracted groundwater treatment system is an innovative technology. Although limited pilot testing was conducted by EPA, the evaluation of the design of this system is inadequate in several key areas:

- Chemical Compatibility,
- Well Design,
- Chemical and Biological Fouling,
- Hydraulic Capacity, and
- Treatment Capacity.

Each of these is discussed in more detail below.

Response: EPA studied the use of UV/Oxidation for the site at two different tests. The first was a full scale on-site operation of the system during an emergency response action in which dinoseb-contaminated rinse water was treated. The second was a comprehensive remedy selection treatability study conducted to evaluate treatment effectiveness of UV/Oxidation with respect to EDB, 1,2-DCP, DBCP and other key volatile compounds using A-zone groundwater. The tests showed that UV/Oxidation can treat the A-zone groundwater to maximum contaminant levels and provided more specific information to be used during the remedial design.

The purpose of treatability studies during the feasibility study phase is to reduce cost and performance uncertainties to acceptable levels so that a remedy can be selected and to support the remedial design of the selected alternative. EPA contends that the treatability studies were adequate for the above-stated goal. The remedial design phase of the clean-up process is intended to detail and address the technical requirements needed for the remedial action. For example, the selected remedy calls for a RCRA-type cap. The details for this cap such as number of layers, cap thickness, specific geotextiles, etc. are to be determined in the remedial design.

49. Dihaloalkanes are generally degradable to Hcl and CO2 (Ollis, et. al. 1989); however, those with saturated bonds, e.g. EDB, are more difficult to treat using UV oxidation. Longer reaction times and/or more powerful UV lamps are necessary to attain effluent quality standards. The Draft FS should evaluate other treatment technologies which may be more efficient.

The enhanced oxidation system did not remove chemicals to non-detectable concentrations. It is not clear if additional tests will be run to determine if non-detectable concentrations are, in fact, achievable or if the power and residence time required to achieve non-detectable concentrations are consistent with extrapolations.

Response: Fumigants such as EDB and 1,2-DCP were expected to be limiting agents by the treatment engineer; therefore the previously discussed remedy selection treatability study was conducted to evaluate the effectiveness of UV/Oxidation treatment. The treatability study data shows that EDB can be treated to maximum contaminant levels. As stated in the proposed plan, the clean-up goal for the treated water is maximum contaminant levels, not non-detect concentrations (see comment 39).

50. The U.S. EPA extraction/injection well design assumes a gravel pack radius of ten feet and a length of 20 feet. The soil boring required to install the well would be 20 feet in diameter to a depth of 75 to 80 feet, which technically is not feasible. It is assumed that the 10 foot gravel pack is a mistake and that there was no intention of installing a well of this design. However, the fact that it was utilized in a basic cost calculation illustrates the level of inadequacy of this document.

Response: See response to FS comment 62.

51. Articles by Camp, and Nyer and Bitter (Camp, 1991; Nyer and Bitter, 1991) indicate laboratory or short duration field tests of Advanced Oxidation Processes ("AOP") with clean tubes can result in unrealistically favorable results compared to operation in a deposit-prone field installation. Solarchem is recommending that OAP on Brown & Bryant groundwater be performed at a pH of 3. This low pH is likely to prevent biological fouling and scaling in the OAP reactor; however, the Draft FS should evaluate the potential for scaling to occur downstream (e.g., in the reinjection wells) when the groundwater is neutralized.

Water quality issues regarding the reinjection of treated groundwater have not been considered. These issues include: the difference in general mineral chemistry of native groundwater and treated groundwater; and the potential effects of fouling due to reinjection of treated water. A precipitate could occur in the water treatment train, in the reinjection pumps, at the well screens, or in the formation. Thus, there exists a substantial potential that the proposed reinjection scheme would not work.

Response: The comment again expects a feasibility study report to contain engineering considerations which will be addressed in the remedial design phase. Solarchem has a proprietary design for wiping the UV lamps in their treatment systems. Since bio-fouling and deposition of insoluble salt could lower UV light intensity, this issue was discussed between Solarchem and EPA treatment engineers.

Low pH around 3 favors UV/Oxidation treatment. pH slightly higher than 4.6 (pKa of dinitrophenol compounds) would shift the equilibrium to the direction of favoring stabilization of dinoseb's conjugate base which increases the treatment effectiveness of horizontal flushing due to increased solubility. Thus, the injectate will be readjusted taking into account mixing with the A-zone water which may be at a higher pH. The readjustment does not necessarily result in pH above neutrality. The pH adjustment will be determined in the remedial design/remedial action phases. EPA believes that these minor adjustments and optimization will not alter remedy selection. Although the pH in the injectate will not be greater than neutrality to trigger precipitation should precipitation occur, a simple additional module with flocculation or ion-exchange capacity can be introduced.

52. Mineral saturation calculations using chemical analytical data for major ions in native groundwater, contaminated groundwater and treated groundwater have not been conducted for the recommended groundwater reinjection system which is common to all action alternatives in the Draft FS. The calculations are necessary to evaluate the potential for precipitation of minerals during treatment or in some portion of the reinjection system.

Response: See response to comment 51. Calculations necessary to evaluate potential for precipitation will be made in the remedial design.

53. Data presented in the FS are not of sufficient quality to perform mineral saturation calculations for contaminated groundwater; an analysis of projected treated groundwater chemical parameters is not included in the Draft FS. Specifically, anion and cation charge balances given in Table 4.14 of the FS for wells clearly in the contaminated zone, range from 27% to 80% difference. Analyses with such significant charge imbalances should not be used for calculations regarding water-mineral equilibria. In addition, the identity and concentration of the analytes not included in the chemical analyses could strongly influence mineral saturation calculations.

Response: See response to comments 51 and 52.

54. The EPA did not consider the likelihood of mineral precipitation in the proposed treatment system at even a rudimentary level. Simple manual calculations performed utilizing the results of analysis of water collected from monitoring well AP-01 demonstrate that the native groundwater is slightly over saturated with respect to carbonate minerals (both aragonite and calcite), as well as magnesium-calcium carbonate minerals. Given this oversaturation, when native or contaminated groundwater is pumped to the surface and treated, precipitation of carbonate minerals will likely occur.

Response: See response to comment 51.

55. The Draft FS does not discuss changes in the treated groundwater due to the proposed treatment process. Addition of strong acid (sulfuric) and strong base (sodium hydroxide) will change the water chemistry by addition of 570 mg/L sulfate and 26 mg/L sodium (Solarchem Environmental Systems, November 1992). This will further the potential of sulfate, containing calcium or magnesium minerals, to precipitate. Potential regulatory issues regarding injection of increased sulfate concentrations to the A-zone aquifer are also not discussed.

Response: Based on the groundwater classification exemptions in

Resolution 88-63, the A-zone groundwater is not considered suitable or potentially suitable for municipal or domestic water supplies. Furthermore, it is the policy of the California legislators that activities which may affect the quality of water shall be regulated to attain highest quality of water which is reasonable considering all the demands made on that water. Given that, it is reasonable to reinject sodium and sulfate at the levels anticipated considering the limited demands on the A-zone groundwater.

From a risk, toxicity and health perspective, there is no negative impact on the quality of water with respect to sodium and sulfate. Sodium effects the hardness of water; sulfate may effect clogging of pipes. Existing average concentrations in A-zone wells of sodium range from 99 to 387 mg/l and of sulfate range from 62 to 1814 mg/l. The MCL for Total Dissolved Solids (TDS) is 500 mg/l; current average levels of TDS in A-zone wells range from 615 to 12000 mg/l.

56. The UV/Oxidation design report discusses that anions such as carbonate, nitrate, and

chloride can inhibit the UV/oxidation reactions desired. The report further discusses that analyses performed on water from the site were within the acceptable range for treatment. However, the actual analytical data were not presented in the treatability study nor were the specific groundwater wells from which the groundwater was collected identified. Considering the wide range in anion concentrations reported for groundwater collected in A-zone wells from the site, it is not clear if a sufficient assessment of the potential inhibition of UV/Oxidation was conducted.

Response: The comment incorrectly refers to the remedy selection treatability study report as a design report. Solarchem has quantitatively analyzed water samples from Brown & Bryant for anions and has determined that the anion concentrations will not negatively influence UV/Oxidation effectiveness. EPA treatment engineer discussed matters concerning treatment effectiveness as a function of various anion concentrations with Solarchem and has concurred with the vendor's technical determination. Since the anion concentrations were not a determining factor leading to selection of the remedy, the National Contingency Plan Section 300.800 does not require such technical detail to be included in the administrative record.

57. There is no discussion regarding the proprietary catalyst and reinjection of the treated groundwater. The form of the catalyst, particulate or dissolved is not discussed. If the patented catalyst is a solid, removal prior to reinjection of treated groundwater is necessary to prevent clogging. If the catalyst is a dissolved chemical(s) it can effect the water chemistry, mineral equilibria, and the consequent potential impact on reinjection in the formation can be critical. Potential regulatory issues regarding injection of this proprietary additive are also not discussed.

Response: EPA treatment engineer has determined that the use of Solarchem proprietary additive will not endanger human health and the environment nor result in unmanageable engineering difficulty. See response to comment 55 and 61.

58. The selection of a 10 gpm treatment system for remediation is inconsistent when the conclusion that the A-zone extraction wells will extract groundwater at a rate of only 100 gpd. If half of the seventy-two wells are operating as extraction wells, the total system flow rate would be approximately 2.5 gpm. A 5 gpm treatment system would seem to be adequate.

Response: Final flowrate will be determined during the remedial design. A 10 gpm system was used for the FS cost estimating purposes. Assumptions used for cost estimates should not be confused with remedial design specifications. See response to comment 60 regarding purpose of FS cost estimate.

59. The selection of a UV oxidation treatment system which treats contaminated groundwater to non-detectable levels is listed in the capital cost summary rather than a treatment system which treats contaminated groundwater to MCLs or ten times the MCL level. The capital cost treatment capacity is not consistent with the preliminary remediation goal for the A-zone discussed on page 3-3 of the FS report.

Response: EPA agrees the capitol cost associated with the treatment system should be $492,000, instead of $650,000. The cost estimate in the Record of Decision reflects this change.

60. Appendix A of the Draft FS - Assumption for Cost of Alternatives - presents some details of the cost estimates which were used by the U.S. EPA to develop Up-front, Annual and Present Worth Costs listed in Table 5.8 of the Draft FS report. Many of the capital costs listed in Appendix A cannot be confirmed without additional information. Assumptions are identified; however, no explanation is provided for many assumptions. Appendix A also

contains errors in the calculation of costs. Given the previous discussions regarding the shortcomings of the technical evaluation of the proposed alternative, it is impossible to determine whether the costs in Table 5.8 are lower or higher than what it may ultimately cost to install and operate such a system as that recommended.

Several specific instances of inaccurate cost assumptions are presented below.

Response: Before each cost estimate comment is addressed, the purpose of the cost estimate during the feasibility study should be clarified. It appears that the commenter believes this cost estimate should have the same level of detail as required in the remedial design. EPA guidance states that "typically, these 'study estimate' costs made during the FS are expected to provide an accuracy of +50 percent to - 30 percent"3. Clearly, the cost estimate is to provide a basis for comparison of the alternatives. EPA was conservative when cost estimating and typically chose the worst plausible scenario when estimating costs. A more detailed cost estimate will be provided during the remedial design.

61. The requirement of the use of proprietary additives and extended reaction times make the advanced oxidation process ("AOP") potentially costly for groundwater applications with a low flow rate and high concentrations of the more refractory compounds, such as EDB.

The reported cost of AOP appears to be high relative to other treatment options. Based on the design criteria presented on page 3 of the Solarchem Design Test Report, GAC usage would be approximately 6.5 lbs GAC per 1000 gallons of water treated. The GAC usage rate is controlled by 1,2-dichloropropane (1,2-DCP). Assuming a replacement cost of $4.50 per lb which includes contractor oversight during replacement, the cost of GAC treatment at Brown & Bryant is estimated to be on the order of $30.00/1000 gallons of treated water.

This GAC usage cost is certainly competitive with the AOP operating costs estimated in the Draft FS. It should be noted that the AOP treatment cost of $83.18/1000 gallons estimated by Solarchem did not include contractor oversight.

The $30.00/1000 gallon GAC and the $83.18/1000 gallon AOP are solely treatment costs and do not include labor costs for routine treatment system operation.

Response: The comment did not reference the source for his assumptions and cost estimates for GAC. However, EPA contends that the actual cost for GAC could be significantly more. In general, GAC is most cost-effective for high volume and low concentrations. The A-zone groundwater at Brown & Bryant is low-flow and very high concentrations.

EPA used the Freundlich isotherm relationship to estimate the carbon use rate. These adsorption isotherms are useful screening tools for determining preliminary carbon useage rates but have several drawbacks that might underestimate actual carbon use EPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, OSWER Directive 9355.3-01, October 1988 rate. The adsorption isotherms do not take into account competitive absorption of multicontaminants, nor other organic material that might interfere with adsorption. EPA estimated that carbon useage rate for 1,2-DCP, under ideal conditions and assuming it is the only contaminant, would be approximately 3 lbs/1000 gallons. Carbon useage rates of 3 lbs/1000 gallons and 6.5 lbs/1000 gallons is considered extremely high rate for GAC and would result in short bed lifes.

The major O&M costs associated with GAC is carbon replacement which increases as bed life decreases. Assuming a 6.5 lbs/1000 gallon useage rate, it is estimated that the annual carbon replacement rate would be 85,000 lbs/year. A GAC system for the Glendale South pump and treat system<Footnote>4 "Feasibility Study for the Glendale Study Area South Operable Unit", August

1992 (San Fernando Valley Superfund Site)</footnote> estimated its carbon useage rate at 90,200 lbs/1000 gal. Adjusting the Glendale cost estimate to reflect conditions at Brown & Bryant, the GAC capital cost for Brown & Bryant is estimated at $344,000. (UV/Oxidation capital costs are $492,000). GAC O&M costs, excluding operator costs, are estimated at $192,000 annually. Carbon replacement cost at Brown & Bryant would be higher than at Glendale because the carbon could not be regenerated on-site like at Glendale, and would require proper handling, treatment and disposal at a hazardous waste facility. This is not accounted for in the $192,000 O&M estimate. (UV/Oxidation O&M costs, excluding operator, are $230,000 annually) Operator costs for UV/Oxidation are assumed to be slightly higher than GAC. However, GAC operator costs would be more than typical due to the frequent bed changes a GAC system at Brown & Bryant would require. In summary, GAC is not half the cost of UV/Oxidation as the comment alludes but is probably slightly less.

In addition to cost, there are many other factors EPA is required to consider when selecting the alternative. CERCLA [Para]121(b) states "Remedial actions in which treatment permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances .. as a principal element, are to be preferred over remedial actions not involving such treatment." UV/Oxidation would reduce the toxicity and volume through treatment. GAC simply transfers the contamination to another medium. In addition, "The President shall select a remedial action that is protective of human health and the environment, that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable." UV/Oxidation is considered an alternative treatment; GAC is not.

However, EPA will evaluate further the possible use of GAC during the remedial design. If, as expected, the cost between the two systems are comparable, UV/Oxidation will be used as the primary treatment.

In addition, EPA will evaluate the use of GAC as an addition to UV/Oxidation. Chemical destruction efficiency using UV/Oxidation decreases as the concentrations decreases. Therefore, it might be cost-effective to treat the majority of contamination using UV/Oxidation, then reduce concentrations to MCLs using GAC. The point at which treatment technology can be switched from UV/Oxidation to GAC will be determined in the remedial design. EPA will weigh the cost-effectiveness and the amount of chemicals destroyed when determining when or whether to add GAC to the treatment train.

The Record of Decision states that the selected method of treatment is UV/Oxidation; however, if after completing a more detailed cost analysis of the two treatments and GAC is significantly cheaper, EPA will re-evaluate its decision of UV/Oxidation.

Finally, the comment states that the propriety additive is a requirement. EPA would like to clarify that any UV/Oxidation system that meets the performance standards would be acceptable.

62. The gravel pack cost calculation appears to assume a radius of ten feet and a length of 20 feet, which results in a unit cost of $5,000 for the gravel pack for each well in U.S. EPA's cost estimates (U.S. EPA, 1993). A twenty foot diameter soil boring is technically not feasible to a depth of 75 to 80 feet. If the gravel pack diameter is actually one foot, when the unit cost for the gravel pack for each well is approximately $50. The total cost per well is listed as $20,000; however, by deleting these gravel costs, the total cost per well would be reduced to approximately $15,000.

Response: The comment identified a typo in the cost estimate. The typo did result in a miscalculation. However, the cost difference because of the typo is not significant. The cost is corrected in the Record of Decision.

63. The capital cost for surface pumps, electrical controls and tanks is assumed to be equal to 100 percent of the capital piping costs; however, no explanation is provided for this assumption. Additional costs which may be encountered for locating piping and wells on off-site properties an across roadways and railroad tracks are not considered in the Draft FS.

Response: The cost of extraction field piping and surface equipment costs were estimated by using the rule of thumb of 100 percent of capital costs. This rule of thumb is used by the EPA cost estimator at the Engineering & Risk Reduction Laboratory in Cincinnati. During remedial design a more specific cost estimate will be done.

64. The analytical cost for on-going monitoring is listed as $1,000 per sample; however, the analytical method and the compounds being analyzed for are not identified. The number of sampling rounds are also not specified.

Response: The cost estimate for on-going monitoring is based on current monitoring at the site.

65. The treatment system capital cost is listed as $650,000. This corresponds to the capital cost associated with a ten gpm treatment syste which meets non-detect levels in the effluent, described in the 20 November 1992 EPA Memorandum from Vance Fong to Cynthia Wetmore. Although this memorandum cites the Solarchem Design Test Report (Solarchem, November 1992) regarding the source of this construction cost estimate for a 10 gpm system, the Solarchem Report provided only a cost estimate of $119,000 for a 1 gpm system. No information is presented on the manner in which capital costs were scaled to account for different design flow rates.

Response: See response to comment 58 and 59.

66. The location of the precipitation front and hence scaling will depend on factors that include: contact time and agitation with respect to air where carbon dioxide gas exchange will occur, and addition of acids and bases during treatment. A precipitate could occur during the addition of sodium hydroxide after UV/oxidation in the water treatment train, in the reinjection system pumps, at well screens, or in the formation. Such fouling could lead to increased operating costs for the system and well maintenance as well as to reduced averaged reinjection flow rates if well or formation fouling occur.

Response: See response to comment 60.

67. U.S. EPA advises in the Draft Remedial Investigation/Feasibility Study Report that it will examine the necessity for the feasibility of B-Zone groundwater remedial alternatives in a Second Operable Unit for the Site. SPTC and Santa Fe recommend that the selection and implementation of an A-Zone remediation program be deferred until the completion of the Second Operable Unit. First, there is substantial question about the feasibility of the proposed A-Zone extraction system due to dewatering and other technical factors. Second, the B-Zone groundwater evaluation will assess the interplay between the A- and B-groundwater zones to evaluate the best remedial alternative to protect the B-Zone groundwater (the zone the EPA seeks to protect). Assessing the groundwater remedial alternatives in such a comprehensive fashion in the Second Operable Unit will not increase any risks of exposure, since, as EPA acknowledges in the Report, the primary concern of the A-Zone groundwater is its impact on the B-Zone, and the B-Zone groundwater is not currently impacting drinking water supplies and is not expected to do so in the near term.

Response: EPA does not agree that the decision on the A-zone groundwater should be deferred until after the B-zone is characterized. Data collected to date show that the A-zone is leaky

and has caused contamination in the B-zone groundwater. The mass of contamination in the A-zone is significant. The rate of leakage, although not exactly known, is sufficient to cause levels in the B-zone to exceed maximum contamination levels. If left unabated, the A-zone groundwater will continue to be a source of further contamination to the B-zone groundwater. The investigation of the B-zone groundwater will not alter the need for action in the A-zone groundwater.

The B-zone groundwater has dramatically different characteristics than the A-zone groundwater. It can sustain higher flowrates and currently has lower contamination levels. As a consequence, a more conventional pump and treat system can be used. Alternatives for the B-zone will include hooking into the existing system, as well as other types of treatment.

Comments from Canonie Environmental on Behalf of Holland & Griffin:

68. Page 2 Second Paragraph: A-zone mounding is referred to in the southwestern corner of the site. Figures 3-6 and 3-7 show a ridge in this area, but no mounding.

Response: The use of the term "mounding" to describe the groundwater flow pattern was not intended to imply only a circular pattern. On page RI-3-5 a more complete description of the feature is given.

69. Page 2 Second Paragraph: States that "from a slug test the groundwater velocity was estimated at 53 feet/year." The statement implies that velocity can be determined directly from the slug test, which is performed to measure hydraulic conductivity. Other parameters, such as gradient and porosity, must also be measured. This should be stated or referenced in the text.

Response: The groundwater velocity is based on a hydraulic conductivity of 4 x 10[-4] cm/sec derived from the slug test, an effective porosity of 26% estimated from literature values, and a gradient of 0.034, which is a localized gradient measured from the wells used in the pump test. A reference to the slug test report is included in section 3 of the RI report.

70. Page 2 Fourth Paragraph: The dinoseb spill area is referred to in this paragraph as the principal hot spot for surface soil contamination and the only location where high concentrations of dinoseb were found in the construction zone. A major omission of this report is that this area has been at least partially remediated. This is only briefly referenced in the RI. The FS (pages FS-1-1 and FS-3-10) states that in 1991, approximately 80 cubic yards of the most contaminated material was excavated from this area, treated by soil washing, and returned the treated soil to the area. This activity is not adequately documented in either section of the report. The limits of the excavation should be defined, as well as verification sampling at the limits of excavation, to confirm the extent of contaminated material removed, particularly if material is subsequently replaced.

Response: EPA excavated and treated approximately 80 cubic yards of the highest contaminated portion of the dinoseb spill area. The exact boundary of this area has not been mapped; however, it has been marked in the field. The contaminated soil was dug to a depth of approximately seven feet, treated with soil washing, and then returned to the excavated pit. Concentrations below the pit are still as high as 4,230 mg/kg (at 8 feet below ground surface). Based on soil boring data, EPA estimated that prior to treatment, up to 650 cubic yards of soil in the dinoseb spill area may exceed 80 mg/kg (see page FS-3-10). Following the removal, up to 570 cubic yards remain. Had EPA selected the remedy that treats this soil, additional characterization of this area would have been necessary to accurately determine the final volume for cleanup. Such characterization might have occurred concurrent with any excavation. EPA

does not believe that additional characterization is necessary for the RI/FS, especially since the selected remedy does not involve additional treatment of the soil at the surface or at depth. See also response to comment 97.

71. Page 3 Fifth Paragraph: References and areal extent, 5.5 acres at 50 micrograms per liter (ug/l) in relation to "target concentrations" should be changed in discussions so that this is not construed to be a cleanup concentration.

Response: More discussion on this point is provided in section 4 of the RI report.

72. Page 4 Third Paragraph: "Absorbed" should be "adsorbed."

Response: The comment is correct. The error was a typographical error.

73. Page 4 Fourth Paragraph: Define "key site contaminants."

Response: Section 4 and 5 include discussions on how "key site contaminants" were identified.

74. Page 6 First Paragraph: "Were" should be "where," and "MCL" should be "MCLs."

Response: Comment noted.

75. Page RI-1-2 Third Paragraph: The second stated principal risk is poorly worded and confusing: "the potential future risk if site contamination were to reach current drinking water sources or from the future use of potential drinking water sources that are currently or may in the future be contaminated from the site." It should simply read: "the potential threat to drinking water sources." It was already stated on the previous page that the B-zone groundwater is considered a potential drinking water source for the purpose of setting cleanup standards.

Response: Comment noted.

76. Page RI-1-2 Fourth and Fifth Paragraphs: "Contamination of surface soils at B&B has resulted largely from spills and improper housekeeping. During the RI, source areas for this contamination were characterized."

"During the RI the principal source areas were characterized to determine which locations on-site were and are currently significant sources of contamination."

It is apparent that, in general, the RI, while not relying on previously-collected chemical data, used this information to recharacterize the areas already known, rather than investigating areas that may not have been established.

Response: In selecting areas for investigation during the RI, EPA relied on available site history and previous investigations to target specific areas on and off site for sampling. During the RI, EPA sampled both areas that were and were not previously sampled.

77. Page RI-1-4: The site description should include a discussion of the potential source areas immediately south of the Brown & Bryant fenceline, including the unlined waste water pit identified in the U.S. EPA document TS-PIC-89826 dated September 1989. This pit was used as part of the adjacent potato shed washing operations. Do DBCP residues from the potato-washing disposed in the waste water pit cause soil and groundwater contamination? Was this waste pond closed in accordance with the California Toxic Pits Cleanup Act?

There are several other potato-washing sheds with unlined waste pits between the site and the Arvin water supply well. Are these operations threatening the Arvin water supply?

The Arvin water supply well is on assessors parcel 192-12-8, which previously had tenants who handled chemicals similar to Brown & Bryant. Those tenants were: San Joaquin Building Supply Company (1946-1957), King Chemical, Inc. (1957-1961), and Bear Mountain Dusters (1961-1969). A photograph of the building on the Arvin water supply well property is enclosed. Note the sign on the side of the building indicating the type of chemicals and supplies handled at the property.

Response: EPA did collect soil samples in the area of the former waste pond as did Kennedy Jenks. None of the data from the soil borings located south of the site suggest a source of contamination. As for other sources in the area, it is not within the scope of this investigation to investigate and develop cleanup remedies for other possible contamination sources. These sources are best addressed by either State or local agencies and are not part of the Brown and Bryant Superfund site.

78. Page RI-1-4 Second Paragraph: This paragraph states that Canonie's closure plan does not have a date. The report date is printed on the front cover -- March 1988.

Response: Comment noted. The copy of this report provided to EPA has a cover page with no date.

79. Page RI-1-7 Sixth Paragraph: "The data collected by these (previous consultant) investigations were used during the RI to identify areas of concern for additional sampling. None of the analytical data collected by Canonie or Hargis is presented in this report because it is of unknown or questionable quality." By the same rationale, the areas sampled should have been questioned, and greater effort should have been directed towards investigating all potential source areas, including off-site locations.

Response: See response to RI comments 76 and 77.

80. Figure 1.1 The figure does not depict any low-permeability layer underlying the A-zone water-bearing unit.

Response: This figure is a simplified cross-section intended to identify the general media of concern. A more detailed cross-section is included in Figures 3-3 and 3-4.

81. Section 2: In this section, which presents Remedial Investigation Field Activities, no mention is given to the emergency response cleanup work in the dinoseb spill area conducted in 1991.

Response: This section presents a summary of field activities for the remedial investigation. Since the removal referred to in the comment was not a data collection activity, it was not included in the summary.

82. Page RI-2-3 First Paragraph: The executive summary mentions that five groundwater sampling rounds were performed. This paragraph mentions six months in which groundwater sampling was performed. This should be clarified.

Response: The executive summary is in error. There were six, not five, groundwater sampling rounds.

83. Page RI-2-3 Second Paragraph: "The results for the B-zone are largely inclusive because

of an insufficient number of wells and because the older on-site wells were screened over more than one water-bearing unit in the B-zone; this zone will be investigated further in a second operable unit RI/FS."

It is not believed appropriate, based on the available information, to screen only one sub-"zone" of the B-zone and treat these zones as hydraulically-district.

Response: EPA has so far investigated discrete sub-zones in the B-zone based on differences in hydrology and chemistry observed between the different sub-zones. This level of analysis, EPA believes, will help to define the portions of the B-zone where contamination is at greatest concentrations. As a result, EPA may be able to more effectively remediate the contamination. More detail regarding the B-zone hydrology and chemistry will be provided in the second operable unit RI/FS.

84. Page RI-2-8 Second Paragraph: This paragraph states that "analysis of soil samples for seven volatile organic chemicals (see Table 2.2)..." Table 2.2 states six volatile organic compounds.

Response: The text is in error. The analysis was for six, not seven, volatile organic compounds.

85. Section 2 Figures: In general, the figures either do not have figures, labels, or numbers, or have inadequate legends. For example, if a figure depicts wells with WA and WB designations, it would be appropriate to indicate the designations where the wells are screened, not merely that they are wells. Figure 2.4 is not shown in a readable scale. It would be helpful to locate all investigative sampling points on a single drawing to indicate actual coverage of the investigative programs.

Response: The purpose of these figures is to locate the position of the various soil borings, surface soil samples and wells located at the site. EPA believes the figures meet this purpose. Details regarding the depth or screened intervals are provided elsewhere in the report.

86. Page RI 3-3 Fourth Paragraph: States "The major groundwater features within the Arvin area consist of a deep confined aquifer which is located below the Corcoran Clay, and a shallower confined aquifer (B-zone) located above the Corcoran Clay." It is unclear whether this is taken from the 1964 or 1991 reference in this paragraph. A confined zone becomes unconfined if water elevations drop to below the upper confining layer. The RI is presenting the layer between the "B-1" and "B-2" zones as a significant confining layer, yet by definition, subzones within the B-zone are connected at least in limited sense.

Response: The appropriate reference for this statement is the 1991 reference. In borings conducted into the B-2 zone the water level is consistently measured above the top of the B-2 unit. The water level at well WB2-1 is about 15 feet above the top of the aquifer. During recent pump tests, EPA also observed a high barometric efficiency for the B-2 wells, which is a characteristic typical of a confined aquifer<Footnote>5 B-2 Aquifer Test Report, Task 11, Brown & Bryant, Arvin, California, Prepared for USEPA by Ecology and Environment, March 31, 1993.</footnote>. Regionally, these discrete zones may be connected.

87. Table 3.2: The total well depth should include depth-to-bottom-of-boring because seals were not placed for many wells in the interval between the well trap and bottom of the boring. For example, bottom-of-boring for EPAS-4 is 93.5 feet below ground surface (bgs). The listed depth is 84 feet bgs, which is the bottom of the trap. EPAS-4 may be a vertical conduit installed by the U.S. EPA, which interconnects the B-zone with the A-zone.

Response: Comment regarding the table noted. See response to comment 89, 117, and 119.

88. Page RI-3-5 Fourth Paragraph: This paragraph states "A possible limb or mound in the water table extends from the southwest site corner, southward approximately parallel and next to the railroad tracks. This groundwater limb has a similar shape to the groundwater contaminate plume which is discussed in Section 4." This should not be confused to indicate that these shapes should be similar and are in agreement. Isoconcentration contours and water level contours should not necessarily match. With the determined groundwater gradient, the groundwater flow direction and, therefore, the contaminant plume should go toward the trough shown on Figures 3.6 and 3.7.

Response: EPA agrees with the comment. The similarity noted in the text between the groundwater flow pattern and the contaminant concentration patterns in the A-zone groundwater is in reference to the general direction of contaminant flow, which is to the south and west. The high concentration of DBCP at well EPAS-3 is consistent with the trough found in this area.

89. Page RI-3-6 Third Paragraph: It is possible that EPAS-1 may penetrate the clay layer underlying the A-zone, which is reported as thin and not well defined. No boring log is provided for this location or EPAS-3 in the Ecology & Environment, Inc. (E&E), Site Assessment Report (November 1990), which documents the field program during which this well was installed, nor is complete information provided in the U.S. EPA RI/FS Workplan. Complete information on the monitoring wells installed by the U.S. EPA contractors should be provided in the U.S. EPA RI/FS. The bottom of the sand pack for EPAS-1 is reported to be at a depth of 90 bgs on the well detail. This corresponds to an elevation of approximately 339.71 mean sea level (MSL). The elevations on the cross-sections shown on Figures 3.3 and 3.4 show that the clay layer underlying the A-zone extends only to an approximate elevation of 350 MSL. Further, the above-referenced report has boring logs for EPAS-2 and EPAS-4 which indicate that the clay layer may have been penetrated and sand pack placed across this interval (instead of grouting back to the proper zone). The report also contains two different boring logs for EPAS-4. The boring log that indicates a total depth of 92 feet bgs may be for EPAS-1 or EPAS-3. This boring log also indicates that the clay layer may have been penetrated. Figures 3.6 and 3.7 show a trough in the vicinity of EPAS-2 and EPAS-3, which may indicate conduits at these wells. This should be investigated due to the inadequate boring logs presented in the E&E report and the U.S. EPA RI/FS Workplan.

Response: The comment presents various issues which are addressed individually below:

Boring logs for EPAS-1 and EPAS-3 are missing and can not be located. There are two boring logs for EPAS-4 because an initial exploratory boring was conducted prior to the well installation. The geology in the area of EPAS-1 and EPAS-3 can be inferred from nearby soil borings. Soil borings CA10, 11 and 17 and HH, MM and NN are located near to EPAS-1 and soil borings CA05, 06, and 07 and CB04 are located near to EPAS-3.

Due to the lack of water production in both EPAS-1 and AP-5, EPA intends to abandon these wells within the next year. EPA believes that EPAS-1 is most likely screened over the clay layer, which accounts for the lack of water in this well.

Based on an analysis of well logs and soil boring logs from the site, EPA believes that wells EPAS-2, EPAS-3 and EPAS-4 are screened above the base of the A-zone. However, EPA acknowledges that the avaiable data is inconclusive but may indicate the bottom of one or more of the boreholes drilled for these wells may be below the base of the A-zone.

See response to comment 117 and 119 in regards to possible conduits.

90. Page RI-3-6 First Paragraph: The so-called "flattening" is only indicated by Well EPAS-4, which is located upgradient without any adjacent wells to confirm trend. Across the site, the gradients have not changed significantly. Although, because the well elevation data is not validated, no groundwater gradient maps can be properly constructed.

Response: While the flattening is more pronounced at well EPAS-4, EPA believes that the data shows does some flattening observed over the site. However, EPA did not intend to place a lot of significance to this observation. See also response to comment 94.

91. Page RI-3-6 Sixth Paragraph: The permeability of the A-zone was reported as 10[-4] to 10[-5].

Response: The comment is correct. The statement should read 10[-4] to 10[-6], not 10[-4] to 10[-5].

92. Page IR-3-7 First Paragraph: This paragraph states that groundwater velocity was calculated using assumed porosity; however, porosity measurements were said to be taken by E&E.

Response: At the time that the slug test was conducted, the porosity data was not available, so a literature estimate of 26% effective porosity was used. However, this estimate is for effective porosity whereas the laboratory measured total porosity. EPA believes that the effective porosity value used is consistent with the laboratory values.

93. Page RI-3-8 Fourth Paragraph: This paragraph states that the water levels in the new wells cannot be correlated to the water levels in the old wells because the old wells are screened across several of the subzones of the B water-bearing unit. As referenced earlier in the comment to Page RI-2-3, second paragraph, the report has also stated that the results for the B-zone are largely inconclusive. The 0.6-foot difference cited in water-level elevation between the "old" and "new" wells does not indicate these zones are not hydraulically interconnected. A pump test could be performed to make such a determination.

The 0.6-foot difference could also be due to surveying the monitoring wells to different elevation controls.

The potential fault that cuts the site could influence water levels. The data may confirm the presence of the fault. Why is the potential fault not shown on any map in the RI/FS?

The potential fault could isolate the Brown & Bryant site from the Arvin water supply well.

Response: See response to comment 83, 86 and 94. As to the potential fault at the site, early in the investigation there was speculation of a fault based on the dry wells located on the west side of the site. However, based primarily on lithological logs and E-logs from soil borings conducted by EPA and Kennedy Jenks, no evidence of a fault could be detected. EPA has not discussed in detail the possibility of a fault in the RI report because of the lack of evidence regarding its existence. The dry wells located on the west side of the site appear to be dry because of the position of the well screens relative to the water table (see page RI-3-6).

94. Table 3.2: The table should make it clear that "survey elevation" is measured to the top of well casing or measuring point elevation. Ground surface elevation would also be good information to list. This table does not correspond to Table 2.1 in the U.S. EPA Workplan. Which elevation data are correct? If the wells were resurveyed, it should be discussed in the RI/FS. What is the true groundwater flow direction in the A-zone and the

B-zone aquifers? If the elevation controls are incorrect, the groundwater flow directions calculated from them will be incorrect. Are the more recent monitoring wells installed by Kennedy Jenks Consultants surveyed to the same vertical control as the other monitoring wells?

Response: During the RI, EPA had all of the EPAS and older wells resurveyed and established for all wells the north side of the casing as the elevation control. Kennedy/Jenks conducted a separate survey of there wells. It can not be verified at this time that the same vertical control was used for each survey. However, when the new B-zone wells are installed for the second RI/FS, all the B-zone wells will be resurveyed and the A-zone well surveys will be verified.

95. Figures 3-2 through 3-7, 3-9: The source of the figures is Ecology and Environment, Inc., 1993. There is no reference citation for this contribution.

Response: The reference to Ecology and Environment is intended to record the originator of the figures; it is not a reference to a separate document.

96. Page RI-4-3 Second Paragraph: This paragraph states "To further identify areas for potential cleanup, Figure 4.1 also identifies eight other samples with concentrations of dinoseb between 8 mg/kg and 80 mg/kg." Only four samples are shown on Figure 4.1. Once a clean-up concentration level of 80 mg/kg has been established, it is not appropriate to cite lower concentrations for cleanup purposes.

Response: The text is in error. There are only four samples between 8 and 80 mg/kg, not eight. The reason for showing these samples in the figure is to characterize areas on-site that may approach the cleanup level. This data may be used to identify portions of the site for further characterization during cleanup.

97. Page RI-4-3 Second, Third, and Fourth Paragraphs: The U.S. EPA emergency response cleanup action in the dinoseb spill area is not adequately addressed in the RI (action is mentioned only in the FS). Approximately 80 cubic yards were removed from this area, treated by soil washing, and replaced. The third paragraph states that five locations in the dinoseb spill area were above the 80 mg/kg level. These areas may have already been removed, which would only leave isolated surface soil "concentrations" as a potential health risk.

Page RI-4-3 Fourth Paragraph: Again, addressing soils in the "construction zone," the dinoseb spill area is the only area of concern, and it may have already been removed. Further, it is not likely that the construction zone, based on sewer line data, would be used along this site boundary.

Response: The RI does characterize the dinoseb spill area prior to the removal. Part of the reason for doing this is to more thoroughly document the contamination problem that led to the removal. Ultimately, the final remedy selected does take into account the fact that the removal reduced the risk from dinoseb in the worst area of surface soil contamination (down to 7 feet) at the site. EPA selected to only cap the southern portion of the site in large part because the dinoseb problem had been substantially remediated by the removal action. Furthermore, treatment of the remaining isolated hot spots was not selected because of the small volume of contaminated soil exceeding 80 mg/kg.

98. Page RI-4-8 Table: Target concentrations are misleading and can be confused as cleanup levels. It is not appropriate to estimate quantities in relation to target concentrations that may not ultimately be used as cleanup goals. Further, the figures generated in this

section are all related to these target goals, whereas standard concentration contours would be helpful to allow simpler interpretation to any concentration limit.

Response: Page RI-4-6 explains the rationale for using the target concentrations in the report. On this page it is stated that the concentrations "are not intended as clean-up levels." EPA did not draw contamination contour lines for these figures because EPA believes that such contours would be too subjective due to the occurrence of multiple sources and the heterogeneity of contaminant concentrations.

99. Page RI-4-18 Second Paragraph: While it is important to note the different screen intervals, data may be gathered from these wells that may be compared. An inflatable packer could be used to sample discrete intervals in the "old" wells. The elevation data collected is likely correct. Well AR-01 should be video-logged to determine the screen interval.

Response: EPA agrees and is considering the actions proposed.

100. Table 4.8: Units are not specified. In the first row of the table, the average number given is "38,8511."

Response: The unit, ug/kg, was mistakenly left off of the table.

101. Figures: In general, several figures are missing a north arrow. For figures depicting concentration contours, past the date of the sampling event and concentrations detected for each well location. Contours should be in relation to standard intervals (e.g., 10, 100, 1,000) instead of target concentration intervals (e.g., 7, 70, 700). Figure 4.9 shows a pattern that could be indicative of an off-site source. This is not discussed in the text of the report.

Response: Concentrations used for Figures 4.7 - 4.9 are averages of 1992 data. The results are included in Table 4.12. EPA believes that presenting the concentrations relative to MCLs is more informative than using an arbitrary interval, especially since the MCLs for the different chemicals are in some cases more than an order of magnitude different. Soil data collected south of the site does not indicate an off-site source (see response to comment 77).

102. Figure 4.9: The point source DBCP anomaly surrounding Monitoring Well EPAS-3 appears to be an off-site source located near the off-site liquid waste disposal pit identified in Figure 4 of U.S. EPA document TS-PIC-89826, September 1989, titled "Aerial Photographic Analysis of Brown & Bryant, Inc., Arvin, California, EPA Region 9" prepared by Environmental Monitoring Systems Laboratory, P.O. Box 93478, Las Vegas, NV 89193-3478. This liquid waste disposal pit is south of the Brown & Bryant property, and it is associated with the potato shed facility due west of the pit. DBCP was used as a pesticide on potato crops during the 1960s. The potato shed operations included washing the soil and its adsorbed DBCP off the potatoes and discharging the waste water to the disposal pit.

This potential off-site source for groundwater contamination of DBCP should be addressed in the RI/FS.

Response: DBCP was not detected in any soil samples collected by either EPA or Kennedy Jenks in the area of the pit and potato shed, except for soil samples at the water table (see Figure 2.4 of the RI Report for the number of soil borings located in this area). See also response to comments 77 and 101.

103. Page RI-5-13 First Paragraph: It is not clear whether the dinoseb modeling effort for A-zone soils included the results for soil already removed. If so, the modeling is invalid.

Response: The modeling conducted for dinoseb was a screening type model. It utilized conservative assumptions to represent the highest contaminated areas of the site. Concentrations utilized for the model were biased to the highest contaminated areas at the site, including the area that was excavated. Despite these conservative assumptions, EPA concluded from the modeling results that additional treatment of the dinoseb hot spot was not necessary. A cap over this area was selected to adequately address the contamination remaining after the removal; this was the least costly alternative for soil treatment outside of the no action alternative.

104. Page RI-6-2 Fourth Paragraph: Preliminary Remediation Goals for residential soil are all less stringent than referenced target concentrations.

Response: The Preliminary Remediation Goals referenced here are based on ingestion or inhalation of contamination from soil. These goals do not take into account the potential for contamination to leak into groundwater. Elsewhere in the RI, EPA investigated the potential for the contaminants in soil to impact groundwater and derived the target concentrations for that purpose (see response to comment 98). For the risk assessment conducted on surface soil and soil in the construction zone, the pathway of exposure that was analyzed was incidental ingestion of contaminated soil.

105. Table 6.1: Analytical results on the first page of the table do not correlate with the values used in the soil sample calculation section on the second page of the table. The highest value listed in Table 6.1 is 520,000 ug/kg not 5,200,000, as noted on the second page of the table. The calculations at the end of Table 6.1 are incorrect if the values in Table 6.1 are recorded correctly.

The higher values in the table are listed with the data qualifier (J), indicating approximate values.

Response: Table 6.1 includes two typographical errors. The concentrations for samples from location 10 are each missing an additional zero at the end and should be 5,200,000 and 3,500,000; the correct concentrations were used elsewhere in the risk assessment section.

106. Table 6.5: Numbers in columns CDI (ave) are miscalculated for the Child and Young Adult, according to the 0.1 to 5,000 mg/kg values in the range column.

Is it appropriate to use analytical numbers that have the data qualifier (J), indicating approximate values as numbers used to calculate health risk?

Are the high values on the table from samples collected in the dinoseb spill area that has already been remediated? If so, they should not be used because they do not reflect current site conditions and falsely over-state the risk.

Response: The CDI(ave) values in Table 6.5 are correct using the 150 average concentration. It is consistent with EPA policy to use concentrations that are qualified with a "J" in risk assessments. Qualified results are used because it is usually preferable to not using any value. The highest concentration used in the surface soil risk scenario is not from the area that has already been remediated. The highest concentration used for the worker scenario was from the area cleaned up by EPA. This is noted in the conclusions in section 6.5 of the RI report. It should also be noted that EPA is not proposing additional soil cleanup in the

construction zone.

107. Page RI-7-1 First Paragraph: Addressing the nature and extent of contamination, again, removal action in the dinoseb spill area should be detailed.

Response: See response to comment 70 and 97.

108. Page RI-7-2 Third Paragraph: Estimating extent of chemicals above target concentrations (i.e., 1,2-DCP over 5.5 acres at concentrations 10 times the MCL) is meaningless. Cleanup concentrations need to be established. The FS states that cleanup concentrations for the A-zone groundwater between 10 and 100 times the MCL would be protective of the B-zone, based on modeling performed.

Response: As noted in the comment, the FS study established a cleanup standard of 10 to 100 times MCL. Therefore, it is not "meaningless" to discuss the area of groundwater contamination equal to or greater than 10 times the MCL. Such a figure provides a volumes estimate for cost purposes. EPA Region 9's policy at Superfund sites is to use MCLs as a basis for cleanup standards in groundwater.

109. Page RI-7-4 Third Paragraph: Data gaps include limited off-site testing to investigate areas such as the potential off-site source area for DBCP (Figure 4.9).

Response: See response to comment 77, 101 and 102.

110. Page RI-7-6 First Paragraph: No expected impact in "near future" is vague.

Response: The potential impact from contamination in the B-zone will be addressed in more detail in the second operable unit.

111. Page FS-1-1 First Paragraph: "Applicable or Relevant and Appropriate Regulations" should be "Applicable or Relevant and Appropriate Requirements."

Response: The comment is correct.

112. FS-1-2 First Paragraph: The statement is misleading. A RCRA cap is not automatically required for all waste ponds and sumps in operation after 1982. However, at closure, surface impoundments in which waste residues remain must be closed as a landfill.

Response: The comment correctly clarifies that a RCRA cap is not required until after an impoundment is closed. Because RCRA is applicable at Brown & Bryant, either a cap (landfill closure) or clean closure of the Brown & Bryant pond and sump are required. A clean closure would require cleanup of all the contamination. Since the contamination from the Brown & Bryant pond and sump has spread to a considerable depth and extent, EPA does not believe that a clean closure of these units is feasible; therefore, EPA chose to use a RCRA cap.

113. FS-1-4 Third Paragraph: "Applicable or Relevant and Appropriate Regulations (ARARs)," again, should be "Applicable or Relevant and Appropriate Requirements."

Response: The comment is correct.

114. FS-3-1 Third Paragraph: "Surface soils at the site are contaminated with dinoseb at levels up to 7,400 ppm" should read "were." As stated on page FS-1-1, "In 1991, EPA excavated and treated the most contaminated soil containing the pesticide, dinoseb," which would include this hot spot."

Response: The comment is correct that the area where the dinoseb concentration was found at 7,400 ppm was cleaned up; however, dinoseb concentrations at up to 5,200 ppm still remain on-site.

115. FS-3-1 Fifth Paragraph: States that "under current conditions (no cap), the model indicated a cleanup level of 2 mg/kg would be protective" of the A-zone groundwater. This model apparently included the "most contaminated" concentrations that have been removed from surface soils. A separate model should be run to reflect existing conditions. The model should also be run using only concentrations less than 80 mg/kg for the 0 to 7 feet below ground surface range because several of the evaluated remedial alternatives involve removal of contaminated surface soils to a cleanup level of 80 mg/kg. This would model the no-action alternative for the A-zone soils and its potential impact on the groundwater.

Response: EPA does not intend to rerun the model for dinoseb. Even though the model provided a conservative prediction of the potential impact of dinoseb contamination in soil to groundwater, EPA concluded that there is not enough of a threat to warrant treatment of dinoseb contaminated soil in the subsurface, especially considering the effect of capping the site on reducing contaminant transport. See also the response to comment 118.

116. FS-3-10 Paragraph 3: The volume of A-zone subsoils that may pose a threat appear overestimated. Soil samples are stated to not exceed 2 mg/kg below 20 feet for dinoseb; however, the estimate includes soil to a depth of 40 feet. Furthermore, the upper 7 feet of soil is considered separately as surface soil.

Response: The volume of 48,000 cubic yards is based on the distribution of volatile organic contaminants in the sump and pond area and not on the distribution of dinoseb contamination. This an estimate of the volume of soil that would have been treated by soil vapor extraction.

117. FS-4-3 Paragraph 4: For groundwater alternatives, an action item should be instituted to investigate and destroy potential conduits to the lower zone. In particular, EPAS-1 through EPAS-4 appear to be improperly constructed.

Response: Since well EPAS-1 serves no useful purpose, EPA agrees it should be destroyed. As for wells EPAS-2, 3 and 4, EPA does not believe that these wells should be destroyed at this time; see response to comment 119 for the rationale.

118. FS-4-5 Paragraph 5: The no-action alternative may be acceptable for A-zone soils once proper dinoseb concentrations are input to the MULTIMED model. Also, no-action for this zone should be considered with cleanup of surface soils to below 80 mg/kg concentration levels.

Response: The no action alternative for soil would not be acceptable because RCRA regulations require a cap over the sump and pond. Furthermore, EPA believes that a cap over the remainder of the most contaminated portions of the site is an appropriate remedy to control the spread on subsurface contamination in the soil. Rerunning the MULTIMED model would not change the selected remedy.

119. The RI/FS should present data that corrects and documents the shortcomings in the U.S. EPA's Brown & Bryant field program. Complete boring log descriptions for Monitoring Wells EPAS-1, EPAS-2, EPAS-3, and EPAS-4 should be provided in the RI/FS. There should be a discussion in the RI/FS concerning the acceptability of using silica sand at the bottom of the monitoring wells where the borings appear to penetrate the bottom of the A-zone aquifer. Using the limited boring information available in the U.S. EPA RI/FS Workplan

dated December 1990. Canonie has prepared well design diagrams with elevation data and the possible position of the A/B Aquitard (enclosed Figures 1 through 4). The potential that the EPA monitoring wells are cross-contaminating the A-zone and B-zone aquifers should be discussed in the RI/FS.

Response: Two issues are presented in this comment. The use of silica sand at the base of the wells is consistent with standard practices. However, EPA agrees that in this case, the use of silica sand was not the best choice. In future well designs for the site, bentonite or grout will be used, where necessary, to fill in the space between the bottom of the borehole and the bottom of the well. The second issue concerns the possibility of cross-contamination from these wells. EPA acknowledges that there is the potential for leakage through the A-zone at these wells and will investigate this concern further during the second operable unit. However, based on current information, EPA believes that this leakage is not significant enough to warrant abandonment of wells EPAS-2, 3 and 4. The leakage is believed to be insignificant based on the fact that water levels within these wells are maintained over time at levels consistent with other site wells, and that the area over which leakage could occur is small (especially compared to area over which the A-zone is contaminated). However, EPA will investigate this concern further during the second operable unit and consider again at that time whether to abandon these wells.

120. The discrepancy between the monitoring well elevation data reported in the RI/FS and the RI/FS Workplan should be discussed in the RI/FS. Groundwater flow directions cannot be evaluated until groundwater elevation data can be validated.

Response: See response to comment 94.

121. There are rusting waste drums on the site, apparently from the U.S. EPA field investigation program. Who is responsible for them? Do they contain hazardous waste? Are they a potential source for surface contamination?

Response: Drums on site are either empty or contain sampling derived wastes. The drums are in good condition and are not leaking. EPA will dispose of this waste at the time of final cleanup.

122. The U.S. EPA conducted excavation and treatment operations within the dinoseb spill area. These operations should be fully described in the RI/FS. Maps and cross-sections should be provided to show the present conditions in the dinoseb spill area. If adequate information is not available, it should be collected before the RI/FS is rewritten.

Response: See response to comment 70.

123. The RI/FS does not contain certified analytical reports and, therefore, it is impossible to verify the correctness of the individual tables that summarize the analytical values. As noted in our comments, several tables contain reporting errors.

Response: All RI data has been validated. A discussion of data quality is provided in section 2.7 of the RI report and a list of data validation reports is provided in Appendix D, and the reports are included in the administrative record for the RI/FS.

124. The dinoseb threat appears overstated, thus, overstating the threat to groundwater from the A-zone soils.

Response: EPA disagrees. The least costly remedy for addressing the dinoseb contamination has been selected. The no action alternative for soil is unacceptable for a variety of reasons. In

particular, it does not meet ARARs and does not address areas of surface soil contamination onsite that exceed the health based cleanup standard. See also response to comment 70 and 97.

125. The risk assessment appears to be based on contamination values that have already been remediated or are within the construction zone, which will be remediated.

Response: See response to comment 106.

126. The A-zone aquifer is not an appropriate operable unit, it should be combined with the B-zone aquifer for a complete groundwater interpretation.

Response: EPA disagrees. There is substantially more contamination in the A-zone groundwater as compared with the B-zone groundwater. In order to treat the worse portion of the site first and to control the current source of contamination threatening the B-zone, EPA has proposed to address the A-zone as a first priority. See also response to comment 67.

127. The RI/FS does not appear to evaluate all sources, including a point source of DBCP south of the Brown & Bryant fence, former potential contaminant sources near the Arvin water supply well, and the point sources potentially caused by the U.S. EPA wells. All of these contaminant sources will influence the choice and scale of remedy.

Response: EPA does not agree that these other sources will have any affect on the remedy selected for this ROD or the scale of the remedy. EPA believes that there is overwhelming evidence that Brown and Bryant is the primary source of the contamination proposed for remediation in this ROD. See also response to comment 77, 101 and 102.

128. Databases used to reach a remedy need to be verified. Certified analytical results are not provided, so there is no opportunity to assess the accuracy of the database used to reach a remedy. Similarly, the groundwater database is suspect because the U.S. EPA well logs, well details, and elevation data are not complete nor are they consistent. It appears that nonverified data influenced the groundwater remedy.

Response: Data used in the RI/FS has gone thorough a through validation and wells were resurveyed during the RI for consistent and accurate measurements of the groundwater gradient. See also response to comment 94 and 123.