Introduction

This document is an explanation of significant differences (ESD) in cleanup actions for the GE/Spokane Site located at E. 4323 Mission Ave., Spokane WA. (Figure 1) The originally selected cleanup action for soil at the site, In-Situ Vitrification (ISV), may be impracticable on the basis of cost [WAC 173-340-360(5)(d)(vi)] for treatment of shallow soils contaminated with Polychlorinated Biphenyls (PCBs). An alternative cleanup method, off-site disposal, has been proposed by General Electric Company (GE).

This is a change of cleanup action from Cleanup Action Plan (CAP), prepared by Ecology and final March 29, 1993. Therefore, this ESD constitutes an amendment of the Final Cleanup Action Plan, and is meant as an exhibit to an amendment of Consent Decree 93206059-3 between the State of Washington and GE. Public participation will be conducted in accordance with WAC 173-340-600(9) and (11).

This ESD documents changes to the final cleanup action plan, in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) section 117(b) and the National Contingency Plan 40 CFR Parts 300.435(c)(2) and 300.825(b) and (c), as well as with the requirements of the Model Toxics Control Act (MTCA) cleanup regulation (Ch. 173-340 WAC). Applicable guidance for this ESD is provided by Kmet (1992) and EPA (1991).

Declaration

Ecology has selected this remedy because it will be protective of human health and the environment. Furthermore, the selected remedy is consistent with the preference of the State of Washington as stated in RCW 70.105D.030(1)(b) for permanent solutions.

Applicability

This ESD and CAP amendment is applicable only to the GE Spokane Site. Cleanup actions have been developed as an overall remediation process being conducted under Ecology oversight using MTCA authority, and should not be considered as setting precedents for other sites.

Numerical values for cleanup levels are set by considering many site-specific factors, including: continuing Ecology involvement in this effort through the RI/FS process; that cleanup actions will be conducted under Ecology oversight; that a compliance monitoring plan will be implemented under Ecology oversight, and that remedial actions will be implemented under a consent decree entered into by Ecology and GE.

Administrative Record

The documents used to make the decisions discussed in this cleanup action plan amendment are constituents of the administrative record for the site. The administrative record for the site is available for public review at the information repository for the site. That is located at Ecology's Eastern Regional Office, N. 4601 Monroe, Spokane, WA 99205-1295.

General Background and MTCA Process

The GE/Spokane site was listed on the National Priorities List by the U.S. Environmental Protection Agency (EPA) in 1988. Ecology was established as the lead agency for oversight of the cleanup through agreement with EPA. Remedial investigations, interim actions, a risk assessment, and a feasibility study were conducted under an agreed order between GE and Ecology, pursuant to the Model Toxics Control Act (Ch. 70.105D RCW). Documentation of these actions are part of the adminstrative record.

Site History

The former transformer service shop had operated from 1961 to 1980. In the course of servicing transformers, oils containing PCBs were used. PCBs were banned in 1979 under the federal Toxic Substances Control Act (TSCA).

On site, PCBs were found in surface soils and dry wells. Beneath the West Dry Well, PCBs in soil cause ground water contamination. A plume of PCB bearing ground water extends west from this dry well, onto property owned by Washington Water Power Company (Figure 2).

GE demolished buildings and excavated most subsurface tanks and drainage structures as an interim action. PCB-bearing soils and debris from the site were used to construct a "test cell" to demonstrate the effectiveness of In-Situ Vitrification (ISV) in destroying PCBs to standards required under federal law and regulation.

Prior to the ISV demonstration test, the feasibility study (Bechtel, 1992) proposed using ISV to destroy PCBs in on-site soils. Ecology approved the feasibility study in 1992.

The Cleanup Action Plan (CAP) for the site was written in early 1993 (Ecology 1993). Ecology concurred with GE that ISV should be performed. Ecology chose a contingent remedy should ISV either be unavailable or otherwise fail to destroy PCBs to an acceptable level. In that way, administrative costs and cleanup delays could be avoided by both Ecology and GE. Solvent-free

dechlorination, a variation of thermal desorption technology, was proposed by GE and chosen by Ecology as the contingent remedy. Ecology and GE entered in to Consent Decree 93206059-3, filed in Spokane County Superior Court in late December, 1993, implementing the CAP as written after public hearing and opportunity to comment. Design documents required to plan for the Cleanup Action are Bechtel, 1993; 1994a; and 1994b.

During design, the original ISV concept changed due to cost and site constraints. Ecology reviewed the progress of conceptual design through the design document review process. As originally contemplated, ISV was to be employed in-situ, vitrifying soils in the west dry well and elsewhere in place without excavation. Modifications to ISV processing unit and cost considerations led GE to propose excavation of west dry well soils and other site soils, and construction of a vitrification treatment area. Ecology approved of these changes as minor, yet withheld final approval until public comment had been solicited. Design documents were accepted as final after public notice and opportunity to comment in October, 1994.

A performance demonstration of ISV technology was conducted on site during June through October, 1994. The purpose of the demonstration was to establish ISV as effective at destroying PCBs in accordance with the destruction/removal efficiency requirements of the Toxic Substances Control Act. On October 31, 1995, EPA issued a national permit to Geosafe (USEPA, 1995) allowing ISV to be used to destroy non-liquid PCBs, equivalent to incineration.

Amendment Request

In a March, 1996 meeting with Ecology, GE asserted that ISV was impracticable to employ for soil cleanup at the GE/Spokane Site, as costs for ISV were "substantial and disproportionate" to the level of protection of human health and the environment obtained by simply hauling material for treatment or disposal off-site. In April, 1996, Ecology concurred that costs may be substantial and disproportionate, and agreed to modify the consent decree to allow off-site incineration and disposal of PCB-contaminated soils at the GE/Spokane Site. Subsequent contract negotiations by GE confirmed that ISV is competititve with off-site incineration for West Dry Well soils, generally of low volume but bearing relatively high concentrations of PCB.

Ecology also noted that GE has to date been unable to establish institutional controls on properties not owned by GE which are necessary to protect human health and the environment in an industrial exposure scenario.

Consideration of Contingent Remedy

The March, 1996 request for amendment did not address the contingent dechlorination remedy proposed in Bechtel, 1992 and included in Ecology, 1993. Ecology believes the contingent remedy to not be applicable for consideration. The Consent Decree required consideration of the contingent remedy only upon notification that ISV technology is unavailable because of 1 or more of the following reasons:

1. The ISV demonstration test is unsuccessful in destroying PCBs to levels acceptable under TSCA.

2. The ISV demonstration test is unavailable to be performed in a reasonable time, taken in this context to mean that mobilization will not be complete prior to January 1, 1995.

3. The ISV demonstration test is unavailable to be performed because a permit to demonstrate the technology at the GE/Spokane Site, required by EPA, is not issued.

ISV was successful in destroying PCBs to levels acceptable under TSCA; mobilization occurred prior to January 1, 1995 for the demonstration test, and a permit to operate ISV technology was issued by EPA. . Thus, no consideration of the Contingent Remedy is necessary in this change of remedial action.

Remedy Description

CAP Selected Remedy

The elements of the previously selected remedy which are proposed for modification are:

- Institutional Controls on Ground Water and Soil

  Institutional controls are a vital element of the cleanup action plan to ensure protection of human health. WAC 173-340-440 requires institutional controls when the cleanup action results in residual concentrations of hazardous substances that exceed cleanup levels. WAC 173-340-745 requires institutional controls on sites where cleanup levels have been set using industrial soil assumptions. At this site, institutional controls include restrictive covenants on extraction and use of ground water. These covenants must be placed on the deeds of properties where ground water is impacted. In addition, restrictions and notices governing handling and disposal of site soils must be placed on the deeds of affected properties.

• Vitrification of Soils

Upon successful completion of the ISV demonstration test, vitrification will be employed to treat on site soils. Shallow soils will be excavated, treated by screening to segregate large cobbles, and stockpiled within the area of contamination. Deep soils containing chemicals above cleanup levels will be treated with in-situ vitrification techniques. Stockpiled soil for treatment will be backfilled on top of the lower melt and vitrified.

Proposed Remedy

The proposed modifications are as follows:

- Institutional controls on Ground Water and Soil

Institutional controls on ground water and soil have been in place on GE-owned property since February, 1996. If institutional controls cannot be placed on site properties not owned by GE, then GE will remove PCBs on these properties not owned by GE to a level consistent with relevant and appropriate requirements, protective of human health and the environment in a residential scenario. That level will be established at 1 mg/kg, per WAC 173-340-740(2).

Ecology will notify local planning authorities that ground water is contaminated with PCBs in this vicinity. Exposure to PCBs through ground water ingestion is unlikely, as city water is readily available. GE will remain responsible to monitor ground water and the performance of the cleanup action.

- Soil Action

GE has already excavated the West Dry Well. These soils and other soils with high PCB concentrations will be screened and vitrified on-site as planned. Remaining site soils above the 10 mg/kg cleanup level for soils on the GE property and the 1 mg/kg cleanup level for soils off the GE property not covered by institutional controls will be screened to reduce volume and transported off-site for disposal in accordance with requirements of TSCA.

Deep soils in the west dry well have been stabilized by grouting, decreasing chemical availability for transport in ground water. GE will monitor ground water to measure the performance of this action in reducing levels of contamination of ground water.

Reasons for change

Table 1 presents a comparison of the original remedy, versus the proposed remedy, and notes reasons for the proposed changes.

Institutional Controls

Cleanup standards were set for this site by Ecology in the CAP (Ecology, 1993) under WAC 173-340-745. These soil cleanup standards for industrial sites require "institutional controls" [WAC 173-340-745(1)(b)(v)] to ensure the long-term integrity of the exposure assumptions. At this site, potential human health and environmental exposure was determined to be consistent with industrial site use. GE has filed such institutional controls on GE property. Beyond that property, without institutional controls, Ecology cannot rely on long-term exposure assumptions limiting land use consistent with industrial exposure. Thus, in accordance with WAC 173-340-745(1)(e), Ecology has determined further remedial action to be necessary to protect human health and the environment. Beyond GE property, Ecology must change the surface soil cleanup level to 1 ppm, in accordance with WAC 173-340-740(2), if institutional controls cannot be put in place prior to filing the consent decree amendment in court..

Soil Action

GE proposed to Ecology that costs for performing ISV to treat remaining contaminated soils on site were "substantial and disproportionate" to off-site incineration of West Dry Well soils and off-site disposal of other shallow site soils. WAC 173-340-360(5)(vi) states:

> "A cleanup action shall not be considered practicable if the incremental cost of the cleanup action is substantial and disproportionate to the incremental degree of protection it would achieve over a lower preference cleanup action. When selecting from among two or more cleanup action alternatives which have an equivalent level of preference under subsection (4) of this section, preference may be given to the least cost alternative. In performing this evaluation, the top three preferences in subsection (4) of this section shall be considered equivalent unless there are overriding public concerns or technical uncertainties."

Ecology conducted a review of data supplied in support of GE's assertion that ISV was impracticable. Ecology concurred that the incremental cost of ISV may be substantial and disproportionate to the benefits of 100% destruction. Ecology's decision is included as Appendix A.

Summary of Significant Differences

Substantially more soil at this site may need to be managed as a result of reduction in cleanup level. Ecology estimates approximately 7000 cubic yards of soil currently exist above a concentration of 10 mg/kg total PCB. Approximately another 7000 cubic yards of soil exist between 1 and 10 mg/kg.

For these high volume low concentration soils, changing from ISV to off-site disposal will mean that approximately 106 kg of PCB will exist in a secure landfill, which would otherwise be destroyed. This means 74% of site PCBs will be destroyed, rather than 100%.

The change will cost approximately 1.5 million dollars less than ISV (Appendix A).

Evaluation of Actions with Respect to MTCA Criteria

The following compares the CAP remedial action and proposed amendment to the remedy selection criteria of WAC 173-340-360.

Protection of Human Health and the Environment

The major exposure routes from the site are from ingestion of or contact with PCB contaminated ground water and soil. Institutional controls restricting use of contaminated ground water would provide short term protection of human health. Removal of those contaminants, without institutional controls, will be more protective of human health.

Virtually 100% destruction of PCBs in soil through vitrification will remove the continuing source of contaminants and also provide a low-permeability mass limiting infiltration and transport of material below cleanup standards. The proposed alternative will destroy 74% of site PCBs. The remaining 26% will require long-term management in a TSCA-permitted chemical waste landfill.

Compliance with Cleanup Standards

All soils containing PCBs above standards protective of human health and the environment will either be removed or grouted. No institutional controls will be required limiting land use on properties other than GE's if the 1 mg/kg PCB cleanup level is necessary.

Compliance with Applicable Federal and State Laws

The cleanup action at the GE/Spokane site will comply with applicable federal and state laws. Local laws which are more stringent than the specified federal and state laws will govern when applicable.

Compliance Monitoring

Compliance monitoring consists of three categories: protection, performance, and confirmational monitoring (WAC 173-340-410). Protection monitoring confirms that human health and the environment are protected during construction and operation and maintenance of the cleanup action. Performance monitoring confirms the cleanup action has attained cleanup standards and other performance based criteria. Confirmational monitoring confirms the long term effectiveness of the cleanup action once cleanup standards are attained.

Compliance monitoring provisions will not change from those already in approved plans (Bechtel, 1993).

Use of Permanent Solutions to the Maximum Extent Practicable

Destruction of PCBs in-situ is considered a permanent solution under MTCA. Off-site transport and disposal, or deep soil stabilization, are considered containment. MTCA recognizes that permanent solutions may not be practicable for all sites. The cleanup action must satisfy the criteria outlined in WAC 173-340-360(5)(d) used to determine whether the cleanup is permanent to the maximum extent practicable.

Protection of Human Health and the Environment

Both alternatives are protective of human health and the environment, though vitrification of 100% of site PCBs will provide somewhat higher overall protection of human health as previously discussed.

Long Term Effectiveness

Long-term effectiveness will be achieved by destruction or removal of PCBs in soil.

Short Term Effectiveness

Risks associated with the cleanup action include potential exposure of workers to dust and soil during construction activities, and exposure to gases during operation of the ISV unit. Off site incineration and disposal creates somewhat

greater risk, because of the transport of contaminated soils through traffic to ultimate treatment or disposal sites. Transport, storage, and disposal of reagents and residual products are subject to applicable regulations.

Permanent Reduction of Toxicity, Mobility, and Volume

Vitrification will reduce the toxicity and volume of PCBs by destruction. Off-site treatment and disposal reduces toxicity and volume by 26% of ISV. All PCBs will be immobilized by grouting, incineration, or disposal in a secure landfill.

Implementability

Both alternatives are readily implemented.

Cost

Cost for ISV of all site soils may render it impracticable relative to off-site incineration and disposal (Appendix A). GE has informed Ecology that ISV of the smaller amount of West Dry Well soils is similar in cost to off-site incineration of those soils.

Provide Reasonable Restoration Time Frame

Both remedies will provide a complete cleanup action within approximately 1 year.

Public Participation and Community Acceptance

MTCA regulations require public concerns regarding this amendment be addressed. A public comment period for this document will allow the public and affected parties a chance to comment on the proposed action. Public comments and concerns will be evaluated in developing the final amendment. A responsiveness summary will also be submitted as part of the final cleanup action plan to specifically respond to all public comments.

Amendment of Cleanup Action Plan

Because of cost considerations, the Cleanup Action Plan is amended to change remedial action for soil at the GE/Spokane Site to allow off-site disposal of shallow soils from the area of the site outside of the West Dry Well.

Because of human health and environmental protection considerations, the Cleanup Action Plan is amended to require a cleanup level in shallow soil to meet residential exposure standards of 1 mg/kg total PCBs for properties which are not covered by institutional controls.

Remedial action shall be complete according to the schedule outlined in the consent decree amendment.

Affirmation of Statutory Determinations

Considering the new information that has been developed and the changes that have been made to the selected remedy, Ecology believes that the remedy remains protective of human health and the environment, complies with federal and state requirements that were identified in the original Cleanup Action Plan, as applicable or relevant and appropriate to this remedial action at the time the original Cleanup Action Plan was final, and is cost effective. In addition, the revised remedy utilizes permanent solutions to the maximum extent practicable for this site.

References Cited

Bechtel, 1992, Feasibility Study Report for the Former General Electric Service Shop, Spokane, WA.

Bechtel, 1993, Summary Cleanup Action Planning Report, including the Soil Treatment, Ground Water Monitoring, Investigative and Project Waste Management, Compliance Monitoring, Data Management, and Health and Safety Plans, for GE-Spokane Remedial Design/Remedial Action Project

Bechtel, 1994a, Preliminary Soil Treatment Design, Construction, and Operation Plan, GE-Spokane Remedial Design/Remedial Action Project

Bechtel, 1994b, Final Soil Treatment Design, Construction, and Operation Plan, GE-Spokane Remedial Design/Remedial Action Project

Ecology, 1993, Final Cleanup Action Plan, Former General Electric Spokane Shop,. E. 4323 Mission Avenue, Spokane, WA

Kmet, Peter to TCP Management Team, Nov. 23, 1992 memorandum, Guidance for Amending Cleanup Action Plans

U. S. EPA, 1991, Guide to Addressing Pre-ROD and Post-ROD Changes, USEPA OSWER Publication 9355-02FS-4

U.S. EPA, 1995, Approval to Dispose of Polychlorinated Biphenyls, issued to Geosafe Corporation, Oct. 31, 1995

Table 1: Comparison of Original Remedial Action Components, and Proposed Changes

Issue	Original Remedy	Proposed Remedy	Reason for change
Soil Action	Vitrification	Deep soil grouting, excavation, and vitrification plus off-site disposal	Costs are substantial and disproportionate to the incremental level of human health and environmental protection
Cleanup Levels	10 mg/kg PCB with institutional controls off GE owned property	1 mg/kg off GE-owned property for which institutional controls have not been obtained.	Cleanup levels adjusted downward on land for which no institutional controls are available.

Figure 1: Location of GE/Spokane Site

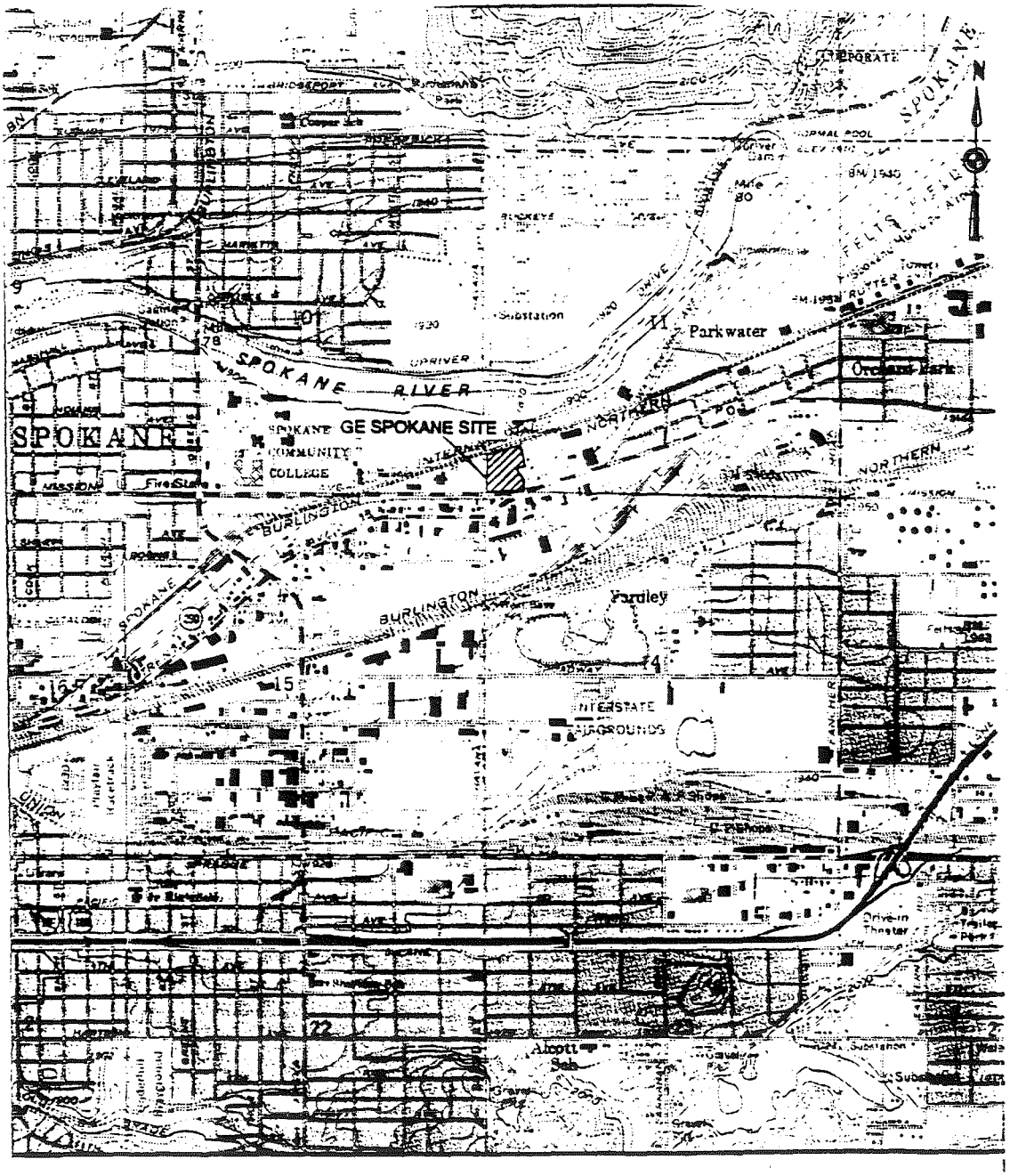
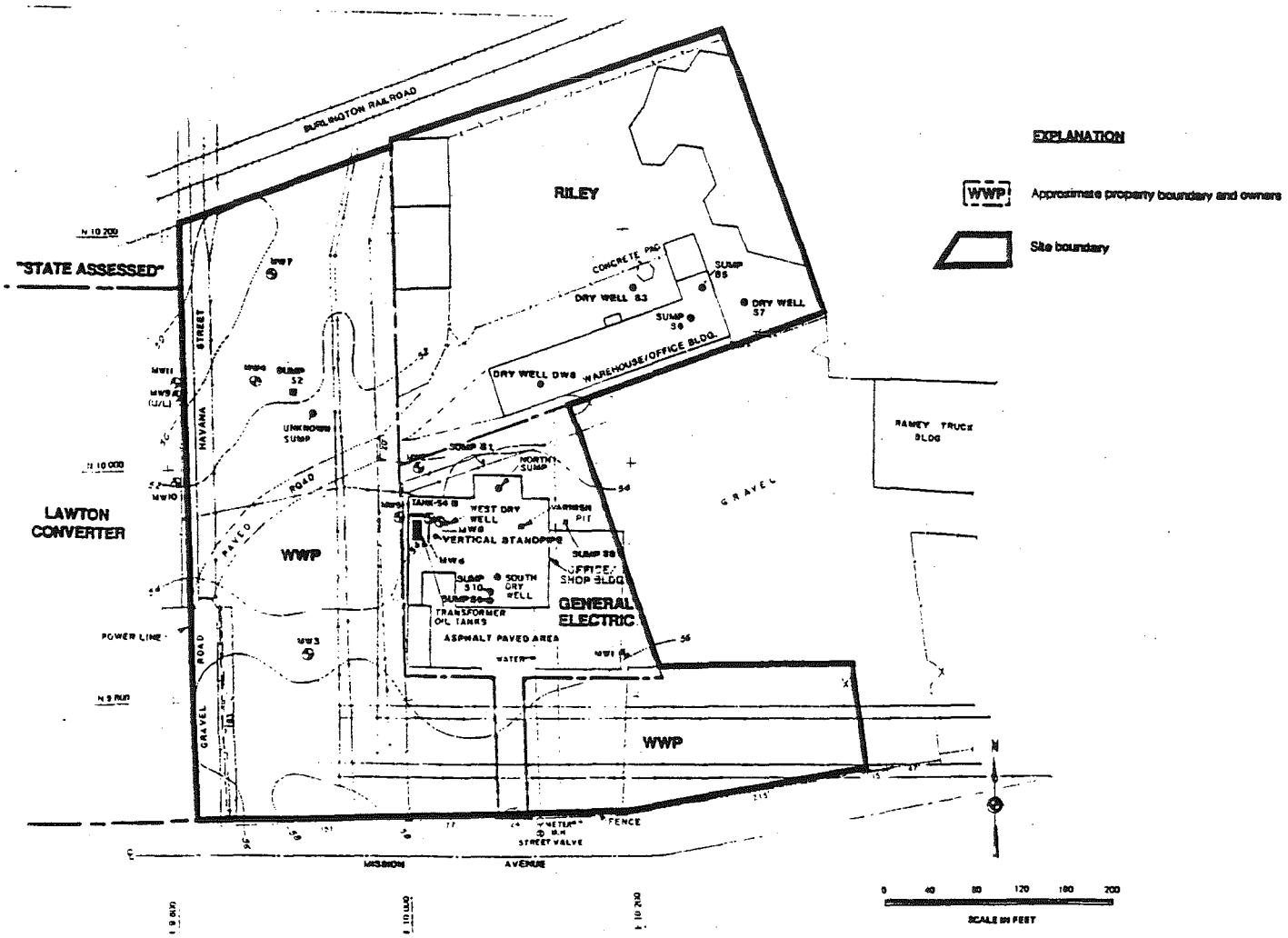


Figure 2: Ownership and Site Facilities



Appendix A

Cost Analysis

DEPARTMENT OF ECOLOGY

May 8, 1996

TO: Flora Goldstein

FROM: Guy J. Gregory

SUBJECT: Revised Substantial And Disproportionate Analysis, GE/Spokane Site

On March 14, 1996, Ecology received from Golder Associates, Inc. (Golder) a "settlement confidential" proposal for a separate evaluation of costs for the ISV remedy and off-site treatment and disposal remedy for the GE/Spokane Site. The off-site remedy was previously submitted as remedy S-10 in the Supplemental Feasibility Study (SFS) filed by Golder, presumably on GE's behalf, December 11, 1995. The SFS was rejected by Ecology December 20, 1995.

GE is promoting this change of remedy on a cost-benefit basis, presumably to avoid litigation should Ecology insist that GE perform the ISV remedy. See correspondence since October 1994 for more information on the dispute regarding the application of ISV at this site. Ecology has agreed to evaluate the two cleanup actions against GE's assertion that ISV costs were substantial and disproportionate to off-site treatment and disposal. The "substantial and disproportionate" language comes directly from WAC 173-340-360(5)(vi), which states:

> "A cleanup action shall not be considered practicable if the incremental cost of the cleanup action is substantial and disproportionate to the incremental degree of protection it would achieve over a lower preference cleanup action. When selecting from among two or more cleanup action alternatives which have an equivalent level of preference under subsection (4) of this section, preference may be given to the least cost alternative. In performing this evaluation, the top three preferences in subsection (4) of this section shall be considered equivalent unless there are overriding public concerns or technical uncertainties."

"Subsection 4" [WAC 173-340-360(4)] is the waste management hierarchy of preference for cleanup technologies. The issues surrounding this determination are the subject of the September 9, 1993 memorandum (Coleman to file) and an October 25, 1995 memorandum (Coleman to PAC Remedy Selection Subcommittee) regarding examples and guidance for making this determination. This example, of course, does not exactly fit any previous examples cited in the memoranda. The questions at this site are typical of such determinations: 1) What are the costs of the cleanup actions? and 2) What are the incremental degrees of protection they achieve? The following are my estimates of the

answers to these questions. Golder's proposal is based upon a cost per unit destruction estimate, thus a review of costs and units are first.

Costs, Units, and Benefit Considerations

Costs

In response to requests for additional information, Ecology received faxes dated March 8, 1996, from Geosafe and March 19, 1996, from Bechtel. These costs update those presented in the SFS, table 4-7, for ISV. These costs are used to evaluate ISV. Costs for off-site treatment and disposal were detailed in the SFS Table 4-6. Copies are attached. Note these tables contain low and high estimates, based upon presumed volume of soils. I compared only the high estimates, based upon the uncertainties in the volume and concentration estimate (see below).

Table 1 compares the presented costs. Only costs shown in italics on this table are included in the analysis. Excluded costs are as follows:

1. West Dry Well excavation and grouting costs were excluded because that work is complete and not remedy-specific.
2. Site preparation costs are widely different, with no information for the discrepancy, so they were excluded.
3. Soil excavation and screening costs vary widely, and are required for each alternative. Ecology chose the larger of the two estimates as constant for each alternative to be conservative and equal.
4. Testing, roadwork and grading costs are not included in the Golder off-site estimate, but the work is necessary for either remedy. I was unable to confirm them independently, so they were excluded from the analysis.
5. No costs are specifically presented for confirmation sampling of excavations, necessary for either remedy. ISV confirmation sampling is included as an additional remedy-specific cost.
6. Engineering and contingency costs are eliminated from the analysis, as they generally vary as a percentage of the total direct costs.
7. $10 per yard was added for on-site handling, stockpiling, truck loading, and manifesting of soils for off-site disposal. Golder's off-site alternative failed to include costs for this portion of the remedy. Their direct disposal costs only account for transportation and disposal.
8. Golder failed to explain why the "low estimate" contained more soils requiring incineration than the "high estimate". I assumed highest volumes in this cost estimate.

I feel these assumptions are consistent with the purpose of the analysis, that is, to compare the direct stated costs of treatment of the alternatives for comparative purposes. Given these assumptions and exclusions, the cost of treatment are:

Vitrification	$4,919,000
Off-Site Treatment and Disposal	$3,512,000

Units managed, or Volume and mass to be treated

Since the original Feasibility Study, roughly 7000 cubic yards of soil have been assumed to be present on site above the cleanup level of 10 mg/kg total PCBs. A specific estimate of total mass of PCB was never put forward. Golder's SFS presented a revised in-place volume, and a PCB mass estimate, in support of both management options and benefit analysis. It suggests roughly 409 kg PCB remain on site. These are divided as 106 kg PCB in shallow soils, and 303 kg PCB in the presumed 800 yards of now-excavated and stockpiled West Dry Well soils.

While Golder's estimates are reasonable, I feel these estimates are low. A derived estimate for PCB mass can be obtained from the average concentration (272 mg/kg [Baseline Risk Assessment, Table II-4]) for 4578 cubic yards of fine soil (cobble removed, Table 3-3, Final Soil Treatment Design, Construction, and Operations Plan). This generates an estimate of 136 kg total PCBs on site above 4 feet depth. Golder's memorandum assumes midpoint average concentrations for contoured areas arrives at an estimate of 106 kg. for the same area of soil. Golder further attempts to legitimize this effort by a minimal and previously unreported sampling event done in 1994.

Also, Golder estimates that shallow soils below 3 feet depth are negligible in both volume and concentration. I think that given the number and location of areas greater than 3 foot depth slated for excavation illustrated on figure 3-6 of the Final Soil Treatment Design, Construction and Operations Plan, Golder is in error. Actual yardage of chemically contaminated soils requiring management will be greater than that proposed by Golder. They also exclude soils which otherwise must be managed, i.e. clean overburden, marginally contaminated soils, cobble, etc.. and fail to provide costs.

Given the uncertainties regarding PCB distribution, there is no practical method of confirming these issues until excavation. Thus, Golder's PCB mass and volume estimates will be used.

Additionally, Golder does not include soils off GE property which are above 1 mg/kg. This low contaminant-mass, high yardage soil will probably require management, as GE has to date failed to acquire institutional controls on WWP and Riley property.

Like all treatment systems, both remedies effectively treat volumes of soil rather than kilograms of contaminant. Cost increases for increased volumes would be roughly proportional to the current cost per volume estimates. Off-site treatment and disposal costs should show linear increase with each additional cubic yard of contaminated material. ISV is a batch treatment, so costs increase stepwise with each "batch", or group of cubic yards. Fixed costs (i.e. mobilization) become diluted on a per-batch basis. A linear approximation then probably represents a low cost per unit estimate.

Benefits

The incremental degree of protection of these remedies, assuming both meet threshold criteria, is directly related to the permanence of the remedy. Both remedies are reasonably permanent. The criteria for permanence found in WAC 173-340-360(5)(d). To ensure a bias toward permanent solutions, cleanup actions conducted under WAC 173-340 including consideration of prior actions at the site shall comply with the following requirements of WAC 173-340-360(5)(e):

- The cleanup action shall prevent or minimize present and future releases and migration of hazardous substances in the environment;
- The cleanup action shall provide for a net reduction in the amount of a hazardous substance being released from a source area;
- The cleanup action shall not rely primarily on dilution and dispersion of the hazardous substance if active remedial measures are technically possible;
- A cleanup action relying primarily on institutional controls and monitoring shall not be used where it is technically possible to implement a cleanup action alternative that utilizes a higher preference cleanup technology for all or a portion of the site;
- A cleanup action involving off-site transport and disposal of hazardous substances without treatment shall not be used if a treatment technology or method exists which will attain cleanup standards and is practicable.

ISV ranks higher with these criteria than off-site treatment and disposal because:

1. PCBs entering the treatment stream are treated to destruction. Residuals are managed by incineration, and the treatment is proven successful at achieving significant reductions below the 10 ppm PCB cleanup standard.
2. No off-site transport and disposal of other than treatment residuals is required. Transported treatment residuals are destroyed, not landfilled.
3. A permanent solution is one in which cleanup standards can be met without further action being required at the original site or any other site involved with the cleanup action, other than the approved disposal of any residue from preferred treatment technologies under WAC 173-340-350(4)(a)(i) through (iii).[WAC 173-340-360(5)(b)]. Off site landfilling and management is inherently less permanent. Thus, the permanence and therefore protectiveness of remedies is proportional to the percentage of PCBs actually destroyed.

Analysis

Numerical assumptions:

- 406 total kg of PCBs remain on Site (Golder, 1996).
  7000 yards total soil need to be managed on site, consistent with the "high estimate costs" as modified above. (Golder, 1996).
- 5250 cubic yards of soil will require treatment and/or disposal, assuming 75% reduction during screening of 1 inch oversize. This is roughly equivalent to 9800 tonnes (metric tons) of soil, or 9,800,000 kg, assuming 1.7 tons per yard, 1.1 tonnes per ton, and 1000 kg/tonne.
- The total soil mass is distributed approximately as 1,500,000 kg in the West Dry Well, and 8,300,000 kg in shallow soil (Golder, 1996).
- PCB mass is distributed as 303 kg PCB in the West Dry Well, and 106 kg PCB in shallow soil (Golder, 1996).
- Costs applicable to treatment for ISV are $4,919,000 to treat 9,800,000 kg soil ($0.502 per kg) bearing 409 kg PCB.
- Costs for off site-treatment and disposal (volumetrically prorating screening and loading costs) are: $1,342,600 to screen, load, transport and incinerate 1,500,000 kg soil ($0.895 per kg) bearing 303 kg PCB; plus $2,159,500 to screen, load, transport, and landfill 8,300,000 kg of soil ($0.260 per kg) bearing 106 kg PCB, for a total of $3,512,100 ($0.358 per kg soil).
- The total protection is proportional to the percentage of PCBs destroyed and not requiring future management. For Off-Site Treatment and Disposal, this is 303/409 kg, or 74%. For ISV, it is 100%.

Analysis

Figure 1 illustrates the percent of soils treated and percent of PCBs destroyed for components of each proposed remedial action. No Action is included for purposes of comparison. Incineration alone treats 15% of the soil, containing roughly 74% of the PCBs. The landfilling component manages the additional 85%, with no increase in PCB destruction, thus no benefit beyond the site meeting cleanup standards.

Figure 2 illustrates the cumulative benefits of ISV relative to the cumulative cost increase. ISV destroys 106/409 more PCBs than the off-site treatment and disposal alternative, so it has an incremental benefit of 26% over the off-site incineration and disposal alternative. This benefit requires an expenditure of an additional $3,577,000.

ISV requires the treatment of 8,300,000/9,800,000, or 84% more soil. The direct linear cost for treating this 8,300,000 kg of soil is 8,300,000 kg times $0.502 per kilogram of soil treated, or $4,166,000. The direct linear cost for disposing of this soil is $2,159,500, or $0.206 per kilogram of soil disposed.

Figure 3 illustrates the cumulative cost for treating the shallow soil. ISV treats 100% of the soil, and gathers 100% of the benefit, at a cost just under 5 million dollars ($5,000,000). Incineration treats 15% of the soil achieving 74% of the benefit at a cost of about $1.35 million.

The incremental benefit of 26% therefore requires the vitrification of 84% more soil for an increase in cost of treatment over disposal of $2,456,800, or about $0.296 per kg of soil.

The incremental costs of destroying this high volume, low concentration soil are as follows: to destroy the additional 106 kg of PCB in shallow soil, ISV costs $4,919,000 - $1,342,600 or $3,577,000. This is approximately equal to $33,745 per kg of PCB. Disposal of this material costs $2,159,500, or $20,372 per kg of PCB.

Conclusions

At this site, it costs approximately $0.502 to treat a kg of site soil using ISV. For low concentration/high volume material, it costs approximately $0.206 per kg to dispose of it in an engineered facility. This means that the cost of on-site treatment of shallow site soil is nearly 2.5 times the cost of off site disposal, and results in a total cost increase of nearly $13,000 per kg of PCBs destroyed.

The relative cost/benefit relationship of the on-site ISV and the off-site incineration and disposal alternatives can be described comparing incremental cost ratio and an incremental benefit ratio. These ratios are only applicable to the estimated PCB mass within the shallow soils above cleanup levels, as the advantages of ISV over off-site incineration for the total site mass appear indisputable. The incremental cost ratio is the cost of ISV for the 106 kg PCBs in shallow soil divided by the cost of the disposal of this soil, 1.66. The incremental benefit is ratio of the destruction of PCBs, or 406/303 which is equal to 1.41. Thus, the incremental costs exceed the incremental benefit for performing ISV.

The cost increase for the incremental benefit of ISV, destruction of 106 kg PCB, versus disposal of that same PCB, is $13372/kg of PCB. I believe this incremental cost may be substantial and disproportionate to the benefit. Thus, ISV may not be a practicable treatment alternative for the large volume of relatively low concentration contamination on site. Should all site soils contain PCBs in similar concentrations to the West Dry Well, and thus require incineration, ISV would clearly be cost competitive over off-site treatment.

Figure 3: Cumulative Cost versus %Soil Treated

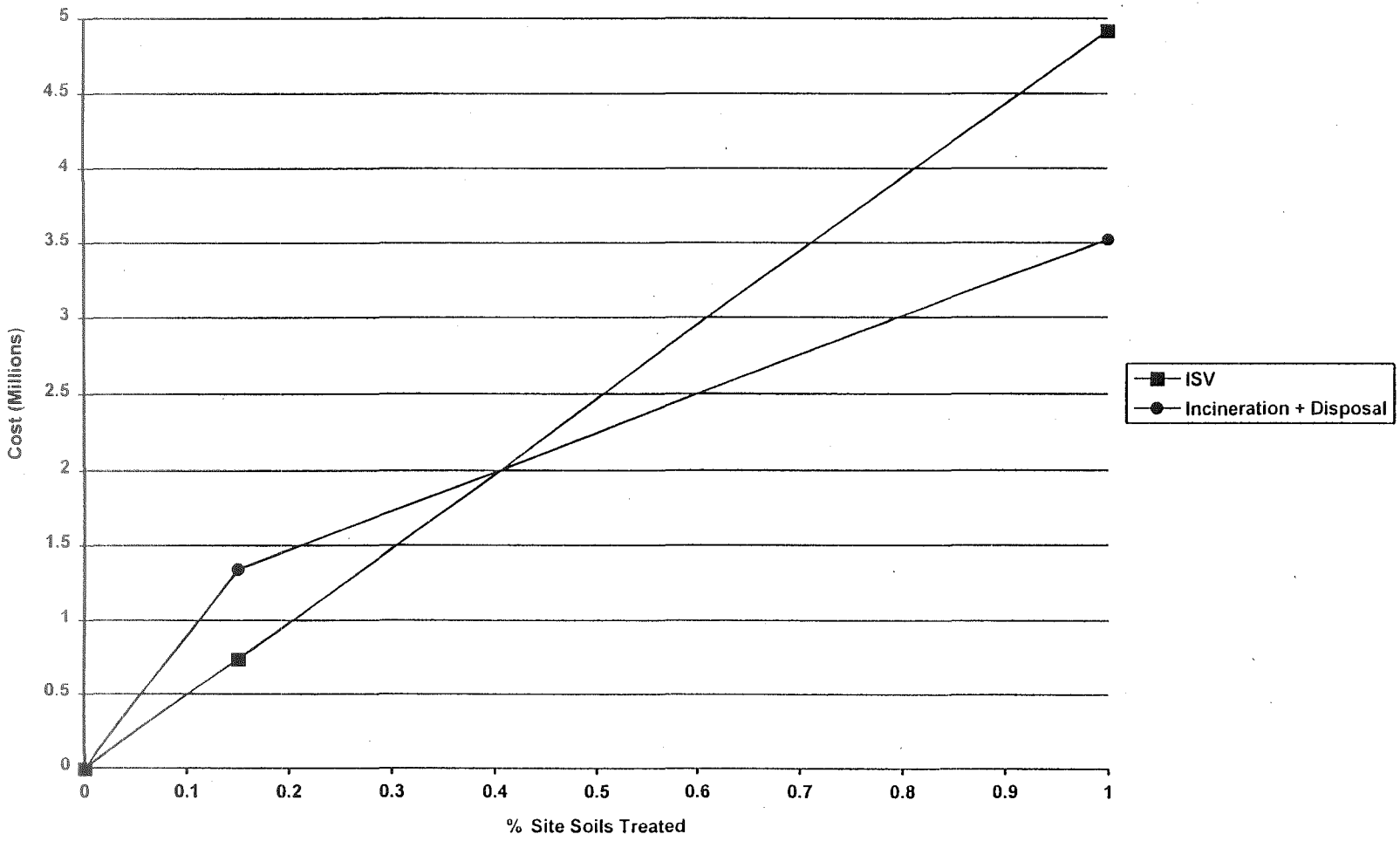


Figure 2: Cumulative Cost versus Cumulative Benefit

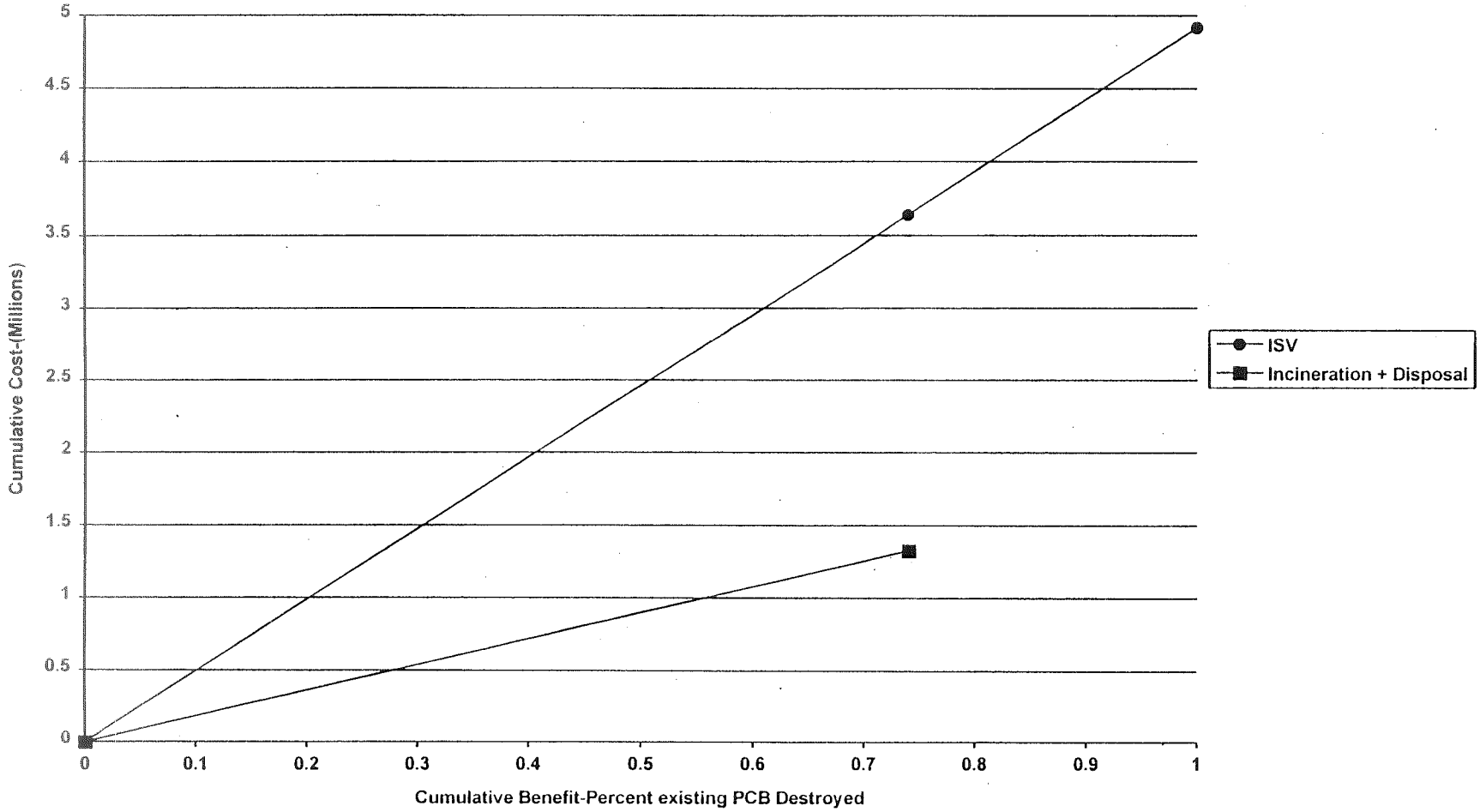


Figure 1: Percent Soils Treated and Percent PCBs Destroyed for Alternatives

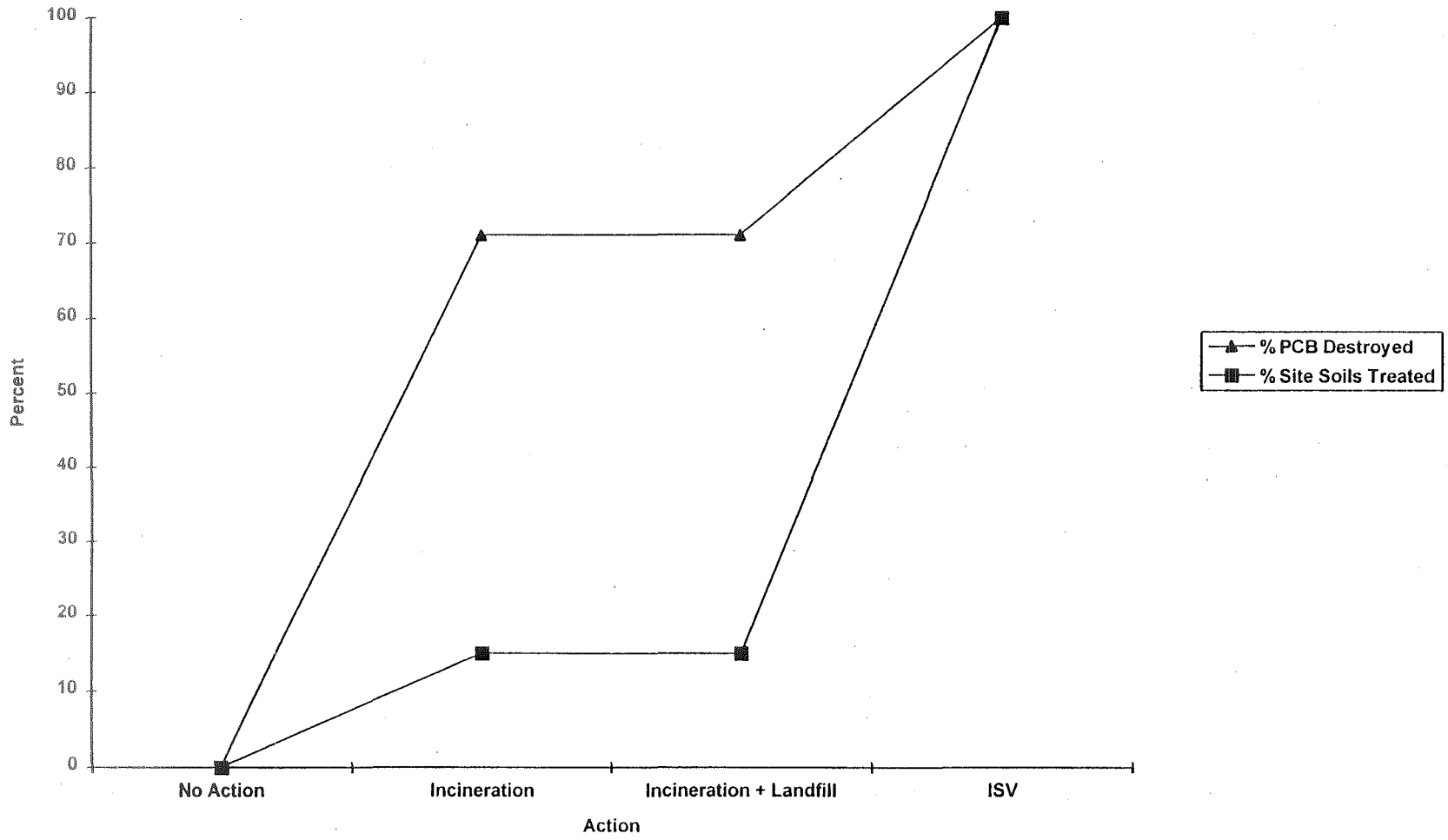


Table 1-Summary of presented costs

Item	Cost-ISV Estimate	Cost-Off-site Treatment and Disposal Alternative	Notes
Site preparation	121,100	50,000	Survey, fencing, site security and maintenance
Excavate West Dry Well (WDW) soils/Backfill w/Cement	283,500	283,500	
Pressure Grout WDW soils	178,500	178,500	
Excavate and Screen Soils/Backfill excavations	*630,000*	435,465 (*assume 630,000-see text)*	Off-Site Treatment and Disposal Alternative cost is sum of 4 items from Table 4-6
Testing, Roadwork and Grading	58,800	Not included	
ISV Cell construction	*535,500*	*N/A*	
Vitrification	*3,500,500*	*N/A*	*Source from Bechtel Memo. Geosafe Bid 2,986,000 plus pollution liability insurance premium, Bechtel added profit.*
Vitrification Support	*171,000*	*N/A*	
Secondary Waste Disposal	*63,000*	*N/A*	
Post-Test Sampling	*18,400*	*Not included*	
Off-Site Incineration of soils	*N/A*	*1,262, 000*	*Assumes 820 yards soil and transport/disposal costs as quoted on Table 4-6. Does not include on site handling*
Off-Site Disposal of site soils	*N/A*	*1,550,250*	*Assumes 6,360 cubic yards of soil with transport and disposal costs as quoted on Table 4-6. Does not include on-site handling*
On-site Handling	*N/A*	*70,000*	*7,000 yards at 10/yd for handling, not included in Golder estimate.*
Excavation confirmation and Post Test Sampling	excavation confirmation sampling not included, Post test sampling as above	Not included	May be present in "Engineering and Construction Surveillance" item, Table 4-6
Cost for treatment included in this analysis	*4,919,000*	*3,512,000*	*See text for explanation*

TABLE 4-6

ESTIMATED COST FOR ALTERNATIVE S-10: Excavation and Off-Site Incineration and Landfill

Item	Unit Cost	Units	Low Estimate Qty	Low Estimate Cost [a]	High Estimate Qty	High Estimate Cost [a]	Notes
CAPITAL COSTS							
Site preparation				$50,000		$50,000	
Excavate and screen West Dry Well soil				$283,500		$283,500	Bechtel cost estimate to GE (8/25/95), not including contingency.
Grout aquifer soils in-place				$178,500		$178,500	Bechtel cost estimate to GE (8/25/95), not including contingency.
Excavate shallow soil	$20	yd^3	5,140	$102,800	7,617	$152,340	Other than West Dry Well
Screen PCB soils	$35	yd^3	3,300	$115,500	6,256	$218,960	
Off-site incineration of West Dry Well soil	$1,540	ton	820	$1,262,800	640	$985,600	Quantity after screening. Incineration @ $0.70/lb; haul 800 miles @ $3.50/loaded truck-mile (Aptus facility, UT).
Off-site landfill of shallow soil	$244	ton	3,380	$823,875	6,360	$1,550,250	Quantity after screening. Landfill @ $200/ton; haul 250 miles @ $3.50/loaded truck-mile (CWM facility, Arlington, OR).
Backfill clean site soil	$5	yd^3	3,305	$16,525	3,681	$18,405	Clean oversize from screening and clean overburden
Backfill to replace disposed soils	$10	yd^3	2,475	$24,750	4,576	$45,760	
Subtotal				$2,858,250		$3,483,315	
Engineering and construction surveillance				$300,000		$400,000	Includes CQA
Subtotal				$3,158,250		$3,883,315	
Contingency	10%			$320,000		$390,000	
TOTAL CAPITAL COSTS				$3,480,000		$4,270,000	Rounded to ten thousands

TABLE 4-7

ESTIMATED COST FOR ALTERNATIVE S-11: Excavation and Vitrification

Item	Unit Cost	Units	Low Estimate* Qty	Low Estimate* Cost	High Estimate** Qty	High Estimate** Cost	Notes
CAPITAL COSTS							
Site Preparation	NA	Lot	1	$81,100	1	$121,100	Survey, fencing, site security & maintenance
Excavate WDW Soils/Backfill w/Cement	NA	Lot	1	$283,500	1	$283,500	Low bid (late 1994); approx 700 cy
Pressure Grout Deep WDW Soils	NA	Lot	1	$178,500	1	$178,500	Average of 2 bids (late 1994); approx. 655 cy
Excavate/Screen Soils/Backfill Excavations	NA	Lot	1	$456,000	1	$630,000	Average of 2 mid-1995 budget quotes; approximately 8260 cy
Testing, Roadwork & Grading	NA	Lot	1	$58,800	1	$58,800	Internal Bechtel estimate
Onsite/Offsite & UI Analytical Laboratories	NA	Lot	1	$155,400	1	$155,400	Internal Bechtel estimate
ISV Cell Construction (Staging of Soils)	NA	Lot	1	$320,500	1	$535,500	Average of 2 mid-1995 budget quotes
Vitrification	NA	Lot	1	$2,240,500	1	$3,500,500	August 1995 estimate from Geosafe
Vitrification Support	NA	Lot	1	$119,800	1	$171,100	Internal Bechtel estimate (includes refractory panels)
Secondary Waste Disposal	NA	Lot	1	$44,000	1	$63,000	Geosafe quantity/Bechtel cost estimate
Drilling/Analysis of Adjacent Soil	NA	Lot	1	$12,800	1	$18,400	Internal Bechtel estimate
Subtotal				$3,950,900		$5,715,800	
Engineering, Procurement, Const. Mgmt	NA	Lot	1	$1,039,100	1	$1,174,200	Includes FSTCOP amendment & draft/final CAR
Subtotal				$4,990,000		$6,890,000	
Contingency	10%			$499,000		$689,000	
TOTAL CAPITAL COSTS				$5,489,000		$7,579,000	

* For treatment/disposal of 4,200 tons/scaled down from high estimate

** For treatment of 7,000 tons

Exhibit A

Amendment to Cleanup Action Plan

and

Explanation of Significant Differences

GE/Spokane Site
E. 4323 Mission Avenue
Spokane, WA

Washington State Department of Ecology
Eastern Regional Office
Toxics Cleanup Program

November 6, 1996

Amendment to Cleanup Action Plan

and

Explanation of Significant Differences

GE/Spokane Site
E. 4323 Mission Avenue
Spokane, WA

Washington State Department of Ecology
Eastern Regional Office
Toxics Cleanup Program

November 6, 1996