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# APPENDIX B
# BASIS OF COST ESTIMATE

This appendix provides details of the estimated implementation costs for the remedial alternatives subject to detailed screening in Section 6 of the Feasibility Study Report. Costs include both capital costs for implementation as well as long-term operation and maintenance (O&M) costs, including engineering, administration, and contingencies. Following is a brief overview of the general cost estimating approach and assumptions common to many of the alternatives.

## Intended Accuracy of Estimates

Per the USEPA Remedial Investigation/Feasibility Study (RI/FS) guidance, the accuracy of FS cost estimates is intended to be in the range of -30 to +50 percent.

## Basis of Costs/Unit Rates

Costs are based on published unit rates, such as R.S. Means, technology review documents, recent actual cost data and supplier quotes for other projects of a similar nature, and professional judgement. Where appropriate and unless otherwise indicated, estimated rates and costs include contractor labor, equipment, materials, expenses, and third- party services (such as waste transportation and disposal), commensurate with the intended accuracy of the estimate. Material costs include procurement, delivery, placement, and compaction, as appropriate. Waste disposal costs include approvals, loading, hauling, and disposal fees.

## Construction Cost Index

The most recent Engineering News Record Construction Cost Index is 11392 (as of January 2020). As appropriate, the cost index may be used to update older cost information (for example, the cost index has increased approximately 14 percent since January 2015).

## Present Worth

The present worth was calculated for the estimated capital and O&M costs based on the anticipated construction and operations schedule for project implementation (refer to Table 6-3 of the FS). It was assumed that pre-construction activities will occur in 2021 and implementation of the alternative will occur in 2022. The O&M period was assumed to be 30 years. Per USEPA guidance, a 7 percent discount factor was used to determine the present worth. ~~over a 30 discount period.~~

## Capital Costs

Capital costs for each alternative are broken down by direct implementation costs and indirect costs.

### Direct Implementation Costs

Direct costs for implementing each alternative are remediation contractor costs broken down by significant components of each remedy. Quantities are based on the volumes and areas described in Section 5 where appropriate. As noted above, unit rates are estimated and include contractor labor, equipment, materials, expenses, and third-party services.

### Indirect Costs

Indirect costs are broken into several categories, and represent ancillary costs necessary for, but not directly associated with, implementation of each remedy. While these costs are generally estimated as a fixed percentage of the estimated direct costs, adjustments may be made to more accurately reflect anticipated costs. For example, no construction management costs would be incurred if a remedy consists of the filing of deed notices and other institutional controls.

- ***Investigations:*** Lump sum costs have been included for several investigations based on the relative complexity of the remedy and requirements for the design. Depending on the alternative, investigations may include predesign investigations, soil delineation, treatability studies, and/or geotechnical investigations.
- ***Remedial/Geotechnical Design:*** Preparation of design documents needed for contractor procurement and implementation of the remedy. Generally estimated as 10 percent of direct costs. Based on the relative complexity of the remedy Alternative SW-2 was assumed as a lump sum of $5,000 and Alternative SG-2 was adjusted to 5% of the direct costs.
- ***Mobilization/Miscellaneous Site Preparation:*** Includes mobilization and demobilization of contractor resources to/from the Site, along with miscellaneous costs such as work trailer setup, establishment of electric service, restroom facilities, etc. Generally estimated as 5 percent of direct costs. Alternative SG-2 does not include construction, therefore, it does not require mobilization or site preparation.
- ***Site Administration:*** Costs borne by the responsible party for internal administration of the Site and management of design and remediation contractors. Generally estimated as 5 percent of direct costs. Alternative SG-2 does not include construction; therefore, site administration costs were adjusted to 1 percent of direct costs.
- ***Permitting/Legal Costs:*** Costs associated with applying for and obtaining any local permits necessary for the work, as well as any legal/filing fees commonly associated with institutional controls. Generally estimated as 2 percent of direct costs.
- ***Construction Management/Oversight:*** Costs associated with the management and oversight of the remedial action contractor during implementation of the remedy, including labor, expenses, and third-party services, such as laboratory analysis or surveying, not otherwise included in the direct costs. Generally estimated as 10 percent of direct costs. Alternative SG-2 does not include construction, therefore, it does not require construction management or oversight.

**Material Quantities**

Common quantity assumptions were based the following:

Conversion from in-place cubic yards to tons for disposal = 1.65 tons/cubic yard
Percentage of excavated soil/fill assumed to require handling as hazardous = 100%

Assumed quantities for the alternatives are summarized as follows:

**Waste Alternatives**

| Item | Quantity | Unit |
|---|---|---|
| Footprint of NAPL Impacted Soil | 6,850 | SF |
| Depth of Excavation | 13 | FT |
| Number of 8'x30' USTs | 6 | - |
| Estimated Soil Removal Volume | 3,500 | CY |

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**Soil/Fill Alternatives**

| Item | Quantity | | | | Unit |
|---|---|---|---|---|---|
| | SF-2 | SF-3 | SF-4 | SF-5 | |
| Footprint of Additional NAPL Impacted Soil | 1,200 | | | | SF |
| Depth of Additional NAPL Impacted Soil | 7 | | | | FT |
| Volume of NAPL Impacted Soil | 310 | | | | CY |
| Asphalt Cap Footprint | - | 27,200 | | | SY |
| New Bulkhead Walls | - | 800 | | | FT |
| Footprint of Targeted Excavation | - | - | 22,856 | - | SF |
| Depth of Targeted Excavation | - | - | 6 | - | FT |
| Volume of Targeted Excavation | - | - | 5,100 | - | CY |
| Untreated Area - Lot 67/69 | - | - | - | 9,200 | SF |
| S/S Treatment Footprint | - | - | - | 137,100 | SF |
| S/S Treatment Volume | - | - | - | 30,500 | CY |

**Groundwater Alternatives**

| Item | Quantity | | | Unit |
|---|---|---|---|---|
| | GW-2 | GW-3 | GW-4 | |
| Sheet Pile Containment | 70,000 | - | - | SF |
| Fill Between Old and New Wall | 975 | - | - | CY |
| Length of Conveyance Trenching/Fill | 2,500 | - | 2,500 | FT |
| Width of Conveyance Trenching/Fill, multiple pipes in trench | 10 | - | 10 | FT |
| Piping, conduit, wiring, instrumentation, all lines homerun to treatment plant | 30,000 | - | 30,000 | FT |
| Footprint of Treatment Building | 7,500 | - | 7,500 | SF |
| Length of Discharge Line | 500 | - | 500 | FT |
| Initial Injection – inorganic (reagent) | - | 1.954 M | - | LB |
| Initial Injection – organic (reagent) | - | 1.622 M | - | LB |
| Days in field | - | 300 | - | Day |
| Second Round | - | 67% initial costs | - | LS |
| Third Round | - | 33% initial costs | - | LS |

**Sewer Alternatives**

| Item | Quantity | Unit |
|---|---|---|
| Length of 4-inch Sewer Pipe | 125 | FT |
| Volume of Liquid Waste in Sewer Pipe | 90 | GAL |
| Volume of Liquid Waste in 4x4 Manhole | 720 | GAL |
| Total Liquid Waste (Manhole + Sewer Pipe) – flush 3 times | 2,500 | GAL |
| Number of Drums for Solid Waste | 2 | - |

**Soil Gas Alternatives**

| Item | Quantity | | Unit |
|---|---|---|---|
| | SG-2 | SG-3 | |
| Amount of Chemical Treatment for Organics | | 570,322 | LB |

## Operation and Maintenance Costs

O&M costs are those costs required to continue implementation of the remedy after the capital construction period has been completed. Typical components include site inspections, routine monitoring, and continued O&M of remediation systems. Additionally, costs are included for National Contingency Plan (NCP)-required five-year reviews where contaminants remain in place following remediation. Costs for five-year reviews include document review, site inspections, and coordination with agency personnel. For the purposes of this FS, these costs have been distributed between the soil and groundwater alternatives at an estimated annual cost of $5000. Costs for O&M items are presented on an annual cost basis.

Costs for groundwater monitoring assumed annual sampling of up to 25 monitoring wells for volatile organic compounds, semi-volatile organic compounds, and metals, and include costs for labor, equipment, analysis, reporting, and purge water disposal. Classification exception area (CEA) monitoring assumes collection of additional parameters once per year.

## Contingency

A contingency of 25 percent is added to both capital and O&M costs to account for unforeseen costs which may be incurred during implementation and O&M of the remedy, such as increases in media quantities required to be addressed beyond that assumed for the FS.