APPENDIX E – COST SPREADSHEETS

FINAL FEASIBILITY STUDY
CASMALIA RESOURCES SUPERFUND SITE
CASMALIA, CALIFORNIA

PREPARED BY: URS CORPORATION

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ATTACHMENTS

1.0 Cost Estimates for FS Area Remedial Alternatives

This section documents the cost estimating procedures, methods and assumptions. This appendix presents the cost estimates for the remedial alternatives and the methodology and design assumptions used to prepare this cost estimates. The cost estimates have been prepared with the consideration of industry standard cost-estimating references, costs of similar projects, and quotes from equipment and process vendors. The cost estimates are considered order-of-magnitude estimates with an expected accuracy of plus 50 percent and minus 30 percent.

The cost estimates presented herein have been prepared for guidance in project evaluation and implementation and are based on information available at the time this document is prepared. The final project cost and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, final design configuration, implementation schedule, continuation of personnel and engineering, and other variable factors. It is expected that the final project costs will vary from the opinions of cost presented herein. As such, the costs indicated do not necessarily represent the final cost of the project or individual alternative.

1.1 Cost Estimating Approach

Cost estimates are provided in this appendix for FS Areas 1 through 5 for all alternatives undergoing detailed evaluation for the area-specific remedial alternatives in Section 11 and the site-wide remedial alternatives in Section 12. Approximate cost estimates were developed for each remedial alternative in each FS Area based on the conceptual design of the remedial alternatives. The conceptual design of specific remedial alternatives is presented in Section 11 of the FS. Typically cost estimates are based on unit costs derived from remediation cost handbooks or on approximate vendor unit cost estimates developed for this Site. Some elements of the cost estimates are based on our judgment and on experience or cost data from the current operations at this site or other sites. Assumptions or basis for individual line items are provided in the comments column of the spreadsheets. The cost estimates are comprehensive estimates of direct and indirect capital costs and O&M costs, and include sales tax and shipping costs, as appropriate. The cost estimate spreadsheet estimates present worth cost in 2012 dollars. We have also provided EPA the expected operating costs by year and the probable schedule for the capital expenditures so that a “then current” cost can be calculated. The cost spreadsheet used in this FS is a template from the EPA cost guidance (USEPA 2000).

The total contingency including scope contingency and bid contingency is assumed to be at the higher end of the typical range (35 to 50%) described in the EPA cost guidance (USEPA 2000). A 35% contingency is used for capital costs for those technologies or remedial components that have been previously implemented at this site and thus we believe we have a better assessment of both unit costs and potential unforeseen circumstances. For all other alternatives, a 50% contingency is used for capital costs. For all alternatives we have used a 50% contingency for the long term O&M costs. The CSC believes the 50% contingency is particularly appropriate at this stage of conceptual design where there is still significant uncertainty about some of the details of design and operation. We note that the previous EPA cost estimates for the Casmalia Resources Superfund site also used that same contingency. An exception to this involves the alternative to dewater the P/S Landfill, using horizontal wells where a 75% contingency was assumed as discussed below. A summary of the contingency percentages used for each area-specific remedial alternative is included in Appendix E (Table E-9-0).

Present worth costs of the remedial alternatives are estimated using two net discount rates of 3% and 7% and two timeframes of 30 years and 100 years. These present worth cost estimates for varying discount rates are presented for comparison purposes. Present worth costs were estimated using (1) a net discount rate of 7% consistent with USEPA's policy stated in the NCP and Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-20 as summarized in USEPA guidance (USEPA 2000); and, (2) a net discount rate of 3% to assess sensitivity where the rate of return may be less than for the 7% scenario. Recent rates of inflation and returns on investment are consistent with that same range. The 100-year present worth cost is provided to estimate long term costs beyond the 30-year timeframe required by CERCLA guidance and capture possible long term remedy replacement costs. Obviously, when calculating a net present value with either of the two discount factors we have assumed there is not much increase in the present worth costs using this longer period. The cost estimates reflect several uncertainties such as the assumptions about the lateral extent of the COC-impacted area, the extraction volumes of groundwater or DNAPL, etc. The cost estimates meet the accuracy requirements of the CERCLA guidance of +50% to -30%. A brief discussion of uncertainty in the cost estimates is presented in Section 11.7.

1.2 Cost Estimate Sheet Details

For the area-specific remedial alternatives in Section 11, the cost sheets for each FS Area include an initial sheet that summarizes the costs for each alternative in the FS Area followed by detailed cost sheets for each alternative in that FS Area.. The summary sheets are provided in the following tables, with the detailed cost sheets for each area behind the summary sheets:

- Table E-1-0 Summary of Area 1 Remedial Alternative Costs
- Table E-2-0 Summary of Area 2 Remedial Alternative Costs
- Table E-3-0 Summary of Area 3 Remedial Alternative Costs
- Table E-4-0 Summary of Area 4 Remedial Alternative Costs
- Table E-5-0 Summary of Area 5 North Remedial Alternative Costs
- Table E-6-0 Summary of Area 5 South Remedial Alternative Costs
- Table E-7-0 Summary of Area 5 West Remedial Alternative Costs

For the site-wide remedial alternatives in Section 12, the cost sheets for each site-wide remedial alternative include an initial sheet that summarizes the costs for the site-wide remedial alternatives followed by detailed costs sheets for each FS Area in the site-wide remedial alternative. The summary sheet is provided in Table E-8-0. With one exception, individual FS Area costs from Section 11 are used directly to build the site-wide remedial alternatives costs in Section 12 and the estimated costs by FS Area are additive from Section 11 to Section 12. The one exception is for Site-wide Remedial Alternative 2, FS Area 2, where an ET cap is assumed for the site-wide alternative (Section 12) where a 5-foot clay cap is assumed for the area-specific alternative FS Area 2, Alternative 3 (Section 11).

The detailed cost sheets are divided into the following typical sections: an alternative description section, capital costs section, operations and maintenance costs section, periodic costs section and present worth analysis section (also called net present value). Most important cost line items in each section have a comment cell to the right that provides a brief statement of assumption or source for the cost.

1.2.1 Capital Cost

The capital cost section is divided into Direct Capital costs and Indirect Capital costs. Under Direct Capital costs, the typical initial sections or line items include mobilization/demobilization, remedial investigation, remedial testing, surveying or other preliminary tasks. For mobilization/demobilization, we used lump sum estimates based on discussion with vendors that was in the range of 1% to 2% of direct capital costs. Some of these preliminary items were based on lump sum estimates based on experience with other projects. Another category that was also a preliminary item was site work that included site preparation, site grubbing/grading, etc. prior to the construction of the key remedial components of the alternative.

After these preliminary elements, there are separate subsections for each key remedial component capital cost such as Capping (PCB Landfill) or Excavation (BTA). Each line item within these subsections utilize unit costs obtained from contractors, vendors or from handbooks. This includes costs for borrow soil, cut/fill grading prior to cap construction, or excavated soils disposal. The approximate estimates cut/fill grading soil volume required prior to capping at any area was estimated by Autocad. Comments are provided with assumptions of on-site disposal versus off-site disposal. Unit costs for off-site disposal were obtained from vendors based on assumed soil waste classification and disposal site location.

Unit costs obtained from contractors were typically an approximate range of unit pricing, for example, $5 to $6/cubic yard of soil or 50¢ to 55¢/sq. ft. of material. In general, the higher end of the range of unit price was used for all items. These unit prices were obtained between July 2011 and March 2012. Since we used the higher end of the range of these unit prices, and because the Consumer Price Index indicates a 2% increase for 2011 to 2012, we believe these prices are valid for use to develop a FS level cost estimate in 2012 $. A backup cost sheet with unit costs, vendors and dates the quotes were obtained is included in Table E-11-0.

After the key remedial components, a typical subsection on the cost sheet is stormwater controls that include costs for concrete V-drains, swales, drainage channels, etc. These costs were based on conservative unit cost verbal estimates from contractors and length of drains. Also, typically included here is remedial monitoring that includes costs for activities such as air sampling, compaction testing or soil sampling during remediation.

For GWTS cost estimates for treating organics in PSCT groundwater, capital costs were based on recent estimates for the current system. For the LTP for treating organics and inorganics, the Appendix E cost estimates use the unit capital costs for reverse osmosis, air stripper and VSEP units developed in Appendix A for a larger 110 gpm system and then proportioned down for a smaller flow rate system (e.g. 10 gpm, 20 gpm, as required). The proportioning approach for the cost estimate used the cost exponent method "Cost 2 = Cost 1*(Flow 2/Flow 1)^0.7" using a cost exponent of 0.7. This proportioning approach was used for individual process unit costs and not on an entire system basis. GWTS costs were based on a design flow rate derived from flow rates from groundwater modeling presented in Appendix D. The estimated flow rates for the sitewide remedial alternatives are also included in Tables E-10-0 to E-10-4 in Appendix E. Typically, the design flow rate is higher than the anticipated extraction rate and if groundwater extraction rates further decrease with time, the GWTS is then assumed to operate in a batch mode.

There are some remedial components that are not unique to one FS Area such as Wetlands Improvements or new evaporation pond construction. Assumptions were made in those cases, where the Wetlands Improvements are included under FS Area 1 and the evaporation pond is included in FS Area 4. The cost for obtaining a site-specific NPDES permit for discharge of treated groundwater was included in the Area 5 North cost sheets for Alternatives 4 and 7 that involve inorganics treatment for off-site discharge to the B-Drainage.

A lump sum cost was added for Green Remediation under each FS Area as a placeholder because actual green remediation BMPs or other renewable energy options will be evaluated and determined in the remedial design phase.

Health and Safety and Construction QA/QC cost items were included as the last section under Direct Capital costs and is estimated as lump sum costs based on discussion with contractors and our prior experience with such construction activities.

Indirect capital costs are called PM/CM costs in the cost sheets and include remedial design/engineering, project management, EPA oversight and construction management. These costs are based on fixed % of total direct capital costs discussed earlier for each alternative. These PM/CM costs are management costs for initial remedial construction phase of the remediation and does include ongoing annual PM costs for annual operations and maintenance.

1.2.2 Operations and Maintenance Cost

Operations and Monitoring (O&M) costs included annual costs for inspection, maintenance, operations, monitoring and repair of constructed remedies. The costs are presented on a per month or per year basis based on our prior experience with the EE/CA cap or the existing groundwater remedial components. There are some components in the annual O&M that have greater uncertainty such as the difference in anticipated annual O&M costs for different types of caps. Since the total present worth cost is used to compare alternatives based on a 30-year or 100-year timeframe, these O&M costs are a fairly large fraction of total cost and add to the uncertainty of the cost evaluation.

O&M costs typically encountered with the groundwater treatment projects also include costs for fuel, utilities, materials consumed (e.g. activated carbon), waste disposal and other direct costs (ODCs). These costs are presented on a per month or per year or per unit quantity (gallon or lb) based on experience from usage in current site groundwater operations. Total extraction flow rates for various groundwater alternatives have significant uncertainty. For example, the horizontal well P/S Landfill dewatering alternative has a wide range of possible recovery volumes for leachate. This is particularly significant with off-site disposal of dewatered liquids that can result in widely variable annual O&M costs. The dewatering flow rates are expected to decrease with time but it is highly uncertain at what rates that would be. Repair and replacement of pumps, valves, fittings, etc. are included under O&M costs. Under miscellaneous ODC costs, instrumentation and equipment rentals are all included. For these O&M costs, a contingency of 50% is assumed as stated earlier. For some components with very high uncertainty such as the

P/S Landfill dewatering, a higher contingency of 75% was used for off-site liquid disposal costs. A summary of the contingency percentages used for each area-specific remedial alternative is included in Appendix E (Table E-9-0).

Project management costs for long term O&M activities and sitewide groundwater is included as a separate item that does not include the contingency. Both these costs are presented as annual costs that are based on experience with current site operations.

1.2.3 Periodic Cost

Periodic costs refer to costs that recur over longer timeframes such as evaporation pond dredging every 5 years or ZVI reactive wall replacement every 15 years or trench replacement every 50 years. Other examples of periodic costs used in the cost sheets include EPA 5-Year Review, evaporation pond maintenance (dredging), replacement of ecological protections for evaporation ponds such as drift fencing and netting, well development, etc. These periodic costs are another cost component with significant uncertainty because nobody can reliably predict how long a ZVI reactive wall would be effective under these site conditions with very high TDS and multiple metal contaminants. However, because these costs are future costs and thus when discounted to 2012 costs do not form as big a component of the uncertainty in costs as other annual O&M costs discussed earlier, no contingency was assumed for periodic costs.

1.2.4 Present Worth

Present worth cost section estimates the 30-year and 100-year cost estimates for the 3% and 7% net discount rates. The PW costs of O&M and Periodic costs are estimated by estimating an annual average cost for three different time intervals, 0-5 years, 6-30 years and 31-100 years. Within each time interval, the cumulative O&M cost is divided by the time interval period of 5 years, 25 years or 70 years, to get a representative annual O&M cost in these time intervals. The present worth of this representative annual O&M cost including the capital cost is the total present worth cost.

The calculation of 30-year and 100-year discounted costs assumes the remedy will be constructed over approximately four summer seasons (beginning in 2014) and as such the capital costs are expended in that time frame. During that time, we expect the site O&M costs will remain approximately the same as they currently are. The remedy construction is expected to be completed by 2018 and a brief summary of the construction sequence was presented in Section 12.

1.3 References

ECHOS, 2000. *Environmental Restoration Assemblies Cost Book*, ECHOS Remediation Cost Handbook, 2000

FRTR, 2011. Federal Remediation Technologies Roundtable, http://www.frtr.gov and http://costperformance.org websites with technology and cost information.

Get-a-Quote.net 2011 National Construction Estimator, 2011

Means 2005 Environmental Remediation Cost Handbook, Unit Costs, RS Means 2005

USEPA, 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, US EPA 540/G-89/004, October 1988

USEPA, 2000. *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study*, US EPA and US Army Corps of Engineers, EPA 540-R-00-002 July 2000

USEPA, 2011. Stormwater BMPs Presentation, http://www.ectc.org USEPA, 2011

USEPA 1991 Design and Construction of RCRA/CERCLA Final Covers, USEPA, EPA 625/4-91/025, May 1991

AREA 1 TABLES

TABLE E-1-0
AREA 1 COST SUMMARY
Casmalia Resources Superfund Site
Final Feasibility Study

Summary of Area 1 Remedial Alternative Costs						
Alt	**PROPOSED REMEDIAL ALTERNATIVE**	**CAPITAL COST (2014 $)**	**ANNUAL O&M (2014 $)**	**TIME FRAME**	**PRESENT WORTH CAPITAL + O&M 3% DISCOUNT RATE (2014 $)**	**PRESENT WORTH CAPITAL + O&M 7% DISCOUNT RATE (2014 $)**
2	RCRA-Equivalent Mono Soil Cap (BTA, CDA) + RCRA Cap (PCB Landfill)	$ 12,286,000	$ 318,000	30-year	$17,253,000	$13,422,000
				100-year	$22,117,000	$14,176,000
3	Evapotranspirative (ET) Soil Cap (BTA, CDA) + RCRA Cap (PCB Landfill)	$ 11,177,000	$ 318,000	30-year	$16,267,000	$12,572,000
				100-year	$21,036,000	$13,311,000
4	RCRA Cap (PCB Landfill, BTA, CDA)	$ 14,018,000	$ 318,000	30-year	$18,793,000	$14,749,000
				100-year	$23,806,000	$15,526,000
5	Excavate (BTA, 20') (CDA, 5') + RCRA Cap (PCB Landfill) + RCRA-Equivalent Mono Soil Cap (BTA, CDA, 5')	$ 31,785,000	$ 318,000	30-year	$34,592,000	$28,365,000
				100-year	$39,456,000	$29,119,000

NOTES
1. Total Present Worth Cost (Capital + O&M in 2014 $) is shown for a 3% and 7% net discount rate and a 30-year and a 100-year timeframe and includes contingency on capital and O&M costs.
2. FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs.
3. PV of Capital Cost (in 2014 $) is shown for a 3% and 7% net discount rate based on the average capital cost for each year of the 5 year construction period.

TABLE E-1-1
FS AREA 1 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: RCRA-Equivalent Mono Soil Cap (BTA, CDA) (5’) + RCRA Cap (PCB Landfill) + Stormwater Controls + ICs + Monitoring

Alternative Description : This remedial alternative involves installing a RCRA cap on the PCB Landfill (4.4 acres) and installing a RCRA equivalent mono (soil) cap (5') on the Burial Trench Area and the Central Drainage (about 24.3 acres) as shown in Figure 11-1A. The RCRA equivalent monocap is 5-feet of engineered low permeability claylike soil. These caps would be tied into the adjacent Capped Landfills Area. The RCRA cap and the RCRA equivalent monocap prevents eco-receptors from potential exposures to shallow soil (0-5’ bgs) contaminants and reduces rainwater infiltration into soil and groundwater in order to reduce further VOC migration in soil and groundwater. The stormwater will be directed by surface drains towards a culvert near PSCT-1 and then flow through a drainage channel to the southern portion of the site and then onto Pond 13 and offsite through or around the wetlands.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
			Capital Costs		
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 200,000	$ 200,000	Based on contractor budgetary quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 100,000	$ 100,000	Based on contractor budgetary quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	
Geotechnical testing/Geophysical Investigation	1	ls	$ 100,000	$ 100,000	Evaluate site stability, buried waste, geotech properties
Site Work					
Site Clearance/Grubbing	29	acre	$ 6,500	$ 189,000	Site clearance/grading prep for cap starting with the foundation layer
Existing wells protection/new well completion	30	wells	$ 5,000	$ 150,000	Protect well, raise well completion to reach new cap topo surface
Dust controls	60	days	$ 1,000	$ 60,000	Based on contractor unit costs and 3 months, 12 weeks, 60 days
RCRA Cap - PCB Landfill (4.4 ac)					PCB LF area (acres) = 4.4
Cut/Fill Leveling Layer (grading)	20,000	cy	$ 5	$ 100,000	Based on existing slopes estimated by CAD; contractor unit cost
Foundation layer (2'), transport and compact	16,000	cy	$ 6	$ 96,000	Soil volume based on estimated cap area, 10% shrink factor, contractor unit cost quote
GCL Bento Liner (matl + labor)	4.4	acre	$ 34,500	$ 152,000	Assume $0.80/sf based on GSE Liner quote incl tax, shipping
HDPE liner (60 mil)(matl + labor)	4.4	acre	$ 34,500	$ 152,000	Assume $0.70/sf for HDPE liner per GSE Liner quote incl tax, shipping
Geocomposite 200 mil fabrinet, matl+labor	4.4	acre	$ 30,500	$ 134,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	4.4	acre	$ 21,800	$ 96,000	Assume $0.50/sf per GSE Liner quote incl tax, shipping
Vegetative cover (2'), transport and compact	16,000	cy	$ 6	$ 96,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	4.4	acre	$ 4,000	$ 18,000	Top soil and hydroseeding
RCRA-equivalent Mono Soil Cap - BTA (5.5 ac)					BTA area (acres) = 5.5
Cut/Fill Leveling Layer (grading)	61,000	cy	$ 5	$ 305,000	Based on existing slopes estimated by CAD; contractor unit cost
Clay cover (4'): borrow and process	39,000	cy	$ 14	$ 546,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cos
Place clay soil and compact, 6" lifts	39,000	cy	$ 3	$ 117,000	Based on contractor unit cost
Vegetative Layer, Clay (1'): borrow and process	10,000	cy	$ 6	$ 60,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cos
Place clay soil and compact, 12" lifts	10,000	cy	$ 2	$ 20,000	Based on contractor unit cost
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding

TABLE E-1-1
FS AREA 1 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost		Estimated Cost		Notes / Assumptions
Capital Costs (continued)							
RCRA-equivalent Mono Soil Cap - CDA (18.8 ac)							CDA area (acres) = 18.8
Cut/Fill Leveling Layer (grading)	120,000	cy	$	5	$	600,000	Based on existing slopes estimated by CAD; Figure 11-1C
Clay cover (4'): borrow and process	133,000	cy	$	14	$	1,862,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cost
Place clay soil and compact, 6" lifts	133,000	cy	$	3	$	399,000	Based on contractor unit cost
Vegetative Layer (1'): borrow and process	33,000	cy	$	6	$	198,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cost
Place clay soil and compact, 12" lifts	33,000	cy	$	2	$	66,000	Based on contractor unit cost
Revegetation/Hydroseeding	18.8	acre	$	4,000	$	75,000	Top soil and hydroseeding
Stormwater Controls							
Surface features - Stormwater ditches, Bench V-ditches	8,000	lf	$	30	$	240,000	Based on contractor unit cost quotes
Stormwater drain pipes	1,000	lf	$	100	$	100,000	Based on contractor unit cost quotes
Stormwater - culvert crossing, 3 inlet structures, riprap	1	ls	$	100,000	$	100,000	Based on contractor budgetary lump sum quote
Concrete drainage channel for Area 1 stormwater	1,500	lf	$	60	$	90,000	Cost based on channel length to RCF pond; use double unit cost for V-dra
Monitoring/Sampling/Testing							
Air Monitoring/Sampling (during implementation)	160	samples	$	500	$	80,000	160 air/dust samples (2/day),(VOCs, PCBs, DDT, metals)
Compaction testing: Geotech engr	60	days	$	500	$	30,000	60 days of testing w Geotech engr/nuclear gage at $500/day
Wetlands - Upgrading for increased SW flow							Upgrade B-Drainage wetlands per the Wetlands Plan (April 2011) and add diversion drainage channels on either side of wetland
Complete Erosion Improvements Described in Draft Wetlands Plan (April, 2011)	1	see previous cost est	$	100,000	$	100,000	Reference: Draft Wetlands Plan (April 2011)
Grading of East Slope B-Drainage hillside, gullies/rills	5	acre	$	20,000	$	100,000	
Erosion control - Turf reinforcement mats	3	acre	$	54,000	$	162,000	
Surface features - Stormwater ditches, Bench V-ditches	4,500	lf	$	30	$	135,000	
General NPDES Stormwater Permit - Revision	1	ls	$	50,000	$	50,000	Assumed lump sum cost for entire site
Green Remediation	1	ls	$	50,000	$	50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control							
Construction QA/QC Program	1	ls	$	200,000	$	200,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$	40,000	$	40,000	Based on contractor quotes
				Direct Capital Total:	**$**	**7,490,000**	
				Contingency (35%)	**$**	**2,622,000**	
				Total Capital Cost:	**$**	**10,112,000**	

TABLE E-1-1
FS AREA 1 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 7,490,000	$ 375,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 7,490,000	$ 225,000	
EPA Oversight Costs	10%	of	$ 7,490,000	$ 749,000	
Construction Management	5%	of	$ 7,490,000	$ 375,000	
			Total PM/CM Cost:	**$ 1,724,000**	
			Total Capital Cost:	**$ 11,836,000**	Direct Capital Cost per Acre = $408,000
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 60,000	$ 60,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 80,000	$ 80,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 40,000	$ 40,000	
			Subtotal Annual O&M Cost:	$ 180,000	
			Contingency (50%):	$ 90,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 306,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace one half of caps	1	100-year	$ 5,918,000	$ 5,918,000	Assume 1/2 of cap would need to be replaced

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$11,836		$11,836	$11,836	
Annual O&M Cost (post construction)	0 - 5	$1,555	$311	$1,424	$1,275	
Annual O&M Cost (post construction)	6 - 30	$7,775	$311	$4,671	$2,584	
Annual O&M Cost (post construction)	31 - 100	$27,338	$391	$4,686	$726	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$17,932,000**	**$15,695,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$22,618,000**	**$16,422,000**	

TABLE E-1-1
FS AREA 1 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
Total Capital Cost (2014):					**$ 12,285,768**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost, Annual (2014):					**$ 317,628**	
Periodic Cost, 5-year (2014):					**$ 25,950**	
Periodic Cost, 100-year (2014):					**$ 6,142,884**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$12,286	$2,457	$10,925	$9,416	FS Area 1 remedy is expected to be constructed during the second construction season (2017) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,614	$323	$1,478	$1,324	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$8,070	$323	$4,849	$2,682	
Annual O&M Cost (post construction)	31 - 100	$28,377	$405.38	$4,864	$754	
Present Value of Capital				**$10,925,000**	**$9,416,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M				**$6,327,000**	**$4,006,000**	
Present Value of 100 Year O&M				**$11,191,000**	**$4,760,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$17,253,000**	**$13,422,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)				**$22,117,000**	**$14,176,000**	

NOTES/ASSUMPTIONS

1 PCB landfill (4.4 acres), BTA (5.5 acres) and CDA (18.8 acres) cover total area of about 29 acres. Alternative cost includes RCRA cap for PCB Landfill, soil cap (5') for BTA and CDA areas, and associated stormwater controls.
2 Existing wellheads will be reinstallated at new cap grade. Assumed 30 wells.
3 Assume active gas control is not required. New PCB and BTA caps will require special termination trench details.
4 RCRA cap profile - 2' foundation, Drainage layer, Geomembrane, Geocomposite, 2' vegetative layer with biotic barrier
5 Soil cap profile - 4' monocap clay barrier, 1' vegetative layer
6 Assumed fill for foundation layer is adequate to smooth existing grades for drainage or lessen steeper slopes for potential stability issues.
7 Some of the existing V-ditches will need to be reconstructed after new capping of PCB and BTA.
8 Existing membrane component of existing cap will need to be tied to the new PCB Landfill cap with a special detailed tie-in.
9 Drainage channel for Area 1 is to be a 1,500-foot concrete channel starting at the PSCT and passing through the footprint of the RCF Pond to Pond 13.
10 As discussed with EPA, agency oversight is typically assumed to be 10% of capital cost

TABLE E-1-2
FS AREA 1 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Evapotranspirative (ET) Cap (BTA, CDA) (5') + RCRA Cap (PCB Landfill) + Stormwater Controls + ICs + Monitoring

Alternative Description : This remedial alternative involves installing a RCRA cap on the PCB Landfill (4.4 acres) and installing a ET soil cap on the Burial Trench Area (5.5 acres) and the Central Drainage (18.8 acres) as shown in Figure 11-2A. The ET soil cap is 5 feet of engineered low permeability claylike soil with a compacted 1-foot foundation layer and a 4-foot vegetative layer that is lightly compacted to about 85%. The soil cap is intended to store water, allow growth of vegetation and removal of soil moisture through transpiration. These caps would be tied into the adjacent Capped Landfills Area. The RCRA Cap and the ET Cap prevents eco-receptors from potential exposures to shallow soil (0-5' bgs) contaminants and significantly reduces rainwater infiltration into soil and groundwater in order to reduce further VOC migration in soil and groundwater. The stormwater will be directed by surface drains towards a culvert near PSCT-1 and then flow through a drainage channel to the southern portion of the site and then onto Pond 13 and offsite to the B-Drainage.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 200,000	$ 200,000	Based on contractor budgetary quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 100,000	$ 100,000	Based on contractor budgetary quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	
Geotechnical testing/Geophysical Investigation	1	ls	$ 100,000	$ 100,000	Evaluate site stability, buried waste, geotech properties
Site Work					
Site Clearance/Grubbing	29	acre	$ 6,500	$ 189,000	Site clearance/grading prep for cap starting with the foundation layer
Existing wells protection/new well completion	30	wells	$ 5,000	$ 150,000	Protect well, raise well completion to reach new cap topo surface
Dust controls	60	days	$ 1,000	$ 60,000	Based on contractor unit costs and 3 months, 12 weeks, 60 days
RCRA Cap - PCB Landfill (4.4 ac)					PCB LF area (acres) = 4.4
Cut/Fill Leveling Layer (grading)	20,000	cy	$ 5	$ 100,000	Based on existing slopes estimated by CAD; contractor unit cost
Foundation layer (2'), transport and compact	16,000	cy	$ 6	$ 96,000	Soil volume based on estimated cap area, 10% shrink factor, contractor unit cost quote
GCL Bento Liner (matl + labor)	4.4	acre	$ 34,500	$ 152,000	Assume $0.80/sf based on GSE Liner quote incl tax, shipping
HDPE liner (60 mil)(matl + labor)	4.4	acre	$ 34,500	$ 152,000	Assume $0.70/sf for HDPE liner per GSE Liner quote incl tax, shipping
Geocomposite 200 mil fabrinet, matl+labor	4.4	acre	$ 30,500	$ 134,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	4.4	acre	$ 21,800	$ 96,000	Assume $0.50/sf per GSE Liner quote incl tax, shipping
Vegetative cover (2'), transport and compact	16,000	cy	$ 6	$ 96,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	4.4	acre	$ 4,000	$ 18,000	Top soil and hydroseeding
Evaptranspirative Soil Cap - BTA (5.5 ac)					BTA area (acres) = 5.5
Cut/Fill Leveling Layer (grading)	61,000	cy	$ 5	$ 305,000	Based on existing slopes estimated by CAD; contractor unit cost
Clay cover (1'): borrow and process	10,000	cy	$ 14	$ 140,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cos
Place clay soil and compact, 6" lifts	10,000	cy	$ 3	$ 30,000	Based on contractor unit cost
Vegetative Layer, Clay (4'): borrow and process	39,000	cy	$ 6	$ 234,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cos
Place clay soil and compact, 12" lifts	39,000	cy	$ 2	$ 78,000	Based on contractor unit cost
Soil Amendments: fertilizer, gypsum, biosolids	5.5	acre	$ 20,000	$ 110,000	Based on gypsum, fertilizer, biosolids costs for 4 ft thickness
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding

TABLE E-1-2
FS AREA 1 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Evapotranspirative Soil Cap - CDA (18.8 ac)					CDA area (acres) = 18.8
Cut/Fill Leveling Layer (grading)	120,000	cy	$ 5	$ 600,000	Based on existing slopes estimated by CAD; Figure 11-1C
Clay cover (1'): borrow and process	33,000	cy	$ 14	$ 462,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cost
Place clay soil and compact, 6" lifts	33,000	cy	$ 3	$ 99,000	Based on contractor unit cost
Vegetative Layer (4'): borrow and process	133,000	cy	$ 6	$ 798,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cost
Place clay soil and compact, 12" lifts	133,000	cy	$ 2	$ 266,000	Based on contractor unit cost
Soil Amendments: fertilizer, gypsum, biosolids	18.8	acre	$ 20,000	$ 376,000	Based on gypsum, fertilizer, biosolids costs for 4 ft thickness
Revegetation/Hydroseeding	18.8	acre	$ 4,000	$ 75,000	Top soil and hydroseeding
Stormwater Controls					
Surface features - Stormwater ditches, Bench V-ditches	8,000	lf	$ 30	$ 240,000	Based on contractor unit cost quotes
Stormwater drain pipes	1,000	lf	$ 100	$ 100,000	Based on contractor unit cost quotes
Stormwater - culvert crossing, 3 inlet structures, riprap	1	ls	$ 100,000	$ 100,000	Based on contractor budgetary lump sum quote
Concrete drainage channel for Area 1 stormwater	1,500	lf	$ 60	$ 90,000	Cost based on channel length to RCF pond; use double unit cost for V-dra
Monitoring/Sampling/Testing					
Air Monitoring/Sampling (during implementation)	160	samples	$ 500	$ 80,000	160 air/dust samples (2/day),(VOCs, PCBs, DDT, metals)
Compaction testing: Geotech engr	60	days	$ 500	$ 30,000	60 days of testing w Geotech engr/nuclear gage at $500/day
Wetlands - Upgrading for increased SW flow					Upgrade B-Drainage wetlands per the Wetlands Plan (April 2011) and add diversion drainage channels on either side of wetland
Complete Erosion Improvements Described in Draft Wetlands Plan (April, 2011)	1	see previous cost est	$ 100,000	$ 100,000	Reference for previous cost estimate
Grading of East Slope B-Drainage hillside, gullies/rills	5	acre	$ 20,000	$ 100,000	
Erosion control - Turf reinforcement mats	3	acre	$ 54,000	$ 162,000	
Surface features - Stormwater ditches, Bench V-ditches	4,500	lf	$ 30	$ 135,000	
General NPDES Stormwater Permit - Revision	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost for entire site
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 200,000	$ 200,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 40,000	$ 40,000	Based on contractor quotes
			Direct Capital Total:	**$ 6,815,000**	
			Contingency (35%)	**$ 2,385,000**	
			Total Capital Cost:	**$ 9,200,000**	

TABLE E-1-2
FS AREA 1 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 6,815,000	$ 341,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 6,815,000	$ 204,000	
EPA Oversight Costs	10%	of	$ 6,815,000	$ 682,000	
Construction Management	5%	of	$ 6,815,000	$ 341,000	
			Total PM/CM Cost:	**$ 1,568,000**	
			Total Capital Cost:	**$ 10,768,000**	Direct Capital Cost per Acre = $371,000
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 60,000	$ 60,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 80,000	$ 80,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 40,000	$ 40,000	
			Subtotal Annual O&M Cost:	$ 180,000	
			Contingency (50%):	$ 90,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 306,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace one half of caps	1	100-year	$ 5,384,000	$ 5,384,000	Assume 1/2 of cap would need to be replaced

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$10,768		$10,768	$10,768	
Annual O&M Cost (post construction)	0 - 5	$1,555	$311	$1,424	$1,275	
Annual O&M Cost (post construction)	6 - 30	$7,775	$311	$4,671	$2,584	
Annual O&M Cost (post construction)	31 - 100	$26,804	$383	$4,594	$712	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$16,864,000**	**$14,627,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$21,458,000**	**$15,340,000**	

TABLE E-1-2
FS AREA 1 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 11,177,184**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 317,628**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 5,588,592**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$11,177	$2,235.44	$9,939	$8,566	FS Area 1 remedy is expected to be constructed during the second construction season (2017) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,614	$322.82	$1,478	$1,324	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$8,070	$322.82	$4,849	$2,682	
Annual O&M Cost (post construction)	31 - 100	$27,823	$397.47	$4,769	$739	
			Present Value of Capital	**$9,939,000**	**$8,566,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$6,327,000**	**$4,006,000**	
			Present Value of 100 Year O&M	**$11,096,000**	**$4,745,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$16,267,000**	**$12,572,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$21,036,000**	**$13,311,000**	

NOTES/ASSUMPTIONS

1 PCB landfill (4.4 acres), BTA (5.5 acres) and CDA (18.8 acres) cover total area of about 29 acres. Alternative cost includes RCRA cap for PCB Landfill, evapotranspirative ET soil cap (5') for BTA and CDA areas, and associated stormwater controls.
2 Assume active gas control is not required. New PCB and BTA caps will require special termination trench details.
3 RCRA cap profile - 2' foundation, Drainage layer, Geomembrane, Geocomposite, 2' vegetative layer with biotic barrier.
4 ET soil cap profile - 1' foundation clay, 4' vegetative layer
5 Assumed fill for foundation layer is adequate to smooth existing grades for drainage or lessen steeper slopes for potential stability issues.
6 Some of the existing V-ditches will need to be reconstructed after new capping of PCB and BTA.
7 Existing membrane component of existing cap will need to be tied to the new PCB landfill cap with a special detailed tie-in.
8 Drainage channel for Area 1 is to be a 1,500-foot concrete channel starting at the PSCT and passing through the footprint of the RCF Pond to Pond 13.
9 As discussed with EPA, agency oversight is typically assumed to be 10% of capital cost

TABLE E-1-3
FS AREA 1 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: RCRA Cap (PCB Landfill, BTA, CDA) + Stormwater Controls + ICs + Monitoring

Alternative Description : This remedial alternative would involve installing a RCRA cap on the PCB Landfill, Burial Trench Area (BTA) and the Central Drainage Area (CDA) as shown in Figure 11-3A. The RCRA cap would prevent direct contact with metals and organic contaminants in shallow soil and address the risk to eco-receptors. It would also prevent rainwater infiltration into groundwater. These caps would be tied into the adjacent Capped Landfills Area. Th total surface area for each of these capped areas will be 4.4 acres for PCB Landfill, 5.5 acres for BTA and 18.8 acres for CDA for a total of 28.7 acres of cap. The cap cross-section is shown in Figure 11-3A. The stormwater will be directed by surface drains towards a culvert near PSCT-1 and then flow through a drainage channel to the southern portion of the site and then onto Pond 13 and offsite through or around the wetlands.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor budgetary quotes
Remediation Documentation/Reporting	1	ea	$ 125,000	$ 125,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	
Geotechnical testing/Geophysical Investigation	1	ls	$ 150,000	$ 150,000	Evaluate site stability, buried waste, geotech properties
Site Work					
Site Clearance/Grubbing	29	acre	$ 6,500	$ 189,000	Site clearance/grading prep for cap starting with the foundation layer
Existing wells protection/new aboveground well completion	30	wells	$ 5,000	$ 150,000	Protect 30 wells, raise well completion based on new cap topo surface
Dust controls	60	ls	$ 1,000	$ 60,000	Based on contractor unit costs and 3 months, 12 weeks, 60 days
RCRA Cap - PCB Landfill (4.4 ac)					
Cut/Fill Leveling Layer (grading)	20,000	cy	$ 5	$ 100,000	Based on existing slopes estimated by CAD; contractor unit cost
Foundation layer (2'), borrow and compact	16,000	cy	$ 6	$ 96,000	Soil volume based on estimated cap area, contractor unit cost quote
GCL Bento Liner (matl + labor)	4.4	acre	$ 34,500	$ 152,000	Assume $0.80/sf based on GSE Liner quote incl tax, shipping
HDPE liner (60 mil)(matl + labor)	4.4	acre	$ 34,500	$ 152,000	Assume $0.80/sf for HDPE liner per GSE Liner quote incl tax, shipping
Geocomposite 200 mil fabrinet, matl+labor	4.4	acre	$ 30,500	$ 134,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	4.4	acre	$ 21,800	$ 96,000	Assume $0.50/sf per GSE Liner quote incl tax, shipping
Vegetative cover (2'), borrow and compact	16,000	cy	$ 6	$ 96,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	4.4	acre	$ 4,000	$ 18,000	Top soil and hydroseeding

TABLE E-1-3
FS AREA 1 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
RCRA Cap - BTA (5.5 ac)					
Cut/Fill Leveling Layer (grading)	61,000	cy	$ 5	$ 305,000	Based on existing slopes estimated by CAD; Figure 11-2C
Foundation layer (2'), borrow and compact	19,000	cy	$ 6	$ 114,000	Soil volume based on estimated cap area, contractor unit cost quote
GCL Bento Liner (matl + labor)	5.5	acre	$ 34,500	$ 190,000	Assume $0.80/sf based on GSE Liner quote incl tax, shipping
HDPE liner (60 mil)(matl + labor)	5.5	acre	$ 34,500	$ 190,000	Assume $0.70/sf for HDPE liner per GSE Liner quote incl tax, shipping
Geocomposite 200 mil fabrinet, matl+labor	5.5	acre	$ 30,500	$ 168,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	5.5	acre	$ 21,800	$ 120,000	Assume $0.50/sf per GSE Liner quote incl tax, shipping
Vegetative cover (2'), borrow and compact	19,000	cy	$ 6	$ 114,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding
RCRA Cap - CDA (18.8 ac)					
Cut/Fill Leveling Layer (grading)	150,000	cy	$ 5	$ 750,000	Based on existing slopes estimated by CAD; contractor unit cost
Foundation layer (2'), borrow and compact	67,000	cy	$ 6	$ 402,000	2' clean soil cover borrowed from NW corner of site
GCL Bento Liner (matl + labor)	18.8	acre	$ 34,500	$ 649,000	Assume $0.80/sf based on GSE Liner quote incl tax, shipping
HDPE liner (60 mil)(matl + labor)	18.8	acre	$ 34,500	$ 649,000	Assume $0.70/sf for HDPE liner per GSE Liner quote incl tax, shipping
Geocomposite 200 mil fabrinet, matl+labor	18.8	acre	$ 30,500	$ 573,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	18.8	acre	$ 21,800	$ 410,000	Assume $0.50/sf per GSE Liner quote incl tax, shipping
Vegetative cover (2'), borrow and compact	67,000	cy	$ 6	$ 402,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	18.8	acre	$ 4,000	$ 75,000	Top soil and hydroseeding
Stormwater Controls					
Surface features - Stormwater ditches, Bench V-ditches	8,000	lf	$ 30	$ 240,000	Based on contractor unit cost quotes
Stormwater drain pipes	1,000	lf	$ 100	$ 100,000	Based on contractor unit cost quotes
Stormwater - culvert crossing, 3 inlet structures, riprap pads	1	ls	$ 100,000	$ 100,000	Based on contractor budgetary lump sum quote
Construct lined drainage channel for Area 1 stormwater	1,500	lf	$ 60	$ 90,000	Cost based on channel length to RCF pond; use double unit cost for V-dra
Monitoring/Sampling/Testing					
Air Monitoring/Sampling (during remedy implementation)	160	samples	$ 500	$ 80,000	160 air/dust samples analyzed for VOCs, PCBs, DDT and metals
Compaction testing: Geotech engr	80	days	$ 500	$ 40,000	80 days of testing w Geotech engr/nuclear gage at $500/day

TABLE E-1-3
FS AREA 1 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
			Capital Costs (continued)		
Wetlands - Upgrading for increased SW flow					Upgrade B-Drainage wetlands per the Wetlands Plan (April 2011) and adc diversion drainage channels on either side of wetland
Complete Erosion Improvements Described in Draft Wetlands Plan (April, 2011)	1	see previous cost est	$ 100,000	$ 100,000	Reference for previous cost estimate
Grading of East Slope B-Drainage hillside, gullies/rills	5	acre	$ 20,000	$ 100,000	
Erosion control - Turf reinforcement mats	3	acre	$ 54,000	$ 162,000	
Surface features - Stormwater ditches, Bench V-ditches	4,500	lf	$ 30	$ 135,000	
General NPDES Stormwater Permit - Revision	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost for entire site
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Assume 25% higher than Alt 2
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 8,548,000**	
			Contingency (35%)	**$ 2,992,000**	Lower contingency used because of prior experience with capping
			Direct Capital Total:	**$ 11,540,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 8,548,000	$ 427,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 8,548,000	$ 256,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$ 8,548,000	$ 855,000	
Construction Management	5%	of	$ 8,548,000	$ 427,000	
			Total PM/CM Cost:	**$ 1,965,000**	
			Total Capital Cost:	**$ 13,505,000**	Direct Capital Cost per Acre = $466,000

TABLE E-1-3
FS AREA 1 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 60,000	$ 60,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 80,000	$ 80,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
			Subtotal Annual O&M Cost:	$ 180,000	
			Contingency (50%):	$ 90,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 306,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace one half of RCRA Caps	1	100-year	$ 6,752,500	$ 6,752,500	Assume of 1/2 of cap costs for partial replacement

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$13,505		$13,505	$13,505	
Annual O&M Cost (post construction)	0 - 5	$1,555	$311	$1,424	$1,275	
Annual O&M Cost (post construction)	6 - 30	$7,775	$311	$4,671	$2,584	
Annual O&M Cost (post construction)	31 - 100	$28,173	$402	$4,829	$749	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$19,601,000**	**$17,364,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$24,430,000**	**$18,113,000**	

TABLE E-1-3
FS AREA 1 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 14,018,190**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 317,628**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 7,009,095**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$14,018	$2,803.64	$12,466	$10,743	FS Area 1 remedy is expected to be constructed during the second construction season (2017) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,614	$323	$1,478	$1,324	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$8,070	$322.82	$4,849	$2,682	
Annual O&M Cost (post construction)	31 - 100	$29,243	$417.76	$5,012	$777	
			Present Value of Capital	**$12,466,000**	**$10,743,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$6,327,000**	**$4,006,000**	
			Present Value of 100 Year O&M	**$11,340,000**	**$4,783,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$18,793,000**	**$14,749,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$23,806,000**	**$15,526,000**	

NOTES/ASSUMPTIONS

1. PCB landfill (4.4 acres), BTA (5.5 acres) and CDA (18.8 acres) cover a total area of about 29 acres. Alternative cost includes RCRA cap for all three areas and associated stormwater controls as shown in Figure 11-2A.
2. Existing wellheads will be reinstalled at new cap grade. Assumed 30 wells
3. Assume active gas control is not required. New PCB and BTA caps will require special termination trench details
4. RCRA cap profile - 2' foundation, GCL layer, HDPE Geomembrane, Geocomposite, and 2' vegetative layer with biotic barrier
5. Assumed fill for foundation layer is adequate to smooth existing grades for drainage or lessen steeper slopes for potential stability issue
6. Some of the existing V-ditches will need to be reconstructed after new capping of PCB and BTA
7. Will need to tie existing membrane component of existing caps to the new PCB and BTA caps with a special detailed tie-in
8. Drainage channel for Area 1 is to be a 1,500-foot concrete channel starting at the PSCT and passing through the footprint of the RCF Pond to Pond 13.
9. As discussed with EPA, agency oversight is typically assumed to be 10% of capital cost

TABLE E-1-4
FS AREA 1 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Excavate (Entire BTA (20') + CDA remedial area (5'))/Offsite Disposal + RCRA-Equivalent Mono Soil Cap (BTA, CDA) (5') + RCRA Cap (PCB Landfill) + Stormwater Controls + ICs + Monitoring

Alternative Description : This remedial alternative would involve installing a RCRA cap on the PCB Landfill as in the other alternatives. It addresses the ecological risks of the other subareas by excavating the shallow soil (5') within a portion of the Central Drainage Area and the entire Burial Trench Area to remove waste from the trenches as shown in Figure 11-4A. The areas targeted for excavation in the CDA are based on the exceedances of the sitewide cleanup goals for metals and organics in shallow (0-5') soils which were defined by the RI. The remedy alternative assumes the entire BTA would be excavated down to 20 feet bgs to remove waste deposited in the trenches (but if trench wastes are deeper than 20 ft bgs, the excavation would correspondingly be deeper). The excavated wastes would be sent offsite to a permitted landfill for disposal. The stormwater will be directed by surface drains towards a culvert near PSCT-1 and then flow through a drainage channel to the southern portion of the site and then onto Pond 13 and offsite through or around the wetlands.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor budgetary quotes
Remediation Documentation/Reporting	1	ea	$ 150,000	$ 150,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 120,000	$ 120,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	
Geotechnical testing/Geophysical Investigation	1	ls	$ 150,000	$ 150,000	Evaluate site stability, buried waste, geotech properties
Site Work					
Site Clearance/Grubbing	29	acre	$ 6,500	$ 189,000	Based on contractor quotes
Existing wells protection/new aboveground well completion	30	wells	$ 5,000	$ 150,000	Protect well, raise well completion to reach new cap topo surface
Dust controls	100	days	$ 1,000	$ 100,000	Based on contractor unit cost-water truck-5 mths, 20 wks, 100 days
RCRA Prescriptive Cap - PCB Landfill (4.4 ac)					
Cut/Fill Leveling Layer (grading)	20,000	cy	$ 4	$ 80,000	Volume estimated by CAD; contractor unit cost quote
Foundation layer (2'), borrow and compact	16,000	cy	$ 6	$ 96,000	Soil volume based on estimated cap area, contractor unit cost quote
GCL Bento Liner (matl + labor)	4.4	acre	$ 34,500	$ 152,000	Assume $0.80/sf based on GSE Liner quote
HDPE liner (60 mil)(matl + labor)	4.4	acre	$ 34,500	$ 152,000	Assume $0.70/sf for 60 mil HDPE liner per GSE Liner quote
Geocomposite 200 mil fabrinet, matl+labor	4.4	acre	$ 30,500	$ 134,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	4.4	acre	$ 21,800	$ 96,000	Assume $0.50/sf per GSE Liner quote
Vegetative cover (2'), borrow and compact	16,000	cy	$ 6	$ 96,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	4.4	acre	$ 4,000	$ 18,000	Top soil and hydroseeding
Excavation/Backfill(20')+RCRA-equiv cap (5')-BTA (5.5 ac)					
Excavation (20')	180,000	cy	$ 6	$ 1,080,000	Contractor unit cost quote for sloped area excavation and hazardous soils; Volume based on 5.6 acres, 20 feet deep;
Segregate wastes for transport to PCB landfill (35,000 cy)	35,000	cy	$ 8	$ 280,000	Assume one half of 70,000 cy waste is transported to PCB landfill; Assume Level B and productivity is 50% and rate is doubled
Portion of soils for offsite landfill disposal (35,000 cy)	52,500	tons	$ 80	$ 4,200,000	Disposal of one half of segregated wastes as nonRCRA haz at Buttonwillow
Borrow offsite NW soil and compact	77,000	cy	$ 6	$ 462,000	Based on contractor unit cost
Segregated unimpacted soil: place and compact	121,000	cy	$ 3	$ 363,000	Based on contractor unit cost
Clay monocover cap (5')	49,000	cy	$ 14	$ 686,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cost
Place clay and compact, 6" lifts	49,000	cy	$ 3	$ 147,000	Assume 50% of clay is onsite borrow and 50% offsite source
Biotic barrier (200 mil Geonet)(matl + labor)	5.5	acre	$ 21,800	$ 120,000	Assume $0.50/sf per GSE Liner quote
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding

TABLE E-1-4
FS AREA 1 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
			Capital Costs (continued)		
Excavation(5') (4.8 ac) +RCRA-equiv cap (5')-CDA (18.8 ac)					CDA excav area (acres) = 4.80
Excavation (Portions of CDA) (5')	39,000	cy	$ 6	$ 234,000	CDA excavation area is 4.8 acres in the western portion
Offsite transport and disposal	58,500	tons	$ 40	$ 2,340,000	Assume nonhaz disposal at Buttonwillow
Borrow offsite NW soil and compact	42,900	cy	$ 6	$ 257,000	Soil volume based on estimated cap area; assume half the soil will be borrowed from NW corner of Site; contractor unit cost quote
Cut/Fill Leveling Layer (grading)	150,000	cy	$ 4	$ 600,000	Based on existing slopes estimated by CAD; Figure 11-3C
Clay monocover cap (5')	167,000	cy	$ 14	$ 2,338,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cost
Place clay and compact, 6" lifts	167,000	cy	$ 3	$ 501,000	Soil volume based on estimated cap area; assume half the soil will be borrowed from NW corner of Site; contractor unit cost quote
Biotic barrier (200 mil Geonet)(matl + labor)	18.8	acre	$ 21,800	$ 410,000	Assume $0.50/sf per GSE Liner quote
Revegetation/Hydroseeding	18.8	acre	$ 4,000	$ 75,000	Top soil and hydroseeding
Stormwater Controls					
Surface features - Stormwater ditches, Bench V-ditches	8,000	lf	$ 30	$ 240,000	Based on contractor unit cost quotes
Stormwater drain pipes	1,000	lf	$ 100	$ 100,000	Based on contractor unit cost quotes
Stormwater - culvert crossing, 3 inlet structures, riprap pads	1	ls	$ 100,000	$ 100,000	Based on contractor budgetary lump sum quote
Concrete drainage channel for Area 1 stormwater	1,500	lf	$ 60	$ 90,000	Cost based on channel length to RCF pond; use double unit cost for V-drain
Monitoring/Sampling/Testing					
Air Monitoring/Sampling (during remedy implementation)	300	samples	$ 500	$ 150,000	180 air/dust samples (3/day),(VOCs, PCBs, DDT, metals)
Compaction testing: Geotech engr	100	days	$ 500	$ 50,000	80 days of testing w Geotech engr/nuclear gage at $500/day
Wetlands - Upgrading for increased SW flow					Upgrade B-Drainage wetlands per the Wetlands Plan (April 2011) and add diversion drainage channels on either side of wetlands
Complete Erosion Improvements Described in Draft Wetlands Plan (April, 2011)	1	see previous cost est	$ 100,000	$ 100,000	Reference for previous cost estimate
Grading of East Slope B-Drainage hillside, gullies/rills	5	acre	$ 20,000	$ 100,000	
Erosion control - Turf reinforcement mats	3	acre	$ 54,000	$ 162,000	
Surface features - Stormwater ditches, Bench V-ditches	4,500	lf	$ 30	$ 135,000	
General NPDES Stormwater Permit - Revision	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost for entire site
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Assume 25% higher than Alt 2
Health and Safety Program, ODCs	1	ls	$ 75,000	$ 75,000	Assume 50% higher than Alt 3
			Direct Capital Total:	**$ 17,700,000**	
			Contingency (50%)	**$ 8,850,000**	Use higher 50% contingency because of deep excavation
			Total Capital Cost:	**$ 26,550,000**	

TABLE E-1-4
FS AREA 1 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 17,700,000	$ 885,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 17,700,000	$ 531,000	
EPA Oversight Costs	10%	of	$ 17,700,000	$ 1,770,000	
Construction Management	5%	of	$ 17,700,000	$ 885,000	
			Total PM/CM Cost:	**$ 4,071,000**	
			Total Capital Cost:	**$ 30,621,000**	Direct Capital Cost per Acre = $1,056,000
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 60,000	$ 60,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 80,000	$ 80,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
			Subtotal Annual O&M Cost:	$ 180,000	
			Contingency (50%):	$ 90,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on site O&M experience
			Total Annual O&M Cost:	**$ 306,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace one half of caps	1	100-year	$ 5,918,000	$ 5,918,000	Assume of 1/2 of cap costs for partial replacement

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$30,621		$30,621	$30,621	
Annual O&M Cost (post construction)	0 - 5	$1,555	$311	$1,424	$1,275	
Annual O&M Cost (post construction)	6 - 30	$7,775	$311	$4,671	$2,584	
Annual O&M Cost (post construction)	31 - 100	$27,338	$391	$4,686	$726	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$36,717,000**	**$34,480,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$41,403,000**	**$35,207,000**	

TABLE E-1-4
FS AREA 1 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)					
			Total Capital Cost (2014):	**$ 31,784,598**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
			Total Annual O&M Cost, Annual (2014):	**$ 317,628**	
			Periodic Cost, 5-year (2014):	**$ 25,950**	
			Periodic Cost, 100-year (2014):	**$ 6,142,884**	

Cost Type	Year	Total Cost (2014 $K)	Cost/Year (2014 $K)	Net Present Value at 3% DF (2014 $K)	Net Present Value at 7% DF (2014 $K)	
Capital Cost		$31,785	$6,357	$28,265	$24,359	FS Area 1 remedy is expected to be constructed during the second construction season (2017) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,614	$322.82	$1,478	$1,324	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$8,070	$322.82	$4,849	$2,682	
Annual O&M Cost (post construction)	31 - 100	$28,377	$405.38	$4,864	$754	

Present Value of Capital	**$28,265,000**	**$24,359,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M	**$6,327,000**	**$4,006,000**	
Present Value of 100 Year O&M)	**$11,191,000**	**$4,760,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)	**$34,592,000**	**$28,365,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)	**$39,456,000**	**$29,119,000**	

NOTES/ASSUMPTIONS

1. PCB landfill (4.4 acres), BTA (5.5 acres) and CDA (18.8 acres) cover total area of about 29 acres. CDA excavation area is 4.8 acres.
2. Existing wellheads will be reinstallated at new cap grade. Assumed 30 wells.
3. Assume active gas control is not required. New PCB and BTA caps will require special termination trench details.
4. RCRA cap profile - 2' foundation, Drainage layer, Geomembrane, Geocomposite, 2' vegetative layer with biotic barrier.
5. Soil cap profile - 5' monocap clay with hydroseeding and vegetation on top
6. Assumed fill for foundation layer is adequate to smooth existing grades for drainage or lessen steeper slopes for potential stability issues.
7. Some of the existing V-ditches will need to be reconstructed after new capping of PCB and BTA.
8. Will need to tie existing membrane component of existing cap to the new PCB Landfill cap with a special detailed tie-in.
9. Drainage channel for Area 1 is to be a 1,500-foot concrete channel starting at the PSCT and passing through the footprint of the RCF Pond to Pond 13.
10. As discussed with EPA, agency oversight is typically assumed to be 10% of capital cost.

AREA 2 TABLES

TABLE E-2-0
AREA 2 COST SUMMARY
Casmalia Resources Superfund Site
Final Feasibility Study

Summary of Area 2 Remedial Alternative Costs

Alt	PROPOSED REMEDIAL ALTERNATIVE	CAPITAL COST (2014 $)	ANNUAL O&M (2014 $)	TIME FRAME	PRESENT WORTH CAPITAL + O&M 3% DISCOUNT RATE (2014 $)	PRESENT WORTH CAPITAL + O&M 7% DISCOUNT RATE (2014 $)
2	Eco-Cap (RCRA Canyon, WCSA remedial areas) (2') + Grading/BMPs	$ 8,269,000	$ 364,000	30-year	$14,596,000	$10,923,000
				100-year	$20,385,000	$11,820,000
3	RCRA-equivalent Mono Soil Cap (RCRA Canyon remedial area)(5') + Excavation (WCSA remedial area)(5') + Grading/BMPs	$ 9,105,000	$ 333,000	30-year	$14,730,000	$11,177,000
				100-year	$19,508,000	$11,918,000
4	RCRA-equivalent Mono Soil Cap (RCRA Canyon remedial area, WCSA remedial area)(5') + Grading/BMPs	$ 10,565,000	$ 364,000	30-year	$16,638,000	$12,682,000
				100-year	$21,915,000	$13,500,000
5	RCRA-equivalent Mono Soil Cap (RCRA Canyon remedial area)(5') + Excavation (WCSA remedial area)(5') + Clean Soil Cover (Uncapped Area)(2')	$ 11,423,000	$ 395,000	30-year	$18,011,000	$13,727,000
				100-year	$23,736,000	$14,614,000
6	RCRA-equivalent Hybrid Cap (RCRA Canyon remedial area) + Excavation (WCSA remedial area)(5') + Clean Soil Cover (Uncapped Area)(2')	$ 11,772,000	$ 411,000	30-year	$18,627,000	$14,187,000
				100-year	$24,568,000	$15,108,000
7	Evapotranspirative (ET) Cap (RCRA Canyon remedial area) + Excavation (WCSA remedial area)(5') + Clean Soil Cover (Uncapped Area)(2')	$ 11,116,000	$ 395,000	30-year	$17,738,000	$13,491,000
				100-year	$23,436,000	$14,374,000
8	RCRA-equivalent Hybrid Cap (entire RCRA Canyon and WCSA)	$ 16,675,000	$ 489,000	30-year	$24,513,000	$18,911,000
				100-year	$31,808,000	$20,042,000
9	Evapotranspiration (ET) Cap (entire RCRA Canyon and WCSA)	$ 15,655,000	$ 473,000	30-year	$23,301,000	$17,936,000
				100-year	$30,322,000	$19,024,000

NOTES
1. Total Present Worth Cost (Capital + O&M in 2014 $) is shown for a 3% and 7% net discount rate and a 30-year and a 100-year timeframe and includes contingency on capital and O&M costs.
2. FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs.
3. PV of Capital Cost (in 2014 $) is shown for a 3% and 7% net discount rate based on the average capital cost for each year of the 5 year construction period.

TABLE E-2-1
FS AREA 2 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Eco-Cap (West slope RCRA Canyon, WCSA remedial area) (2') + Grading/BMPs (Uncapped areas) + Stormwater Controls + ICs + Monitoring

Alternative Description : This alternative involves capping metals-impacted soils in the RCRA Canyon and WCSA which were identified as requiring remediation in the revised ERA with an "ecological or eco-cap" which is 2 foot of clean soil over an HDPE biotic barrier (Figure 11-5A). The eco-cap would be placed in the RCRA Canyon west slope (8.4 acres) and over a portion of the WCSA east slope (5.5 acres). The ecologica cap is intended to eliminate potential exposure to eco-receptors. This remedial alternative assumes some grading and additional borrow soil is required to reduce the steepness of some of the sloped areas in order to install the cap. Some portions of the west slope and the WCSA that are steeper than 2:1 would be covered with turf reinforcement mats to minimize erosion. Since the eco-cap does not eliminate surface water infiltration or potential seeps at the foot of the RCRA Canyon, the stormwater from the RCRA Canyon/WCSA would be collected in an onsite evaporation pond where it would be managed.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 150,000	$ 150,000	Based on contractor budgetary quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 80,000	$ 80,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	
Geotechnical testing/Geophysical Investigation	1	ls	$ 200,000	$ 200,000	Evaluate site stability, identify any buried waste, geotech borings/testing
Site Work					
Site Preparation/Clearance/Grubbing	13.9	acre	$ 6,500	$ 90,000	Site clearance/grubbing/grading prep of north and south canyons and canyon bottoms
Existing wells protection/new well completion	20	wells	$ 5,000	$ 100,000	Protect well, raise well completion to reach new cap topo surface
Dust controls: water truck/day	40	days	$ 1,000	$ 40,000	Based on contractor unit costs and 2 months, 8 weeks, 40 days
Eco Cap 2' - RCRA Canyon West Slope (8.4 acres)					Westslope_area (acres) 8.40
Cut/Fill Leveling Layer (grading)	100,000	cy	$ 5	$ 500,000	Based on cap area, existing slopes; grading to reduce steep slopes
Soil Cover (2'): borrow and compact	30,000	cy	$ 6	$ 180,000	Soil volume based on cap area; soil will be borrowed from NW corner of Site; contractor unit cost quote
Biotic barrier (200 mil Geonet)	0.0	acre	$ 21,750	$ -	Use Geonet as biotic barrier; material + install <0.50/sf per contrac
Erosion control - jute mesh or TRM, silt fencing	8.4	acre	$ 9,000	$ 75,600	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Revegetation/Hydroseeding	8.4	acre	$ 4,000	$ 34,000	Top soil and hydroseeding

TABLE E-2-1
FS AREA 2 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Eco Cap 2' - WCSA (5.5 acres)					WCSA rem area (acres) 5.50
Cut/Fill (grading) uncapped area East Slope	30,000	cy	$ 5	$ 150,000	Based on CAD estimate for East Slope area
Soil Cover (2'): borrow and compact	19,000	cy	$ 6	$ 114,000	Soil volume based on WCSA cap area; assume half the soil will be borrowed from NW corner of Site; contractor unit cost quote
Biotic barrier (200 mil Geonet)	0.0	acre	$ 21,750	$ -	Use Geonet as biotic barrier; material + install <0.50/sf per contrac
Erosion control - jute mesh or TRM, silt fencing	5.5	acre	$ 9,000	$ 49,500	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding
Grading/BMPs All Uncapped Areas (19.3 acres)					Uncapped area 19.30
Cut/Fill (grading) of uncapped East Slope area	7	acre	$ 20,000	$ 140,000	Grading of uncapped east slope to remove gullies, rills for erosion control; assume 7 acres
Erosion control - Turf reinforcement mats	3	acre	$ 54,000	$ 162,000	Turf reinforcement mats for steep slopes >2:1 in Uncapped areas; Unict cost from CalTrans Erosion control toolbox; Assume 3 acres
Erosion control - Jute mesh, rip rap, silt fence	6	acre	$ 9,000	$ 54,000	Jute mesh for slopes in Uncapped areas; Unit cost from CalTrans Erosion control toolbox; 3 acres
Revegetation/Hydroseeding	19.3	acre	$ 4,000	$ 77,000	Top soil and hydroseeding
Stormwater Controls					
Surface features - SW ditches, bench roads/V-ditches	6,000	lf	$ 30	$ 180,000	Based on contracor unit cost quotes
Culverts, inlet structures	1	ls	$ 150,000	$ 150,000	Based on contractor budgetary quotes
Concrete channel - Capped area stormwater flow	2,000	ls	$ 30	$ 60,000	Based on contractor quotes
Concrete channel - Uncapped area stormwater flow	2,500	ls	$ 30	$ 75,000	Based on contractor quotes
Incremental Evaporation Pond cost	9	acre	$ 206,000	$ 1,854,000	Incremental evaporation pond capacity needed based on unit cost for evaporation pond construction (see Area 4 cost estimate)
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	150	samples	$ 500	$ 75,000	150 air/dust samples (10/day),(VOCs, PCBs, DDT, metals)
Soil Compaction Testing: Geotech engr	20	days	$ 500	$ 10,000	20 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	100	samples	$ 200	$ 20,000	Analyze for metals including 6010 total metals, soluble metals Ba, CrVI, other parameters
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation

TABLE E-2-1
FS AREA 2 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 200,000	$ 200,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 5,042,000**	
			Contingency (35%)	**$ 1,765,000**	
			Total Capital Cost:	**$ 6,807,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 5,042,000	$ 252,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 5,042,000	$ 151,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$ 5,042,000	$ 504,000	
Construction Management	5%	of	$ 5,042,000	$ 252,000	
			Total PM/CM Cost:	**$ 1,159,000**	
			Total Capital Cost:	**$ 7,966,000**	Direct Capital Cost per Acre = $573,000
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 120,000	$ 120,000	20% higher settlement repair cost for eco-cap than mono cap
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
			Subtotal Annual O&M Cost:	$ 210,000	
			Contingency (50%):	$ 105,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 351,000**	

TABLE E-2-1
FS AREA 2 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Cap, drains, erosion controls	1	50-year	$ 7,966,000	$ 7,966,000	Assume cap and drains would need to be replaced every 50 years

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$7,966		$7,966	$7,966	
Annual O&M Cost (post construction)	0 - 5	$1,780	$356	$1,630	$1,460	
Annual O&M Cost (post construction)	6 - 30	$8,900	$356	$5,347	$2,958	
Annual O&M Cost (post construction)	31 - 100	$40,502	$579	$6,942	$1,076	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$14,944,000**	**$12,384,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$21,886,000**	**$13,460,000**	

TABLE E-2-1
FS AREA 2 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 8,268,708**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 364,338**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 8,268,708**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$8,269	$1,654	$7,353	$6,337	FS Area 2 remedy is expected to be constructed during the first construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,848	$369.53	$1,692	$1,515	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$9,238	$370	$5,551	$3,070	
Annual O&M Cost (post construction)	31 - 100	$33,772	$482.46	$5,789	$897	
			Present Value of Capital	**$7,353,000**	**$6,337,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$7,243,000**	**$4,585,000**	
			Present Value of 100 Year O&M	**$13,032,000**	**$5,483,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$14,596,000**	**$10,923,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$20,385,000**	**$11,820,000**	

NOTES/ASSUMPTIONS

1 RCRA canyon Westslope (8.4 acres) and WCSA remedial area (5.5 acres) cover a total of about 13.9 acres.
2 Assumes additional site contaminant investigation is not necessary for capping and excavation areas.
3 Soil volumes for RCRA canyon are based on area of remediation derived by risk-based approach, Appendix C
4 Clean soil is borrowed from NW corner of site and trucked down the canyon for use as soil cover.
5 Clayey soils from NW Borrow area are pre-processed with screening and pulverizing with pug mill. No supplemental bentonite or other clay included.

TABLE E-2-2
FS AREA 2 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: RCRA-Equivalent Mono Soil Cap (West slope RCRA Canyon) (5') + Excavate (WCSA remedial area) (5') + Grading/BMPs (Uncapped Areas) + Stormwater Controls (Segregate Capped and Uncapped Area SW) + ICs + Monitoring

Remedial Alternative Description : This remedial alternative involves installing a RCRA equivalent mono soil cap on the west slope of the RCRA Canyon (approximately 8.4 acre) and the impacted portion of the WCSA (5.5 acres) will be excavated and the soil used as fill in Pond A-5 (Figure 11-6A). The RCRA equivalent mono soil cap is 5-foot of low permeability claylike soil with a 4-foot compacted layer to meet the 10-6 cm/s permeability criterion and a top 1-foot vegetative layer that is compacted to 85% of maximum dry density. The RCRA equivalent cap will control potential exposures to ecological receptors and will reduce surface water infiltration. The extent of the excavation is approximate and sidewall sampling will be used to confirm cleanup goals. The excavated portions of the WCSA will be backfilled to match grades. This remedial alternative assumes some grading and additional borrow soil is required to reduce the steepness of some of the sloped areas in order to install the cap. The final surfaces of the western slope of the RCRA Canyon will be sloped and include surface drains to allow drainage of storm water from the westslope of the RCRA canyon to flow into a new retention basin that will be constructed in the footprint of the former Pond A-5. This stormwater will be discharged by pipeline to the B-Drainage via the General NPDES permit. The uncapped area of the eastslope and WCSA will implement grading and BMPs as part of erosion control. The surface water runoff from the eastern slope of the RCRA Canyon (i.e. the WCSA) will be collected/managed in a new onsite evaporation pond constructed in the footprint of the A-Series Pond.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 200,000	$ 200,000	Based on contractor budgetary quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 80,000	$ 80,000	Based on contractor budgetary quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	
Prelim Geotech investigation/Geophysical Eval	1	ls	$ 100,000	$ 100,000	Geophysical to identify any buried features, prelim geotech sampling, testing, physical properties
Detailed Geotechnical Evaluation/Reporting	1	ls	$ 200,000	$ 200,000	Evaluate slope stability for capping in steep slopes and erosion control measures
Site Work					
Site Preparation/Clearance/Grubbing	13.9	acre	$ 6,500	$ 90,000	Site clearance/grubbing/grading prep of north and south canyons and canyon bottoms
Existing wells protection/new well completion	20	wells	$ 5,000	$ 100,000	Protect well, raise well completion to reach new cap topo surface
Dust controls: water truck/day	50	days	$ 1,000	$ 50,000	Based on contractor unit costs and 2.5 months, 10 weeks, 50 days
RCRA-equivalent Mono Cap 5' - West Slope (8.4 acres)					
Cut/Fill Leveling Layer (grading)	100,000	cy	$ 5	$ 500,000	Based on cap area, existing slopes; grading to reduce steep slopes
Clay Layer (4')	60,000	cy	$ 14	$ 840,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cost
Place clay soil and compact, 6" lifts	60,000	cy	$ 3	$ 180,000	Based on contractor unit cost quotes
Clay soil from borrow area, 1' vegetative layer	15,000	cy	$ 6	$ 90,000	Based on 1' veg layer requiring addition of amendments and some preprocessing of soils
Place and compact, 12" lifts	15,000	cy	$ 2	$ 30,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh, silt fencing	8.4	acre	$ 31,500	$ 264,600	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing; use average unit cost of 0.2/sf and 1.00/sf
Revegetation/Hydroseeding	8.4	acre	$ 4,000	$ 34,000	Top soil and hydroseeding

TABLE E-2-2
FS AREA 2 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Excavation, 5' - WCSA; Grading (5.5 acres)					
Excavation (5 feet bgs)	44,000	cy	$ 6	$ 264,000	Based on contractor unit costs
Backfill/compact of excavation to match grades	48,000	cy	$ 4	$ 192,000	Grading of WCSA area outside of excavation to partially backfill excavation and reduce slope steepness
Erosion control - jute mesh, silt fencing	5.5	acre	$ 31,500	$ 173,250	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing; use average unit cost of 0.2/sf and 1.00/sf
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding
Grading/BMPs All Uncapped Areas (19.3 acres)					
Grading of uncapped East Slope area, gullies/rills	7	acre	$ 20,000	$ 140,000	Grading of uncapped east slope to remove gullies, rills for erosion control, assume 7 out of 19.3 acres
Erosion control - Turf reinforcement mats	3	acre	$ 54,000	$ 162,000	Turf reinforcement mats in Uncapped areas; Unit cost from CalTrans Erosion control toolbox; assume 3 out of 21 acres
Erosion control - jute mesh, silt fencing, rip rap	6	acre	$ 9,000	$ 54,000	Unit cost from CalTrans Erosion control toolbox; assume 6 out of 21 acres
Revegetation/Hydroseeding	19.3	acre	$ 4,000	$ 77,000	Top soil and hydroseeding
Stormwater and Erosion Controls					
Surface features on cap - bench roads/V-ditches	6,000	lf	$ 30	$ 180,000	Surface features for drainage - concrete V-drains, perimeter ditches
Culverts, inlet structures	1	ls	$ 150,000	$ 150,000	Based on contractor unit cost quotes
Concrete channel - Capped area stormwater flow	2,000	lf	$ 30	$ 60,000	Based on contractor unit cost quotes
Concrete channel - Uncapped area stormwater flow	2,500	lf	$ 30	$ 75,000	Based on contractor unit cost quotes
Incremental Evaporation Pond cost	3	acre	$ 206,000	$ 618,000	Incremental evaporation pond capacity needed based on unit cost for evaporation pond construction (see Area 4 cost estimate)
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	150	samples	$ 500	$ 75,000	150 air/dust samples (10/day),(VOCs, PCBs, DDT, metals)
Soil Compaction Testing: Geotech engr	40	days	$ 500	$ 20,000	40 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	400	samples	$ 200	$ 80,000	Analyze for metals including 6010 total metals, soluble metals Ba, CrVI, other parameters
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 5,551,000**	
			Contingency (35%)	**$ 1,943,000**	
			Direct Capital Total:	**$ 7,494,000**	

TABLE E-2-2
FS AREA 2 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 5,551,000	$ 278,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 5,551,000	$ 167,000	
EPA Oversight Costs	10%	of	$ 5,551,000	$ 555,000	
Construction Management	5%	of	$ 5,551,000	$ 278,000	
			Total PM/CM Cost:	**$ 1,278,000**	
			Total Capital Cost:	**$ 8,772,000**	Direct Capital Cost per Acre = $631,000
		Operation and Maintenance Costs			
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 100,000	$ 100,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
			Subtotal Annual O&M Cost:	$ 190,000	
			Contingency (50%):	$ 95,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 321,000**	
		Periodic Costs			
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Cap and erosion controls	1	100-year	$ 4,386,000	$ 4,386,000	Assume 1/2 the cap and erosion controls would need to be replaced over the 100 year period

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)
Capital Cost		$8,772		$8,772	$8,772
Annual O&M Cost (post construction)	0 - 5	$1,630	$326	$1,493	$1,337
Annual O&M Cost (post construction)	6 - 30	$8,150	$326	$4,897	$2,709
Annual O&M Cost (post construction)	31 - 100	$26,856	$384	$4,603	$714

TABLE E-2-2
FS AREA 2 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Total Present Value of Alternative (Capital + 30 Year O&M)			**$15,162,000**	**$12,817,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)			**$19,765,000**	**$13,531,000**	
PRESENT VALUE ANALYSIS (2014 $)					
Total Capital Cost (2014):				**$ 9,105,336**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost, Annual (2014):				**$ 333,198**	
Periodic Cost, 5-year (2014):				**$ 25,950**	
Periodic Cost, 100-year (2014):				**$ 4,552,668**	

Cost Type	Year	Total Cost (2014 $K)	Cost/Year (2014 $K)	Net Present Value at 3% DF (2014 $K)	Net Present Value at 7% DF (2014 $K)	
Capital Cost		$9,105	$1,821	$8,097	$6,978	FS Area 2 remedy is expected to be constructed during the first construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,692	$338.39	$1,550	$1,387	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$8,460	$338.39	$5,083	$2,812	
Annual O&M Cost (post construction)	31 - 100	$27,877	$398.24	$4,778	$741	
Present Value of Capital				**$8,097,000**	**$6,978,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M				**$6,633,000**	**$4,199,000**	
Present Value of 100 Year O&M				**$11,411,000**	**$4,940,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$14,730,000**	**$11,177,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)				**$19,508,000**	**$11,918,000**	

NOTES/ASSUMPTIONS

1 This alternative involves RCRA-equivalent soil cap (5') for remediation areas on the West slope and excvavation (5') for the WCSA remedial area and grading to reduce and smooth out steep slopes.
2 RCRA canyon Westslope (8.4 acres) and WCSA remedial area (5.5 acres) cover a total of about 13.9 acres. Extent of excavation is approximate and could change depending on sidewall sampling to confirm cleanup goals.
3 Assumes additional site contaminant investigation is not necessary for capping and excavation areas.
4 Soil volumes for RCRA canyon are based on area of remediation derived by risk-based approach, Appendix C.
5 Clean soil is borrowed from NW corner of site and trucked down the canyon for use as soil cover.
6 Clayey soils from NW Borrow area are pre-processed with screening and pulverizing with pug mill. No supplemental bentonite or other clay included.

TABLE E-2-3
FS AREA 2 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: RCRA-Equivalent Mono Soil Cap (West slope RCRA Canyon, WCSA remedial area) (5') + Grading/BMPs (Uncapped areas) + Stormwater Controls + ICs + Monitoring

Alternative Description : This remedial alternative involves installing a RCRA equivalent mono soil cap on the westslope of the RCRA Canyon (8.4 acre) and a portion of the WCSA (5.5 acres) as shown on Figure 11-7A. The RCRA equivalent mono cap is 5-foot of low permeability claylike soil. The RCRA equivalent mono soil cap will control potential exposures to ecological receptors and will significantly reduce water infiltration.This remedial alternative assumes some grading and additional borrow soil is required to reduce the steepness of some of the sloped areas in order to install the cap. The final surfaces of the western slope of the RCRA Canyon and WCSA will be sloped and include surface drains to allow drainage of storm water from the westslope of the RCRA canyon and WCSA to flow into a new retention basin that will be constructed in the footprint of the former Pond A-5. This stormwater will be sent by pipeline to the B-Drainage and discharged offsite via the site's General NPDES permit. The surface water runoff from the uncapped eastern slope of RCRA Canyon and WCSA will be collected in a new onsite evaporation pond where it would be managed.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
			Capital Costs		
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 200,000	$ 200,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 80,000	$ 80,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	Addtnl investigations (env., geotech, geophys); refine nature & extent, revisit risk calcs
Geotechnical testing/Geophysical Investigation	1	ls	$ 100,000	$ 100,000	Evaluate site stability, buried waste (EE/CA experience
Detailed Geotechnical Evaluation/Reporting	1	ls	$ 200,000	$ 200,000	Evaluate slope stability for capping in steep slopes and erosion control measures
Site Work					
Site Preparation/Clearance/Grubbing	20	acre	$ 6,500	$ 130,000	Site clearance/grubbing/grading prep of north and south canyons and canyon bottoms
Existing wells protection/new well completion	20	wells	$ 5,000	$ 100,000	Protect well, raise well completion to reach new cap topo surface
Dust controls	60	days	$ 1,000	$ 60,000	Based on contractor unit costs and 3 months, 12 weeks, 60 days
RCRA-equiv MonoSoil Cap 5' - Westslope (8.4 ac)					
Cut/Fill Leveling Layer (grading)	100,000	cy	$ 5	$ 500,000	Based on cap area, existing slopes; grading to reduce steep slopes
Clay Layer (4'): borrow, process	60,000	cy	$ 14	$ 840,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cost
Place clay soil and compact, 12" lifts	60,000	cy	$ 3	$ 180,000	Based on contractor unit cost quote
Clay soil from borrow area, 1' vegetative layer	15,000	cy	$ 6	$ 90,000	Based on 1' veg layer requiring addition of amendments and some preprocessing of soils
Place and compact, 12" lifts	15,000	cy	$ 2	$ 30,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh or TRM, silt fencing	8.4	acre	$ 31,500	$ 264,600	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Revegetation/Hydroseeding	8.4	acre	$ 4,000	$ 34,000	Top soil and hydroseeding

TABLE E-2-3
FS AREA 2 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
RCRA-equiv Mono Soil Cap 5' - WCSA (5.5 ac)					
Cut/Fill Leveling Layer (grading)	30,000	cy	$ 5	$ 150,000	Based on CAD estimate for East Slope area
Clay Layer (4'): borrow, process	39,000	cy	$ 14	$ 546,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cost
Place clay soil and compact, 12" lifts	39,000	cy	$ 3	$ 117,000	Based on contractor unit cost quote
Clay soil from borrow area, 1' vegetative layer	15,000	cy	$ 6	$ 90,000	Based on 1' veg layer requiring addition of amendments and some preprocessing of soils
Place and compact, 12" lifts	15,000	cy	$ 2	$ 30,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh or TRM, silt fencing	5.5	acre	$ 31,500	$ 173,250	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding
Incremental cost for borrow soil for Pond A-5 in Area 4	44,000	cy	$ 6	$ 264,000	Excavation of WCSA 5.5 acres provided fill for Pond A-5 but with capping of WCSA 5.5 acres, borrow soil is needed for Pond A-5
Grading/BMPs All Uncapped Areas (19.3 ac)					
Grading of uncapped East Slope area, gullies/rills	7	acre	$ 20,000	$ 140,000	Grading of uncapped east slope to remove gullies, rills for erosion control, assume 7 out of 14 acres
Erosion control - Turf reinforcement mats	3	acre	$ 54,000	$ 162,000	Turf reinforcement mats in Uncapped areas; Unict cost from CalTrans Erosion control toolbox; assume 3 acres
Erosion control - jute mesh, silt fencing, rip rap	6	acre	$ 9,000	$ 54,000	Turf reinforcement mats in Uncapped areas; Unict cost from CalTrans Erosion control toolbox; assume 6 acres
Revegetation/Hydroseeding	19.3	acre	$ 4,000	$ 77,000	Top soil and hydroseeding
Stormwater Controls					
Surface features - SW ditches, bench roads/V-ditches	9,000	lf	$ 30	$ 270,000	Surface features for drainage - grading, swales, V-drains
Culverts, inlet structures	1	ls	$ 150,000	$ 150,000	Based on contractor budgetary estimate
Concrete channel - Capped area stormwater flow	2,000	lf	$ 30	$ 60,000	Based on contractor unit costs
Concrete channel - Uncapped area stormwater flow	2,500	lf	$ 30	$ 75,000	Based on contractor unit costs
Incremental Evaporation Pond cost	3	acre	$ 206,000	$ 618,000	Incremental evaporation pond capacity needed based on unit cost for evaporation pond construction

TABLE E-2-3
FS AREA 2 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	150	samples	$ 500	$ 75,000	150 air/dust samples (10/day),(VOCs, PCBs, DDT, metals)
Soil Compaction Testing: Geotech engr	60	days	$ 500	$ 30,000	60 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	400	samples	$ 200	$ 80,000	Analyze for metals including 6010 total metals, soluble metals Ba, CrVI, other parameters
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 6,442,000**	
			Contingency (35%)	**$ 2,255,000**	
			Total Capital Cost:	**$ 8,697,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 6,442,000	$ 322,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 6,442,000	$ 193,000	
EPA Oversight Costs	10%	of	$ 6,442,000	$ 644,000	
Construction Management	5%	of	$ 6,442,000	$ 322,000	
			Total PM/CM Cost:	**$ 1,481,000**	
			Total Capital Cost:	**$ 10,178,000**	Direct Capital Cost per Acre = $509,000

TABLE E-2-3
FS AREA 2 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 60,000	$ 60,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 100,000	$ 100,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
			Subtotal Annual O&M Cost:	$ 210,000	
			Contingency (50%):	$ 105,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Previous EE/CA and PS Landfill Cap experience
			Total Annual O&M Cost:	**$ 351,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Cap	1	100-year	$ 5,089,000	$ 5,089,000	Assume 1/2 of cap would need to be replaced

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$10,178		$10,178	$10,178	
Annual O&M Cost (post construction)	0 - 5	$1,780	$356	$1,630	$1,460	
Annual O&M Cost (post construction)	6 - 30	$8,900	$356	$5,347	$2,958	
Annual O&M Cost (post construction)	31 - 100	$29,659	$424	$5,084	$788	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$17,156,000**	**$14,596,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$22,240,000**	**$15,384,000**	

TABLE E-2-3
FS AREA 2 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 10,564,764**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 364,338**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 5,282,382**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$10,565	$2,112.95	$9,395	$8,097	FS Area 2 remedy is expected to be constructed during the first construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,848	$369.53	$1,692	$1,515	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$9,238	$369.53	$5,551	$3,070	
Annual O&M Cost (post construction)	31 - 100	$30,786	$439.80	$5,277	$818	
			Present Value of Capital	**$9,395,000**	**$8,097,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$7,243,000**	**$4,585,000**	
			Present Value of 100 Year O&M	**$12,520,000**	**$5,404,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$16,638,000**	**$12,682,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$21,915,000**	**$13,500,000**	

NOTES/ASSUMPTIONS

1 This alternative involves soil cap (5') for remediation areas on the Westslope and excavation (5') for the WCSA remedial area and grading to reduce and smooth out steep slopes.
2 RCRA canyon Westslope (8.4 acres) and WCSA remedial area (5.5 acres) cover a total of about 13.9 acres.
3 Soil volumes for RCRA canyon are based on area of remediation derived by risk-based approach, Appendix C.
4 Clean soil is borrowed from NW corner of site and trucked down the canyon for use as soil cover.
5 Clayey soils from NW Borrow area are pre-processed with screening and pulverizing with pug mill. No supplemental bentonite or other clay included.

TABLE E-2-4
FS AREA 2 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: RCRA-Equivalent Mono Soil Cap (West slope RCRA Canyon) (5’) + Excavation (WCSA remedial area) (5’) + Clean Soil Cover (Uncapped Areas) (2’) + Stormwater Controls (Segregate Capped and Uncapped Area SW) + ICs + Monitoring

Alternative Description : This remedial alternative involves installing a RCRA equivalent mono soil cap on the westslope of the RCRA Canyon which is approximately 8.4 acre as shown in Figure 11-8A. The RCRA equivalent mono soil cap is 5-foot of low permeability claylike soil. The RCRA equivalent cap will control potential exposures to ecological receptors and will reduce surface water infiltration. A portion of the WCSA will be excavated and the soil used as fill in Pond A-5. The excavated portions of the WCSA will be backfilled and compacted adequately to limit infiltration with a hydraulic conductivity in the range of 10-4 to 10-6 cm/s. This remedial alternative assumes some grading and additional borrow soil is required to reduce the steepness of some of the sloped areas in order to install the cap. The uncapped remaining areas (24.8 acres) of the site will be covered with 2-foot of clean soil and additional cut/fill grading with max slopes of 2:1 on east slope. The final surfaces of the western slope of the RCRA Canyon and the eastslope/WCSA will be sloped and include surface drains to allow drainage of storm water from the entire RCRA canyon to flow into a new retention basin that will be constructed in the footprint of the former Pond A-5. This stormwater will be sent by pipeline through or around the B-Drainage wetlands and discharged offsite via the General NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 125,000	$ 125,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	
Prelim Geotechnical testing/Geophysical Eval	1	ls	$ 75,000	$ 75,000	Evaluate site stability, buried waste
Detailed Geotechnical Evaluation/Reporting	1	ls	$ 100,000	$ 100,000	Evaluate slope stability for capping in steep slopes and erosion control measures
Site Work					
Site Preparation/Clearance/Grubbing	33.2	acre	$ 6,500	$ 216,000	Site clearance/grubbing/grading prep of entire westslope, WCSA and uncapped areas
Existing wells protection/new well completion	20	wells	$ 5,000	$ 100,000	Protect well, raise well completion to reach new cap topo surface
Dust controls: water truck/day	80	days	$ 1,000	$ 80,000	Based on contractor cost-water truck/day 4 mths, 16 weeks, 80 days
RCRA-equivalent Soil Cap 5' - Westslope (8.4 ac)					
Cut/Fill Leveling Layer (grading)	100,000	cy	$ 5	$ 500,000	Based on cap area, existing slopes
Foundation Clay Layer (4')	60,000	cy	$ 14	$ 840,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cost
Place clay soil and compact, 6" lifts	60,000	cy	$ 3	$ 180,000	Based on contractor unit cost
Clay soil from borrow area, 1' vegetative layer	15,000	cy	$ 6	$ 90,000	Based on 1' veg layer requiring addition of amendments and some preprocessing of soils
Place and compact, 12" lifts	15,000	cy	$ 2	$ 30,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh or TRM, silt fencing	8.4	acre	$ 31,500	$ 264,600	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Revegetation/Hydroseeding	8.4	acre	$ 4,000	$ 34,000	Top soil and hydroseeding

TABLE E-2-4
FS AREA 2 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Excavation/Backfill, 5' - WCSA (5.5 ac)					
Excavation (5 feet bgs)	44,000	cy	$ 6	$ 264,000	Volume based on revised risk-based remedial area, Appendix C
Backfill/compact of excavation to match grades	48,000	cy	$ 4	$ 192,000	Grading of WCSA area outside of excavation to partially backfill excavation and reduce slope steepness
Erosion control - jute mesh, silt fencing	5.5	acre	$ 31,500	$ 173,250	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing; use average unit cost of $0.20/sf and 1.00/sf
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding
Grading and 2' soil cover - Uncapped area (19.3 ac+5.5 ac)					
Cut/Fill Leveling Layer (grading)	300,000	cy	$ 5	$ 1,500,000	Cut/Fill grading of 300,000 cy to reduce slopes from 1:1 to less than 2:1 based on CAD for East slope area
Soil Cover (2'), Uncapped area + WCSA	88,000	cy	$ 6	$ 528,000	Soil volume based on soil cover area of 24.8 acres. Assumes soil will be borrowed from NW corner of Site; contractor unit cost quote
Erosion control - Turf reinforcement mats	4	acre	$ 54,000	$ 216,000	Turf reinforcement mats in Uncapped areas; Unit cost from CalTrans Erosion control toolbox; assume 4 acres
Erosion control - jute mesh, silt fencing	7	acre	$ 9,000	$ 63,000	Turf reinforcement mats in Uncapped areas; Unit cost from CalTrans Erosion control toolbox; assume 7 acres
Revegetation/Hydroseeding	19.3	acre	$ 4,000	$ 77,000	Top soil and hydroseeding
Stormwater Controls					
Surface features on cap - bench roads/V-ditches	6,000	lf	$ 30	$ 180,000	Surface features for drainage - grading, swales, V-drains
Culverts, inlet structures	1	ls	$ 150,000	$ 150,000	Based on contractor budgetary estimate
Concrete channel - Capped area stormwater flow	2,500	lf	$ 30	$ 75,000	Based on contractor unit cost quote
Incremental Evaporation Pond cost	0	acre	$ 206,000	$ -	No incremental evap pond cost because this alternative would discharge all Area 2 stormwater as clean capped discharge offsite
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	200	samples	$ 500	$ 100,000	200 air/dust samples (10/day),(VOCs, PCBs, DDT, metals)
Soil Compaction Testing: Geotech engr	80	days	$ 500	$ 40,000	80 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	500	samples	$ 100	$ 50,000	Analyze for metals including 6010 total metals, soluble metals Ba, CrVI, other parameters
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation

TABLE E-2-4
FS AREA 2 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 6,965,000**	
			Contingency (35%)	**$ 2,438,000**	
			Total Capital Cost:	**$ 9,403,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 6,965,000	$ 348,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 6,965,000	$ 209,000	
EPA Oversight Costs	10%	of	$ 6,965,000	$ 697,000	
Construction Management	5%	of	$ 6,965,000	$ 348,000	
			Total PM/CM Cost:	**$ 1,602,000**	
			Total Capital Cost:	**$ 11,005,000**	Direct Capital Cost per Acre = $331,000
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 60,000	$ 60,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 120,000	$ 120,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
			Subtotal Annual O&M Cost:	$ 230,000	
			Contingency (50%):	$ 115,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Previous Landfill Cap experience
			Total Annual O&M Cost:	**$ 381,000**	

TABLE E-2-4
FS AREA 2 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs						
US EPA Five-year Review (5,10,15,20,25 and 30 years)		6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Cap, drains		1	100-year	$ 5,502,500	$ 5,502,500	Assume 1/2 of cap, drains are replaced
PRESENT VALUE ANALYSIS (2012 $K)						
Cost Type	**Year**	**Total Cost (2012 $K)**	**Cost/Year (2012 $K)**	**Net Present Value at 3% DF (2012 $K)**	**Net Present Value at 7% DF (2012 $K)**	
Capital Cost		$11,005		$11,005	$11,005	
Annual O&M Cost (post construction)	0 - 5	$1,930	$386	$1,768	$1,583	
Annual O&M Cost (post construction)	6 - 30	$9,650	$386	$5,798	$3,207	
Annual O&M Cost (post construction)	31 - 100	$32,173	$460	$5,515	$855	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$18,571,000**	**$15,795,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$24,085,000**	**$16,650,000**	

TABLE E-2-4
FS AREA 2 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 11,423,190**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 395,478**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 5,711,595**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$11,423	$2,284.64	$10,158	$8,755	FS Area 2 remedy is expected to be constructed during the first construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$2,003	$401	$1,835	$1,643	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$10,017	$400.67	$6,018	$3,329	
Annual O&M Cost (post construction)	31 - 100	$33,395	$477.07	$5,724	$887	
			Present Value of Capital	**$10,158,000**	**$8,755,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$7,853,000**	**$4,972,000**	
			Present Value of 100 Year O&M)	**$13,577,000**	**$5,859,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$18,011,000**	**$13,727,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$23,736,000**	**$14,614,000**	

NOTES/ASSUMPTIONS

1 This alternative involves RCRA-equivalent soil cap (5') for remediation areas on the West slope and excvavation (5') for the WCSA remedial area and grading to reduce and smooth out steep slopes.
2 RCRA canyon Westslope (8.4 acres) and WCSA remedial area (5.5 acres) remediation areas cover total of about 13.9 acres.
3 Assumes additional site contaminant investigation is not necessary for capping and excavation areas.
4 Soil volumes for RCRA canyon are based on area of remediation derived by risk-based approach, Appendix C.
5 Clean soil is borrowed from NW corner of site and trucked down the canyon for use as soil cover.
6 Clayey soils from NW Borrow area are pre-processed with screening and pulverizing with pug mill. No supplemental bentonite or other clay included.

TABLE E-2-5
FS AREA 2 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: RCRA-equivalent Hybrid Cap (West slope RCRA Canyon) (5') + Excavation (WCSA remedial area) + Clean Soil Cover (Uncapped Areas) (2') + Stormwater Controls + ICs + Monitoring

Alternative Description : This remedial alternative involves installing a RCRA equivalent hybrid cap on the Westslope of the RCRA Canyon (8.4 acre), excavation of the WCSA remedial area to 5 feet bgs and a 2-foot soil cover over the remaining uncapped area as shown on Figure 11-9A. The RCRA equivalent hybrid cap is a HDPE liner equipped with studs and spikes intended for sloped areas and a 2-foot vegetative soil cover. The RCRA equivalent cap will control potential exposures to ecological receptors and will significantly reduce water infiltration. A portion of the WCSA will be excavated and the soil used as fill in Pond A-5. This remedial alternative assumes some grading and additional borrow soil is required to reduce the steepness of some of the sloped areas in order to install the cap. The uncapped area will include a 2-foot soil cover after additional cut/fill grading with max slopes of 2:1 on east slope. The stormwater will be collected by surface drains to a concrete channel that allows drainage into a new retention basin that will be constructed in the footprint of the former Pond A-5. This stormwater will be sent by pipeline through or around the B Drainage wetlands and discharged offsite via the General NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 125,000	$ 125,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	Addtnl investigations (env., geotech, geophys); refine nature & extent, revisit risk calcs
Geotechnical testing/Geophysical Investigation	1	ls	$ 125,000	$ 125,000	Evaluate site stability, buried waste (EE/CA experience
Detailed Geotechnical Evaluation/Reporting	1	ls	$ 225,000	$ 225,000	Evaluate slope stability for capping in steep slopes and erosion control measures
Site Work					
Site Preparation/Clearance/Grubbing	33.2	acre	$ 6,500	$ 216,000	Site clearance/grubbing/grading prep of north and south canyons and canyon bottoms
Existing wells protection/new well completion	20	wells	$ 5,000	$ 100,000	Protect well, raise well completion to reach new cap topo surface
Dust controls	80	days	$ 1,000	$ 80,000	Based on contractor unit costs and 3 months, 12 weeks, 60 days
RCRA-equiv Hybrid Cap - Westslope (8.4 ac)					
Cut/Fill Leveling Layer (grading)	125,000	cy	$ 5	$ 625,000	Based on grading to reduce steep slopes; more grading assumed than RCRA mono or ET soil caps
Super Gripnet HDPE Liner: matl + install	8.4	acre	$ 39,200	$ 329,000	Based on quote from Agruamerica manufacturer; incl. taxes and shipping
Geocomposite 200 mil fabrinet, matl+labor	8.4	acre	$ 30,500	$ 256,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)	8.4	acre	$ 21,750	$ 183,000	Use Geonet as biotic barrier; material + install <0.50/sf per contractor
Soil cover, 2' vegetative layer, from borrow area	30,000	cy	$ 6	$ 180,000	Based on 2' veg layer requiring addition of amendments and some preprocessing of soils
Place and compact, 12" lifts	30,000	cy	$ 2	$ 60,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh or TRM, silt fencing	8.4	acre	$ 31,500	$ 264,600	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Revegetation/Hydroseeding	8.4	acre	$ 4,000	$ 34,000	Top soil and hydroseeding

TABLE E-2-5
FS AREA 2 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Excavation/Backfill, 5' - WCSA (5.5 ac)					
Excavation (5 feet bgs)	44,000	cy	$ 6	$ 264,000	Volume based on revised risk-based remedial area, Appendix C
Backfill/compact of excavation to match grades	48,000	cy	$ 4	$ 192,000	Grading of WCSA area outside of excavation to partially backfill excavation and reduce slope steepness
Erosion control - jute mesh, silt fencing	5.5	acre	$ 31,500	$ 173,250	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing; use average unit cost of 0.2/sf and 1.00/sf
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding
Grading and 2' soil cover - Uncapped area (19.3 ac+5.5 ac)					
Cut/Fill Leveling Layer (grading)	300,000	cy	$ 5	$ 1,500,000	Cut/Fill grading of 300,000 cy to reduce slopes from 1:1 to less than 2:1 based on CAD for East slope area
Soil Cover (2'), Uncapped area + WCSA	88,000	cy	$ 6	$ 528,000	Soil volume based on soil cover area of 24.8 acres. Assumes soil will be borrowed from offsite NW Borrow Area; contractor unit cost
Erosion control - Turf reinforcement mats	4	acre	$ 54,000	$ 216,000	Turf reinforcement mats in Uncapped areas; Unit cost from CalTrans Erosion control toolbox; assume 4 acres
Erosion control - jute mesh, silt fencing	7	acre	$ 9,000	$ 63,000	Turf reinforcement mats in Uncapped areas; Unict cost from CalTrans Erosion control toolbox; assume 7 acres
Revegetation/Hydroseeding	19.3	acre	$ 4,000	$ 77,000	Top soil and hydroseeding
Stormwater Controls					
Surface features - SW ditches, bench roads/V-ditches	6,000	lf	$ 30	$ 180,000	Surface features for drainage - V-drains, swales, bench roads
Culverts, inlet structures	1	ls	$ 150,000	$ 150,000	Based on contractor budgetary estimate
Concrete channel - Capped area stormwater flow	2,500	lf	$ 30	$ 75,000	Based on contractor unit cost quote
Concrete channel - Uncapped area stormwater flow	0	lf	$ 30	$ -	Based on contractor unit cost quote
Incremental Evaporation Pond cost	0	acre	$ 206,000	$ -	Incremental evaporation pond capacity needed based on unit cost for evaporation pond construction
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	150	samples	$ 500	$ 75,000	150 air/dust samples (10/day),(VOCs, PCBs, DDT, metals)
Soil Compaction Testing: Geotech engr	60	days	$ 500	$ 30,000	60 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	400	samples	$ 200	$ 80,000	Analyze for metals including 6010 total metals, soluble metals Ba, CrVI, other parameters
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation

TABLE E-2-5
FS AREA 2 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 300,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 7,178,000**	
			Contingency (35%)	**$ 2,512,000**	
			Total Capital Cost:	**$ 9,690,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 7,178,000	$ 359,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 7,178,000	$ 215,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$ 7,178,000	$ 718,000	
Construction Management	5%	of	$ 7,178,000	$ 359,000	
			Total PM/CM Cost:	**$ 1,651,000**	
			Total Capital Cost:	**$ 11,341,000**	Direct Capital Cost per Acre = $342,000
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 60,000	$ 60,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 130,000	$ 130,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
			Subtotal Annual O&M Cost:	$ 240,000	
			Contingency (50%):	$ 120,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Previous EE/CA and PS Landfill Cap experience
			Total Annual O&M Cost:	**$ 396,000**	

TABLE E-2-5
FS AREA 2 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Cap	1	100-year	$ 5,670,500	$ 5,670,500	Assume 1/2 of cap would need to be replaced

PRESENT VALUE ANALYSIS (2012 $K)						
Cost Type	**Year**	**Total Cost (2012 $K)**	**Cost/Year (2012 $K)**	**Net Present Value at 3% DF (2012 $K)**	**Net Present Value at 7% DF (2012 $K)**	
Capital Cost		$11,341		$11,341	$11,341	
Annual O&M Cost (post construction)	0 - 5	$2,005	$401	$1,836	$1,644	
Annual O&M Cost (post construction)	6 - 30	$10,025	$401	$6,023	$3,332	
Annual O&M Cost (post construction)	31 - 100	$33,391	$477	$5,723	$887	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$19,201,000**	**$16,317,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$24,924,000**	**$17,204,000**	

TABLE E-2-5
FS AREA 2 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 11,771,958**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 411,048**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 5,885,979**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$11,772	$2,354.39	$10,468	$9,022	FS Area 2 remedy is expected to be constructed during the first construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$2,081	$416	$1,906	$1,707	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$10,406	$416.24	$6,252	$3,458	
Annual O&M Cost (post construction)	31 - 100	$34,659	$495	$5,941	$921	
			Present Value of Capital	**$10,468,000**	**$9,022,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$8,158,000**	**$5,165,000**	
			Present Value of 100 Year O&M)	**$14,099,000**	**$6,086,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$18,627,000**	**$14,187,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$24,568,000**	**$15,108,000**	

NOTES/ASSUMPTIONS

1 This alternative involves RCRA-equivalent hybrid cap for remedial areas on the West slope and excavation (5') for the WCSA remedial area and grading to reduce steepness of slopes.
2 The hybrid cap cross section includes a Super Gripnet 60-mil liner, a 200-mil geocomposite fabrinet for drainage and a 2-foot soil cover.
3 The HDPE liner is a SuperGripnet 60-mil liner with studs and spikes intended for covering sloped areas.
4 Soil volumes for RCRA canyon are based on area of remediation (Westslope 8.4 ac, WCSA 5.5 ac) derived by risk-based approach, Appendix C.
5 Clean soil is borrowed from the Offsite NW Borrow Area are excavated and trucked down the canyon for use as soil cover.
6 Borrow soils are claystone material that will require some pre-processing before being placed for the cap construction.

TABLE E-2-6
FS AREA 2 - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative:	Evapotranspirative (ET) Cap (West slope RCRA Canyon) (5') + Excavation (WCSA remedial area) + Clean Soil Cover (Uncapped Areas) (2') + Stormwater Controls + ICs + Monitoring

Alternative Description : This remedial alternative involves installing a evapotranspirative (ET) cap on the Westslope of the RCRA Canyon (8.4 acre), excavation of the WCSA remedial area to 5 feet bgs and a 2-foot soil cover over the remaining uncapped area as shown on Figure 11-10A. The ET cap is a mono soil cap that is 5-foot thick with a lightly compacted low permeability soil with high storage capacity and a vegetative cover designed to maximize evaporation and transpiration. The ET cap cross section assumed here is a 4-foot lightly compacted vegetative soil layer over a 1-foot well compacted foundation layer using the same low permeability onsite soils. The ET cap will control potential exposures to ecological receptors and will significantly reduce water infiltration. A portion of the WCSA will be excavated and the soil used as fill in Pond A-5. This remedial alternative assumes some grading and additional borrow soil is required to reduce the steepness of some of the sloped areas in order to install the cap. The uncapped area will include a 2-foot soil cover after grading of the slopes to reduce steepness with max slope 2:1 on east slope. The stormwater will be collected by surface drains to a concrete channel that allows drainage into a new retention basin that will be constructed in the footprint of the former Pond A-5. This stormwater will be sent by pipeline through or around the B-Drainage wetlands and discharged offsite via the General NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 125,000	$ 125,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	Addtnl investigations (env., geotech, geophys); refine nature & extent, revisit risk calcs
Geotechnical testing/Geophysical Investigation	1	ls	$ 75,000	$ 75,000	Evaluate site stability, buried waste (EE/CA experience
Detailed Geotechnical Evaluation/Reporting	1	ls	$ 100,000	$ 100,000	Evaluate slope stability for capping in steep slopes and erosion control measures
Site Work					
Site Preparation/Clearance/Grubbing	33.2	acre	$ 6,500	$ 216,000	Site clearance/grubbing/grading prep of north and south canyons and canyon bottoms
Existing wells protection/new well completion	20	wells	$ 5,000	$ 100,000	Protect well, raise well completion to reach new cap topo surface
Dust controls	80	days	$ 1,000	$ 80,000	Based on contractor unit costs and 3 months, 12 weeks, 60 days

TABLE E-2-6
FS AREA 2 - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Evapotranspirative Cap - Westslope (8.4 ac)					
Cut/Fill Leveling Layer (grading)	100,000	cy	$ 5	$ 500,000	Based on cap area, existing slopes to near 2:1; grading to reduce steep slopes estimated by CAD
Clay soil from borrow area, 1' foundation layer	15,000	cy	$ 14	$ 210,000	Based on assumed ET cap design of 2' bottom compacted and pre-processing of borrow soils to achieve low permeability
Place and compact, 6" lifts	15,000	cy	$ 3	$ 45,000	Moderately compacted, 90% relative compaction, 6" lifts
Clay soil from borrow area, 4' vegetative layer	60,000	cy	$ 6	$ 360,000	Based on 3' veg layer requiring addition of amendments and some preprocessing of soils
Place and compact, 12" lifts	60,000	cy	$ 2	$ 120,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh or TRM, silt fencing	8.4	acre	$ 31,500	$ 264,600	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Soil Amendments: fertilizer, gypsum, biosolids	8.4	acre	$ 20,000	$ 168,000	Based on gypsum, fertilizer, biosolids costs for 4 ft thickness
Revegetation/Hydroseeding	8.4	acre	$ 4,000	$ 34,000	Top soil and hydroseeding
Excavation/Backfill, 5' - WCSA (5.5 ac)					
Excavation (5 feet bgs)	44,000	cy	$ 6	$ 264,000	Volume based on revised risk-based remedial area, Appendix C
Backfill/compact of excavation to match grades	48,000	cy	$ 4	$ 192,000	Grading of WCSA area outside of excavation to partially backfill excavation and reduce slope steepness
Erosion control - jute mesh, silt fencing	5.5	acre	$ 31,500	$ 173,250	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing; use average unit cost of 0.2/sf and 1.00/sf
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding
Grading and 2' soil cover - Uncapped area (19.3 ac+5.5 ac)					
Cut/Fill Leveling Layer (grading)	300,000	cy	$ 5	$ 1,500,000	Cut/Fill grading of 300,000 cy to reduce slopes from 1:1 to less than 2:1 based on CAD for East slope area
Soil Cover (2'), Uncapped area + WCSA	88,000	cy	$ 6	$ 528,000	Soil volume based on soil cover area of 24.8 acres. Assumes soil will be borrowed from offsite NW Borrow Area; contractor unit cost
Erosion control - Turf reinforcement mats	4	acre	$ 54,000	$ 216,000	Turf reinforcement mats in Uncapped areas; Unit cost from CalTrans Erosion control toolbox; assume 4 acres
Erosion control - jute mesh, silt fencing	7	acre	$ 9,000	$ 63,000	Turf reinforcement mats in Uncapped areas; Unict cost from CalTrans Erosion control toolbox; assume 7 acres
Revegetation/Hydroseeding	19.3	acre	$ 4,000	$ 77,000	Top soil and hydroseeding

TABLE E-2-6
FS AREA 2 - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Stormwater Controls					
Surface features - SW ditches, bench roads/V-ditches	6,000	lf	$ 30	$ 180,000	Surface features for drainage - V-drains, swales, bench roads
Culverts, inlet structures	1	ls	$ 150,000	$ 150,000	Based on contractor budgetary estimate
Concrete channel - Capped area stormwater flow	2,500	lf	$ 30	$ 75,000	Based on contractor unit cost quote
Concrete channel - Uncapped area stormwater flow	0	lf	$ 30	$ -	Based on contractor unit cost quote
Incremental Evaporation Pond cost	0	acre	$ 206,000	$ -	Incremental evaporation pond capacity needed based on unit cost for evaporation pond construction
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	200	samples	$ 500	$ 100,000	200 air/dust samples (10/day),(VOCs, PCBs, DDT, metals)
Soil Compaction Testing: Geotech engr	80	days	$ 500	$ 40,000	80 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	500	samples	$ 200	$ 100,000	Analyze for metals including 6010 total metals, soluble metals Ba, CrVI, other parameters
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 6,778,000**	
			Contingency (35%)	**$ 2,372,000**	
			Total Capital Cost:	**$ 9,150,000**	

TABLE E-2-6
FS AREA 2 - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	**Estimated Quantity**	**Unit**	**Unit Cost**	**Estimated Cost**	**Notes / Assumptions**
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 6,778,000	$ 339,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 6,778,000	$ 203,000	
EPA Oversight Costs	10%	of	$ 6,778,000	$ 678,000	
Construction Management	5%	of	$ 6,778,000	$ 339,000	
			Total PM/CM Cost:	**$ 1,559,000**	
			Total Capital Cost:	**$ 10,709,000**	Direct Capital Cost per Acre = $323,000
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 60,000	$ 60,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 120,000	$ 120,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
			Subtotal Annual O&M Cost:	$ 230,000	
			Contingency (50%):	$ 115,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Previous EE/CA and PS Landfill Cap experience
			Total Annual O&M Cost:	**$ 381,000**	

TABLE E-2-6
FS AREA 2 - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Cap	1	100-year	$ 5,354,500	$ 5,354,500	Assume 1/2 of cap would need to be replaced

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$10,709		$10,709	$10,709	
Annual O&M Cost (post construction)	0 - 5	$1,930	$386	$1,768	$1,583	
Annual O&M Cost (post construction)	6 - 30	$9,650	$386	$5,798	$3,207	
Annual O&M Cost (post construction)	31 - 100	$32,025	$457	$5,489	$851	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$18,275,000**	**$15,499,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$23,764,000**	**$16,350,000**	

TABLE E-2-6
FS AREA 2 - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 11,115,942**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 395,478**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 5,557,971**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$11,116	$2,223.19	$9,885	$8,519	FS Area 2 remedy is expected to be constructed during the first construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$2,003	$400.67	$1,835	$1,643	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$10,017	$400.67	$6,018	$3,329	
Annual O&M Cost (post construction)	31 - 100	$33,241	$474.88	$5,698	$883	
			Present Value of Capital	**$9,885,000**	**$8,519,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$7,853,000**	**$4,972,000**	
			Present Value of 100 Year O&M	**$13,551,000**	**$5,855,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$17,738,000**	**$13,491,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$23,436,000**	**$14,374,000**	

NOTES/ASSUMPTIONS

1 This alternative involves evapotranspirative (ET) cap for remedial areas on the West slope and excavation (5') for the WCSA remedial area and grading to reduce steepness of slopes.
2 The ET cap is a monosoil cap that is 5-foot thick with a lightly compacted low permeability soil with high storage capacity and a vegetative cover designed to maximize evaporation and transpiration.
3 The ET cap cross section assumed here is a 4-foot lightly compacted vegetative soil layer over a 1-foot well compacted foundation layer using the same low permeability onsite soils.
4 Soil volumes for RCRA canyon are based on area of remediation (Westslope 8.4 ac, WCSA 5.5 ac) derived by risk-based approach, Appendix C.
5 Clean soil is borrowed from the Offsite NW Borrow Area are excavated and trucked down the canyon for use as soil cover.
6 Borrow soils are claystone material that will require some pre-processing before being placed for the cap construction.

TABLE E-2-7
FS AREA 2 - ALTERNATIVE 8
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: RCRA Equivalent Hybrid Cap (Entire RCRA Canyon, WCSA) + Stormwater Controls + ICs + Monitoring

Alternative Description : This remedial alternative involves installing a RCRA equivalent hybrid cap on the across the RCRA Canyon and WCSA as shown on Figure 11-11A. The RCRA equivalent hybrid cap is a HDPE liner equipped with studs and spikes intended for sloped areas and a 2-foot vegetative soil cover. The RCRA equivalent cap will control potential exposures to ecological receptors and will significantly reduce water infiltration. This remedial alternative assumes some grading and additional borrow soil is required to reduce the steepness of the sloped areas to less than 2:1 in order to install the cap. The final surfaces of the cap on the RCRA Canyon and WCSA will be sloped and include surface drains to allow drainage of storm water from the westslope of the RCRA canyon and WCSA to flow into a new retention basin that will be constructed in the footprint of the former Pond A-5. This stormwater will be sent by pipeline to the B-Drainage and discharged offsite via the site's General NPDES permit. The surface water runoff from the uncapped southend of WCSA will be collected in a new onsite evaporation pond where it would be managed.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 125,000	$ 125,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	Addtnl investigations (env., geotech, geophys); refine nature & extent, revisit risk calcs
Geotechnical testing/Geophysical Investigation	1	ls	$ 100,000	$ 100,000	Evaluate site stability, buried waste (EE/CA experience
Detailed Geotechnical Evaluation/Reporting	1	ls	$ 200,000	$ 200,000	Evaluate slope stability for capping in steep slopes and erosion control measures
Site Work					
Site Preparation/Clearance/Grubbing	33.2	acre	$ 6,500	$ 216,000	Site clearance/grubbing/grading prep of north and south canyons and canyon bottoms
Existing wells protection/new well completion	20	wells	$ 5,000	$ 100,000	Protect well, raise well completion to reach new cap topo surface
Dust controls	80	days	$ 1,000	$ 80,000	Based on contractor unit costs and 3 months, 12 weeks, 60 days
RCRA-equiv Hybrid Cap - Westslope (8.4 ac)					
Cut/Fill Leveling Layer (grading)	125,000	cy	$ 5	$ 625,000	Based on cap area, existing slopes; grading to reduce steep slopes
Super Gripnet HDPE Liner: matl + install	8.4	acre	$ 39,200	$ 329,000	Based on quote from Agruamerica manufacturer; incl. taxes and shipping
Geocomposite 200 mil fabrinet, matl+labor	8.4	acre	$ 30,500	$ 256,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)	8.4	acre	$ 21,750	$ 183,000	Use Geonet as biotic barrier; material + install <0.50/sf per contractor
Soil cover, 2' vegetative layer, from borrow area	30,000	cy	$ 6	$ 180,000	Based on 2' veg layer requiring addition of amendments and some preprocessing of soils
Place and compact, 12" lifts	30,000	cy	$ 2	$ 60,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh or TRM, silt fencing	8.4	acre	$ 31,500	$ 264,600	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Revegetation/Hydroseeding	8.4	acre	$ 4,000	$ 34,000	Top soil and hydroseeding

TABLE E-2-7
FS AREA 2 - ALTERNATIVE 8
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
RCRA-equiv Hybrid Cap - WCSA (5.5 ac)					
Cut/Fill Leveling Layer (grading)	30,000	cy	$ 5	$ 150,000	Based on CAD estimate for WCSA
Super Gripnet HDPE Liner: matl + install	5.5	acre	$ 39,200	$ 216,000	Based on quote from Agruamerica manufacturer; incl. taxes and shipping
Geocomposite 200 mil fabrinet, matl+labor	5.5	acre	$ 30,500	$ 168,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)	5.5	acre	$ 21,750	$ 120,000	Use Geonet as biotic barrier; material + install <0.50/sf per contractor
Clay soil from borrow area, 4' vegetative layer	19,000	cy	$ 6	$ 114,000	Based on 4' veg layer requiring addition of amendments and some preprocessing of soils
Place and compact, 12" lifts	19,000	cy	$ 2	$ 38,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh or TRM, silt fencing	5.5	acre	$ 31,500	$ 173,250	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding
Incremental cost for borrow soil for Pond A-5 in Area 4	44,000	cy	$ 6	$ 264,000	Excavation of WCSA 5.5 acres provided fill for Pond A-5 but with capping of WCSA 5.5 acres, borrow soil needed for Pond A-5
RCRA-equiv Hybrid Cap - Other Canyon Areas (19.3 ac)					
Cut/Fill Leveling Layer (grading)	300,000	cy	$ 5	$ 1,500,000	Assumed 300,000 cy of grading to reduce slopes from 1:1 to less than 2:1 based on CAD for east slope area
Super Gripnet HDPE Liner: matl + install	19.3	acre	$ 39,200	$ 757,000	Based on quote from Agruamerica manufacturer; incl. taxes and shipping
Geocomposite 200 mil fabrinet, matl+labor	19.3	acre	$ 30,500	$ 589,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)	19.3	acre	$ 21,750	$ 420,000	Use Geonet as biotic barrier; material + install <0.50/sf per contractor
Borrow 2' soil cover and compact, 6" lifts	68,000	cy	$ 8	$ 544,000	Based on contractor unit cost for offsite NW Borrow area and compact
Erosion control - jute mesh or TRM, silt fencing	19.3	acre	$ 31,500	$ 607,950	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Revegetation/Hydroseeding	19.3	acre	$ 4,000	$ 77,000	Top soil and hydroseeding
Stormwater Controls					
Surface features - SW ditches, bench roads/V-ditches	16,000	lf	$ 30	$ 480,000	Surface features for drainage - grading, swales, V-drains
Culverts, inlet structures	1	ls	$ 150,000	$ 150,000	Based on contractor budgetary estimate
Concrete channel - Capped area stormwater flow	2,500	lf	$ 30	$ 75,000	Based on contractor unit cost quotes
Concrete channel - Uncapped area stormwater flow	0	lf	$ 30	$ -	Based on contractor unit cost quotes
Incremental Evaporation Pond cost	0	acre	$ 206,000	$ -	Incremental evaporation pond capacity needed based on unit cost for evaporation pond construction

TABLE E-2-7
FS AREA 2 - ALTERNATIVE 8
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	150	samples	$ 500	$ 75,000	150 air/dust samples (10/day),(VOCs, PCBs, DDT, metals)
Soil Compaction Testing: Geotech engr	60	days	$ 500	$ 30,000	60 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	100	samples	$ 200	$ 20,000	Analyze for metals including 6010 total metals, soluble metals Ba, CrVI, other parameters
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 350,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 75,000	Based on contractor quotes
			Direct Capital Total:	**$ 10,168,000**	
			Contingency (35%)	**$ 3,559,000**	
			Total Direct Capital Cost:	**$ 13,727,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 10,168,000	$ 508,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 10,168,000	$ 305,000	
EPA Oversight Costs	10%	of	$ 10,168,000	$ 1,017,000	
Construction Management	5%	of	$ 10,168,000	$ 508,000	
			Total PM/CM Cost:	**$ 2,338,000**	
			Total Capital Cost:	**$ 16,065,000**	Capital Cost per Acre = $484,000
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 80,000	$ 80,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 150,000	$ 150,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 60,000	$ 60,000	Based on current site O&M costs
			Subtotal Annual O&M Cost:	$ 290,000	
			Contingency (50%):	$ 145,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Previous EE/CA and PS Landfill Cap experience
			Total Annual O&M Cost:	**$ 471,000**	

TABLE E-2-7
FS AREA 2 - ALTERNATIVE 8
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Cap	1	100-year	$ 8,032,500	$ 8,032,500	Assume 1/2 of cap would need to be replaced

PRESENT VALUE ANALYSIS (2012 $)						
Cost Type	**Year**	**Total Cost (2012 $K)**	**Cost/Year (2012 $K)**	**Net Present Value at 3% DF (2012 $K)**	**Net Present Value at 7% DF (2012 $K)**	
Capital Cost		$16,065		$16,065	$16,065	
Annual O&M Cost (post construction)	0 - 5	$2,380	$476	$2,180	$1,952	
Annual O&M Cost (post construction)	6 - 30	$11,900	$476	$7,150	$3,955	
Annual O&M Cost (post construction)	31 - 100	$41,003	$586	$7,028	$1,090	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$25,395,000**	**$21,972,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$32,423,000**	**$23,061,000**	

TABLE E-2-7
FS AREA 2 - ALTERNATIVE 8
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $K)						
				Total Capital Cost (2014):	**$ 16,675,470**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 488,898**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 8,337,735**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$16,675	$3,335	$14,829	$12,780	FS Area 2 remedy is expected to be constructed during the first construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$2,470	$494	$2,263	$2,026	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$12,352	$494	$7,422	$4,105	
Annual O&M Cost (post construction)	31 - 100	$42,561	$608	$7,295	$1,131	
			Present Value of Capital	**$14,829,000**	**$12,780,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$9,684,000**	**$6,131,000**	
			Present Value of 100 Year O&M)	**$16,980,000**	**$7,262,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$24,513,000**	**$18,911,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$31,808,000**	**$20,042,000**	

NOTES/ASSUMPTIONS

1 This alternative involves a hybrid cap with a HDPE liner and 2-foot soil cap across the RCRA Canyon and WCSA and grading to reduce and smooth out steep slopes.
2 The hybrid cap cross section includes a Super Gripnet 60-mil liner, a 200-mil geocomposite fabrinet for drainage and a 2-foot soil cover.
3 The HDPE liner is a SuperGripnet 60-mil liner with studs and spikes to increase friction resistance and is intended for covering sloped areas.
4 Clean soil is borrowed from the Offsite NW Borrow Area are excavated and trucked down the canyon for use as soil cover.
5 Borrow soils are claystone material that will require some pre-processing before being placed for the cap construction.

TABLE E-2-8
FS AREA 2 - ALTERNATIVE 9
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Evapotranspirative (ET) Cap (entire RCRA Canyon, WCSA) + Stormwater Controls + ICs + Monitoring

Alternative Description : This remedial alternative involves installing a ET cap across the RCRA Canyon and WCSA as shown on Figure 11-12A. The ET cap is a monosoil cap that is 5-foot thick with a lightly compacted low permeability soil with high storage capacity and a vegetative cover designed to maximize evaporation and transpiration. The ET cap cross section assumed here is a 4-foot lightly compacted vegetative soil layer over a 1-foot well compacted foundation layer using the same low permeability onsite soils. The ET cap will control potential exposures to ecological receptors and will significantly reduce water infiltration.This remedial alternative assumes some grading and additional borrow soil is required to reduce the steepness of some of the sloped areas in order to install the cap to less than 2:1 on the east slope. The final surfaces of the cap on the RCRA Canyon and WCSA will be sloped and include surface drains to allow drainage of storm water from the RCRA canyon and WCSA to flow into a new retention basin that will be constructed in the footprint of the former Pond A-5. This stormwater will be sent by pipeline to the B-Drainage and discharged offsite via the site's General NPDES permit. The surface water runoff from the uncapped southend of WCSA will be collected in a new onsite evaporation pond where it would be managed.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 125,000	$ 125,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	Addtnl investigations (env., geotech, geophys); refine nature & extent, revisit risk calcs
Geotechnical testing/Geophysical Investigation	1	ls	$ 150,000	$ 150,000	Evaluate site stability, buried waste (EE/CA experience
Detailed Geotechnical Evaluation/Reporting	1	ls	$ 250,000	$ 250,000	Evaluate slope stability for capping in steep slopes and erosion control measures
Site Work					
Site Preparation/Clearance/Grubbing	33.2	acre	$ 6,500	$ 216,000	Site clearance/grubbing/grading prep of north and south canyons and canyon bottoms
Existing wells protection/new well completion	20	wells	$ 5,000	$ 100,000	Protect well, raise well completion to reach new cap topo surface
Dust controls	100	days	$ 1,000	$ 100,000	Based on contractor unit costs and 3 months, 12 weeks, 60 days
Evapotranspiration (ET) Cap - Westslope (8.4 ac)					
Cut/Fill Leveling Layer (grading)	100,000	cy	$ 5	$ 500,000	Based on cap area, existing slopes to near 2:1; grading to reduce steep slopes estimated by CAD
Clay soil from borrow area, 1' foundation layer	15,000	cy	$ 14	$ 210,000	Based on assumed ET cap design of 2' bottom compacted and pre-processing of borrow soils to achieve low permeability
Place and compact, 6" lifts	15,000	cy	$ 3	$ 45,000	Moderately compacted, 90% relative compaction, 6" lifts
Clay soil from borrow area, 4' vegetative layer	60,000	cy	$ 6	$ 360,000	Based on 3' veg layer requiring addition of amendments and some preprocessing of soils
Place and compact, 12" lifts	60,000	cy	$ 2	$ 120,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh or TRM, silt fencing	8.4	acre	$ 31,500	$ 264,600	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing

TABLE E-2-8
FS AREA 2 - ALTERNATIVE 9
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Revegetation/Hydroseeding	8.4	acre	$ 4,000	$ 34,000	Top soil and hydroseeding
Capital Costs (continued)					
Evapotranspiration (ET) Cap - WCSA (5.5 ac)					
Cut/Fill Leveling Layer (grading)	30,000	cy	$ 5	$ 150,000	Based on CAD estimate for WCSA
Clay soil from borrow area, 1' foundation layer	10,000	cy	$ 14	$ 140,000	Based on assumed ET cap design of 1' foundation compacted and pre-processing of borrow soils to achieve low permeability
Place and compact, 6" lifts	10,000	cy	$ 3	$ 30,000	Moderately compacted, 90% relative compaction, 6" lifts
Clay soil from borrow area, 4' vegetative layer	39,000	cy	$ 6	$ 234,000	Based on 4' veg layer requiring addition of amendments and some preprocessing of soils
Place and compact, 12" lifts	39,000	cy	$ 2	$ 78,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh or TRM, silt fencing	5.5	acre	$ 31,500	$ 173,250	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Soil Amendments: fertilizer, gypsum, biosolids	5.5	acre	$ 20,000	$ 110,000	Based on gypsum, fertilizer, biosolids costs for 4 ft thickness
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding
Incremental cost for borrow soil for Pond A-5 in Area 4	44,000	cy	$ 6	$ 264,000	Excavation of WCSA 5.5 acres provided fill for Pond A-5 but with capping of WCSA 5.5 acres, borrow soil needed for Pond A-5
Evapotranspiration (ET) Cap - Other Areas (19.3 ac)					
Cut/Fill Leveling Layer (grading)	300,000	cy	$ 5	$ 1,500,000	Cut/Fill grading of 300,000 cy to reduce slopes from 1:1 to less than 2:1 based on CAD for East slope area
Clay soil from borrow area, 1' foundation layer	34,000	cy	$ 14	$ 476,000	Based on assumed ET cap design of 1' foundation layer compacted and pre-processing of borrow soils to achieve low permeability
Place and compact, 6" lifts	34,000	cy	$ 3	$ 102,000	Moderately compacted, 90% relative compaction, 6" lifts
Clay soil from borrow area, 4' vegetative layer	137,000	cy	$ 6	$ 822,000	Based on 4' veg layer requiring addition of amendments and limited preprocessing of soils
Place and compact, 12" lifts	137,000	cy	$ 2	$ 274,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh or TRM, silt fencing	19.3	acre	$ 31,500	$ 607,950	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Soil Amendments: fertilizer, gypsum, biosolids	19.3	acre	$ 20,000	$ 386,000	Based on gypsum, fertilizer, biosolids costs for 4 ft thickness
Revegetation/Hydroseeding	19.3	acre	$ 4,000	$ 77,000	Top soil and hydroseeding
Stormwater Controls					
Surface features - SW ditches, bench roads/V-ditches	16,000	lf	$ 30	$ 480,000	Surface features for drainage - grading, swales, V-drains
Culverts, inlet structures	1	ls	$ 150,000	$ 150,000	Based on contractor budgetary estimate
Concrete channel - Capped area stormwater flow	2,500	lf	$ 30	$ 75,000	Based on contractor unit cost quotes
Concrete channel - Uncapped area stormwater flow	0	lf	$ 30	$ -	Based on contractor unit cost quotes

TABLE E-2-8
FS AREA 2 - ALTERNATIVE 9
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Incremental Evaporation Pond cost	0	acre	$ 206,000	$ -	Incremental evaporation pond capacity needed based on unit cost for evaporation pond construction
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	150	samples	$ 500	$ 75,000	150 air/dust samples (10/day),(VOCs, PCBs, DDT, metals)
Soil Compaction Testing: Geotech engr	100	days	$ 500	$ 50,000	100 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	100	samples	$ 200	$ 20,000	Analyze for metals including 6010 total metals, soluble metals Ba, CrVI, other parameters
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 300,000	$ 300,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 75,000	$ 75,000	Based on contractor quotes
			Direct Capital Total:	**$ 9,546,000**	
			Contingency (35%)	**$ 3,341,000**	
			Total Direct Capital Cost:	**$ 12,887,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 9,546,000	$ 477,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 9,546,000	$ 286,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$ 9,546,000	$ 955,000	
Construction Management	5%	of	$ 9,546,000	$ 477,000	
			Total PM/CM Cost:	**$ 2,195,000**	
			Total Capital Cost:	**$ 15,082,000**	Capital Cost per Acre = $454,000

TABLE E-2-8
FS AREA 2 - ALTERNATIVE 9
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 80,000	$ 80,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 140,000	$ 140,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 60,000	$ 60,000	Based on current site O&M costs
			Subtotal Annual O&M Cost:	$ 280,000	
			Contingency (50%):	$ 140,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Previous EE/CA and PS Landfill Cap experience
			Total Annual O&M Cost:	**$ 456,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Cap	1	100-year	$ 7,541,000	$ 7,541,000	Assume 1/2 of cap would need to be replaced

PRESENT VALUE ANALYSIS (2012 $)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$15,082		$15,082	$15,082	
Annual O&M Cost (post construction)	0 - 5	$2,305	$461	$2,111	$1,890	
Annual O&M Cost (post construction)	6 - 30	$11,525	$461	$6,925	$3,830	
Annual O&M Cost (post construction)	31 - 100	$39,461	$564	$6,764	$1,049	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$24,118,000**	**$20,803,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$30,882,000**	**$21,851,000**	

TABLE E-2-8
FS AREA 2 - ALTERNATIVE 9
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $K)						
				Total Capital Cost (2014):	**$ 15,655,116**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 473,328**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 7,827,558**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$15,655	$3,131	$13,922	$11,998	FS Area 2 remedy is expected to be constructed during the first construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$2,393	$478.52	$2,191	$1,962	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$11,963	$478.52	$7,188	$3,976	
Annual O&M Cost (post construction)	31 - 100	$40,961	$585	$7,021	$1,089	
			Present Value of Capital	**$13,922,000**	**$11,998,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$9,379,000**	**$5,938,000**	
			Present Value of 100 Year O&M	**$16,400,000**	**$7,026,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$23,301,000**	**$17,936,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$30,322,000**	**$19,024,000**	

NOTES/ASSUMPTIONS

1 This alternative involves an ET cap across the RCRA Canyon and WCSA and grading to reduce and smooth out steep slopes.
2 The ET cap cross section includes a compacted 1-foot foundation layer and 4-foot lightly compacted vegetative layer.
3 Clean soil is borrowed from the Offsite NW Borrow Area are excavated and trucked down the canyon for use as soil cover.
4 Borrow soils are claystone material that will require some pre-processing before being placed for the cap construction.
5 Claystone soils are pre-processed with screening and pulverizing with pug mill. No supplemental bentonite or other clay included.

AREA 3 TABLES

TABLE E-3-0
AREA 3 COST SUMMARY
Casmalia Resources Superfund Site
Feasibility Study

Summary of Area 3 Remedial Alternative Costs						
Alt	**PROPOSED REMEDIAL ALTERNATIVE**	**CAPITAL COST (2014 $)**	**ANNUAL O&M (2014 $)**	**TIME FRAME**	**PRESENT WORTH CAPITAL + O&M 3% DISCOUNT RATE (2014 $)**	**PRESENT WORTH CAPITAL + O&M 7% DISCOUNT RATE (2014 $)**
2	RCRA Cap (Locations 2,3,4) + Excavate/Asphalt Paving (Location 1)(5') + Monitoring wells (Location 10) + Stormwater Controls	$ 5,909,000	$ 258,000	30-year	$10,423,000	$7,801,000
				100-year	$14,030,000	$8,360,000
3	RCRA Cap (Location 2) + Excavate (Locations 3, 4)/Place in PCB Landfill+ Excavate/Asphalt Paving (Location 1)(5') + Monitoring wells (Location 10) + Stormwater Controls	$ 6,681,000	$ 196,000	30-year	$9,888,000	$7,619,000
				100-year	$12,814,000	$8,072,000
4	RCRA Cap (Location 2) + Excavate (Locations 3, 4)/Place in PCB Landfill + Excavate/Asphalt Paving (Location 1)(5') and Excavate/Location 10 (50'))/Place in PCB Landfill	$ 8,368,000	$ 196,000	30-year	$11,389,000	$8,912,000
				100-year	$14,460,000	$9,388,000
5	Excavate (Locations 1,2 and 4 (5'), Location 3 (20') and Location 10 (50'))/Offsite disposal + Stormwater Controls	$ 25,564,000	$ 97,000	30-year	$24,727,000	$20,854,000
				100-year	$25,885,000	$21,034,000

NOTES

1. Total Present Worth Cost (Capital + O&M in 2014 $) is shown for a 3% and 7% net discount rate and a 30-year and a 100-year timeframe and includes contingency on capital and O&M costs.
2. FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs.
3. PV of Capital Cost (in 2014 $) is shown for a 3% and 7% net discount rate based on the average capital cost for each year of the 5 year construction period.

TABLE E-3-1
FS AREA 3 - ALTERNATIVE 2
Casmalia Superfund Site
Final Feasibility Study

Remedial Alternative: RCRA Cap (Locations 2, 3, 4) + Excavate/New Asphalt Cap (Location 1) (5') + GW Monitoring (Location 10) + Grading/BMPs (Uncapped Areas) + Stormwater Controls + ICs + Monitoring

Remedial Alternative Description : This remedial alternative involves extending the RCRA cap which is discussed for Area 1 over the Maintenance Shed Area (Location 2) and Hotspot Locations 3 and 4 south of the PSCT (Figure 11-13A). This RCRA Cap will extend for approximately 300 feet south of the PSCT and run parallel to it over Locations 3 and 4. The surface of the cap is sloped and includes surface drains to direct stormwater on the cap to flow southeast towards the drainage channel near PSCT-1. The stormwater in the drainage channel will flow under a culvert on RCF Road to Pond 13 and then offsite through or around the wetlands under the site's General NPDES permit. Portions of Hotpsot Location 1 that are not already covered by asphalt or concrete will be excavated and the entire location will be paved with a new 4" asphalt cap. For Hotspot Location 10 (RISBON-59), the remedial alternative proposes two additional UHSU downgradient groundwater monitoring wells to ensure that there is no impact in the future to groundwater from this deep soil impacted area.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ 75,000	$ 75,000	Addtnl site investigations to define extent
Geotechnical testing/Geophysical Investigation/Surveying	1	ls	$ 75,000	$ 75,000	Evaluate site stability, buried waste, geotech soil properties
Site Work					
Demo Maintenance Shed Building	1	ls	$ 100,000	$ 100,000	Includes removal and disposal of MSA bldg and foundation
UST Removals, 2 Tanks	1	ls	$ 100,000	$ 100,000	Includes excavation, disposal, sampling, reporting and consultant costs for two USTs 5,000 gal and 2,000 gal
Existing wells protection/new aboveground well completion	15	wells	$ 5,000	$ 75,000	Protect well, raise well completion to reach new cap topo surface
Site Clearance/Grubbing for RCRA cap	6.6	acre	$ 6,500	$ 43,000	Site clearance/grading prep for cap starting with the foundation layer
Excavation/Backfill/Asphalt Cap (5') - Location 1 (1 ac)					Only a portion of the 2 acre area is excavated
Excavation (5'): Soil portion of Location 1	8,000	cy	$ 6	$ 48,000	Based on estimated remediation area, existing slopes; contractor cost
Backfill from Borrow Area and compact	8,800	cy	$ 6	$ 53,000	Borrow area transport and compact
Excavated Soil onsite Placement at PCB Landfill	8,800	cy	$ 2	$ 18,000	
4" Asphalt Pavement capping (with 4" aggregate base)	43,500	sf	$ 5	$ 218,000	Assumes asphalt paving of unpaved areas, approx 1 acre
RCRA Cap - Location 2 (MSA, N of PSCT) (2.8 ac)					Location 2 area (acres) 2.8
Cut/Fill Leveling Layer (grading)	17,000	cy	$ 5	$ 85,000	Based on estimate from CAD; contractor unit cost
Foundation layer (2'): borrow and compact	9,900	cy	$ 6	$ 59,000	Site clearance/grading prep for cap starting with the foundation layer. Soil volume based on cap area, contractor unit cost quote
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote incl. tax, shipping
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.70/sf for 60 mil HDPE liner per GSE Liner quote
Geocomposite 200 mil fabrinet, matl+labor	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote incl. tax, shipping
Vegetative cover (2')	9,900	cy	$ 6	$ 59,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding

TABLE E-3-1
FS AREA 3 - ALTERNATIVE 2
Casmalia Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
RCRA Cap - Location 3 (south of PSCT-3) (2.2 ac)					Location 3 (acres) 2.2
Cut/Fill Leveling Layer (grading)	13,000	cy	$ 5	$ 65,000	Based on estimate from CAD; contractor unit cost
Foundation layer (2'): borrow and compact	7,800	cy	$ 6	$ 47,000	Soil volume based on estimated cap area, contractor unit cost quote
GCL Bento Liner (matl + labor)	2.2	acre	$ 34,500	$ 76,000	Assume $0.80/sf based on GSE Liner quote
HDPE liner (60 mil)(matl + labor)	2.2	acre	$ 34,500	$ 76,000	Assume $0.70/sf for 60 mil HDPE liner per GSE Liner quote
Geocomposite 200 mil fabrinet, matl+labor	2.2	acre	$ 30,500	$ 67,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.2	acre	$ 21,800	$ 48,000	Assume $0.50/sf per GSE Liner quote
Vegetative cover (2')	7,800	cy	$ 6	$ 47,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.2	acre	$ 4,000	$ 9,000	Top soil and hydroseeding
RCRA Cap - Location 4 (south of PSCT-1) (1.6 ac)					Location 4 (acres) 1.6
Cut/Fill Leveling Layer (grading)	10,000	cy	$ 5	$ 50,000	Based on estimate from CAD; contractor unit cost
Foundation layer (2'): borrow and compact	5,700	cy	$ 6	$ 34,000	Soil volume based on estimated cap area, contractor unit cost quote
GCL Bento Liner (matl + labor)	1.6	acre	$ 34,500	$ 55,000	Assume $0.80/sf based on GSE Liner quote
HDPE liner (60 mil)(matl + labor)	1.6	acre	$ 34,500	$ 55,000	Assume $0.70/sf for 60 mil HDPE liner per GSE Liner quote
Geocomposite 200 mil fabrinet, matl+labor	1.6	acre	$ 30,500	$ 49,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	1.6	acre	$ 21,800	$ 35,000	Assume $0.50/sf per GSE Liner quote
Vegetative cover (2')	5,700	cy	$ 6	$ 34,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	1.6	acre	$ 4,000	$ 6,000	Top soil and hydroseeding
GW Monitoring Wells - Location 10 (RISBON-59)					
Install 2 Upper HSU groundwater monitoring wells downgradient of RISBON-59	2	wells	$ 15,000	$ 30,000	4" Sch 80 PVC well casing, total depth 40 feet
Stormwater Controls					
Surface features - Stormwater ditches, Bench V-ditches	1,800	lf	$ 30	$ 54,000	Estimated length of surface drainage ditches
BMPs - Grading to remove rills and gullies	15	acre	$ 20,000	$ 300,000	Assumed areas that needs BMPs is 15 out of 40 acres
BMPs - Turf reinforcement mats, jute mesh, silt fence	15	acre	$ 43,500	$ 653,000	Assumed areas that needs BMPs
BMPs - hydroseeding	15	acre	$ 4,000	$ 60,000	Assumed areas that needs BMPs

TABLE E-3-1
FS AREA 3 - ALTERNATIVE 2
Casmalia Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during remedy implementation)	50	samples	$ 500	$ 25,000	50 air/dust samples, analysis+labor
Compaction testing: Geotech engr	30	days	$ 500	$ 15,000	30 days of testing w Geotech engr/nuclear gage at $500/day
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 75,000	$ 75,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 30,000	$ 30,000	Based on contractor quotes
			Direct Capital Total:	**$ 3,604,000**	
			Contingency (35%)	**$ 1,261,000**	
			Direct Capital Total:	**$ 4,865,000**	Direct Capital Cost per Acre = $591,000
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 3,604,000	$ 180,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 3,604,000	$ 108,000	
EPA Oversight Costs	10%	of	$ 3,604,000	$ 360,000	
Construction Management	5%	of	$ 3,604,000	$ 180,000	
			Total PM/CM Cost:	**$ 828,000**	
			Total Capital Cost:	**$ 5,693,000**	
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 60,000	$ 60,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Groundwater monitoring (RISBON-59 area, Location 10)	1	year	$ -	$ -	Included in Area 5 cost estimate for sitewide gw monitoring
Misc repairs, ODCs	1	year	$ 40,000	$ 40,000	
			Subtotal Annual O&M Cost:	$ 150,000	
			Contingency (50%)	$ 75,000	
Project Management/Technical Support	1	year	$ 24,000	$ 24,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 249,000**	

TABLE E-3-1
FS AREA 3 - ALTERNATIVE 2
Casmalia Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Caps	1	100-year	$ 2,846,500	$ 2,846,500	Assume 1/2 of caps would need to be replaced

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$5,693		$5,693	$5,693	
Annual O&M Cost (post construction)	0 - 5	$1,270	$254	$1,163	$1,041	
Annual O&M Cost (post construction)	6 - 30	$6,350	$254	$3,815	$2,110	
Annual O&M Cost (post construction)	31 - 100	$20,277	$290	$3,476	$539	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$10,672,000**	**$8,845,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$14,147,000**	**$9,384,000**	

TABLE E-3-1
FS AREA 3 - ALTERNATIVE 2
Casmalia Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 5,909,334**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 258,462**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 2,954,667**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$5,909	$1,182	$5,255	$4,529	FS Area 3 remedy is expected to be constructed during the second construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,318	$263.65	$1,207	$1,081	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$6,591	$263.65	$3,960	$2,191	
Annual O&M Cost (post construction)	31 - 100	$21,047	$300.67	$3,608	$559	
			Present Value of Capital	**$5,255,000**	**$4,529,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$5,168,000**	**$3,272,000**	
			Present Value of 100 Year O&M	**$8,775,000**	**$3,831,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$10,423,000**	**$7,801,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$14,030,000**	**$8,360,000**	

NOTES/ASSUMPTIONS

1. This alternative addresses the ten impacted soil locations identified for FS Area 3 in Figure 11-13A.
2. Location 1 is in Liquid Treatment Area and partial excavation of hot spots is assumed with asphalt replacement where needed.
3. Locations 2, 3, and 4 are to be capped with a RCRA cap that will tie into the Area 1 Cap.
4. Locations 5 through 9 - leave in place based on ecological risk modeling and statistical analysis that confirm area-wide risk-based requirements are met.
5. Location 10, RISBON-59 assumes long term groundwater monitoring of existing and two new downgradient monitoring wells in the UHSU.
6. Capital cost for Maintenance Shed building demolition and removal of 2 USTs are included prior to remedial activities.

TABLE E-3-2
FS AREA 3 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: RCRA Cap (Locations 2) + Excavate ((Location 3) (20'); (Location 4) (5')) + Excavate/New Asphalt Cap (Location 1) (5') + Groundwater Monitoring (Location 10) + Grading/BMPs (Uncapped Areas) + Stormwater Controls + ICs + Monitoring

Remedial Alternative Description : This remedial alternative involves extending the RCRA cap which is discussed for Area 1 over the Maintenance Shed Area (Location 2) and excavation of Hotspot Locations 3 and 4 south of the PSCT for disposal in the PCB Landfill (Figure 11-14A). The excavation will be backfilled with clean borrow soil. The surface of the cap would be sloped and includes surface drains to direct stormwater on the cap to flow southeast towards the drainage channel near PSCT-1. The stormwater in the drainage channel will flow under a culvert on RCF Road to Pond 13 and then offsite through or around the wetlands under the site's General NPDES permit. Hotspot Location 1 will be excavated and paved with a new 4" asphalt cap. For Hotspot Location 10 (RISBON-59), the alternative proposes 2 additional UHSU downgradient groundwater monitoring wells to ensure that there is no impact in the future to groundwater from this deep soil impacted area.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ 75,000	$ 75,000	Addtnl site investigations to define extent
Geotechnical testing/Geophysical Investigation/Surveying	1	ls	$ 75,000	$ 75,000	Evaluate site stability, buried waste, geotech soil properties
Site Work					
Demo Maintenance Shed Building	1	ls	$ 100,000	$ 100,000	Includes removal and disposal of MSA bldg and foundation
UST Removals, 2 Tanks	1	ls	$ 100,000	$ 100,000	Includes excavation, disposal, sampling, reporting and consultant costs for two USTs 5,000 gal and 2,000 gal
Existing wells protection/new aboveground well completion	15	wells	$ 5,000	$ 75,000	Protect well, raise well completion to reach new cap topo surface
Site Clearance/Grubbing for RCRA cap	6.6	acre	$ 6,500	$ 43,000	Site clearance/grading prep for cap starting with the foundation layer
Excavation/Backfill/Asphalt Cap (5') - Location 1 (1 ac)					Only a portion of the 2 acre area is excavated
Excavation (5'): Soil portion of Location 1	8,000	cy	$ 6	$ 48,000	Based on estimated remediation area, existing slopes; contractor cost
Backfill from Borrow Area and compact	8,800	cy	$ 6	$ 53,000	Borrow area transport and compact
Excavated Soil onsite Placement at PCB Landfill	8,800	cy	$ 2	$ 18,000	
4" Asphalt Pavement capping (with 4" aggregate base)	43,500	sf	$ 5	$ 218,000	Assumes asphalt paving of unpaved areas, approx 1 acre
RCRA Cap - Location 2 (MSA, N of PSCT) (2.8 ac)					Location 2 area (acres) 2.8
Cut/Fill Leveling Layer (grading)	17,000	cy	$ 5	$ 85,000	Based on estimate from CAD; contractor unit cost
Foundation layer (2'): borrow and compact	9,900	cy	$ 6	$ 59,000	Site clearance/grading prep for cap starting with the foundation layer. Soil volume based on cap area, contractor unit cost quote
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote incl. tax, shipping
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.70/sf for 60 mil HDPE liner per GSE Liner quote
Geocomposite 200 mil fabrinet, matl+labor	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote incl. tax, shipping
Vegetative cover (2')	9,900	cy	$ 6	$ 59,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding

TABLE E-3-2
FS AREA 3 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Excavation/Backfill (20') - Location 3 (2.2 ac)					Location 3 (acres) 2.2
Excavation (0-20')	71,000	cy	$ 6	$ 426,000	Based on estimated remediation area and 1:1 side slopes. Assume no shoring is necessary. Segregate unimpacted soils as fill
Segregate unimpacted soils use as fill and compact	24,000	cy	$ 3	$ 72,000	Assume unimpacted soil is 1/3rd of excavated soil
Backfill: borrow and compact	54,000	cy	$ 6	$ 324,000	Borrow from NW Borrow area; no pre-processing
Revegetation/Hydroseeding	2.2	acre	$ 4,000	$ 9,000	Top soil and hydroseeding
Excavated Soil Transport/Dispose PCB Landfill	47,000	cy	$ 2	$ 94,000	Assume PCB landfill disposal of 2/3rds of excavated soil
Excavation/Backfill (5') - Location 4 (1.6 ac)					
Excavation	13,000	cy	$ 6	$ 78,000	Based on estimated remediation area, existing slopes; contractor cost
Backfill: borrow and compact	14,300	cy	$ 6	$ 86,000	Borrow from NW Borrow area; no pre-processing
Revegetation/Hydroseeding	1.6	acre	$ 4,000	$ 6,000	Top soil and hydroseeding
Excavated Soil Transport/Dispose at PCB Landfill	13,000	cy	$ 2	$ 26,000	
GW Monitoring Wells - Location 10 (RISBON-59)					
Install 2 Upper HSU groundwater monitoring wells downgradient of RISBON-59	2	wells	$ 15,000	$ 30,000	4" Sch 80 PVC well casing, total depth 40 feet
Stormwater Controls					
Surface features - Stormwater ditches, Bench V-ditches	1,800	lf	$ 30	$ 54,000	Estimated length of surface drainage ditches
BMPs - Grading to remove rills and gullies	15	acre	$ 20,000	$ 300,000	Assumed areas that needs BMPs is 15 out of 40 acres
BMPs - Turf reinforcement mats, jute mesh, silt fence	15	acre	$ 43,500	$ 653,000	Assumed areas that needs BMPs
BMPs - hydroseeding	15	acre	$ 4,000	$ 60,000	Assumed areas that needs BMPs
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during remedy implementation)	50	samples	$ 500	$ 25,000	50 air/dust samples, analysis+labor
Soil Confirmation Sampling and Analyses	60	samples	$ 100	$ 6,000	for tank removals, Locs 1,,2,3,4,10 excavations
Compaction testing: Geotech engr	30	days	$ 500	$ 15,000	30 days of testing w Geotech engr/nuclear gage at $500/day

TABLE E-3-2
FS AREA 3 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost		Estimated Cost		Notes / Assumptions
Capital Costs (continued)							
Green Remediation	1	ls	$	50,000	$	50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control							
Construction QA/QC Program	1	ls	$	150,000	$	150,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$	50,000	$	50,000	Based on contractor quotes
			Direct Capital Total:		**$**	**4,073,000**	
			Contingency (35%)		**$**	**1,426,000**	
			Direct Capital Total:		**$**	**5,499,000**	Direct Capital Cost per Acre = $668,000
Project / Construction Management							
Remedial Design/Engineering	5%	of	$	4,073,000	$	204,000	
Project Management, Agency Reporting and Coordination	3%	of	$	4,073,000	$	122,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$	4,073,000	$	407,000	
Construction Management	5%	of	$	4,073,000	$	204,000	
			Total PM/CM Cost:		**$**	**937,000**	
			Total Capital Cost:		**$**	**6,436,000**	
Operation and Maintenance Costs							
Cap Inspection / Maintenance							
Cap, Drainage Channel Inspection and Maintenance	1	year	$	30,000	$	30,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$	40,000	$	40,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$	-	$	-	
Groundwater monitoring (RISBON-59 area, Location 10)	1	year	$	-	$	-	Included in Area 5 cost estimate for sitewide gw monitoring
Misc repairs, ODCs	1	year	$	40,000	$	40,000	
			Subtotal Annual O&M Cost:		$	110,000	
			Contingency (50%)		$	55,000	
Project Management/Technical Support	1	year	$	24,000	$	24,000	Based on current site O&M costs
			Total Annual O&M Cost:		**$**	**189,000**	

TABLE E-3-2
FS AREA 3 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Caps	1	100-year	$ 3,218,000	$ 3,218,000	Assume 1/2 of caps would need to be replaced

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$6,436		$6,436	$6,436	
Annual O&M Cost (post construction)	0 - 5	$970	$194	$888	$795	
Annual O&M Cost (post construction)	6 - 30	$4,850	$194	$2,914	$1,612	
Annual O&M Cost (post construction)	31 - 100	$16,448	$235	$2,819	$437	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$10,238,000**	**$8,843,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$13,058,000**	**$9,280,000**	

TABLE E-3-2
FS AREA 3 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 6,680,568**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 196,182**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 3,340,284**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$6,681	$1,336.11	$5,941	$5,120	FS Area 3 remedy is expected to be constructed during the second construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,007	$201.37	$922	$826	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$5,034	$201.37	$3,025	$1,673	
Annual O&M Cost (post construction)	31 - 100	$17,073	$243.90	$2,926	$454	
			Present Value of Capital	**$5,941,000**	**$5,120,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$3,947,000**	**$2,499,000**	
			Present Value of 100 Year O&M	**$6,873,000**	**$2,953,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$9,888,000**	**$7,619,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$12,814,000**	**$8,072,000**	

NOTES/ASSUMPTIONS

1. This alternative addresses the ten impacted soil locations identified for FS Area 3 in Figure 11-14A.
2. Location 1 is in Liquid Treatment Area and partial excavation of hot spots is assumed with asphalt replacement where needed.
3. Location 2 is to capped with a RCRA cap that will tie into the Area 1 RCRA cap.
4. Locations 3 and 4 are to be excavated down to 20' bgs and 5' bgs respectively and backfilled.
5. Locations 5-9 - No action based on ecological risk modeling and statistical analysis that confirm area-wide risk-based requirements are met.
6. Location 10, RISBON-59 assumes long term groundwater monitoring of existing and two new downgradient monitoring wells in the UHSU.
7. Capital cost for Maintenance Shed building demolition and removal of 2 USTs are included prior to remedial activities.

TABLE E-3-3
FS AREA 3 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: RCRA Cap (Location 2) + Excavate ((Location 3) (20'); (Location 4) (5'); (Location 10) (50'))/Place in PCB Landfill + Excavate/New Asphalt Cap (Location 1) (5') + Grading/BMPs (Uncapped Areas) + Stormwater Controls + ICs + Monitoring

Remedial Alternative Description : This remedial alternative involves extending the RCRA cap which is discussed for Area 1 over the Maintenance Shed Area (Location 2) and excavation of Hotspot Locations 3 and 4 south of the PSCT for disposal in the PCB Landfill (Figure 11-15A). The excavation will be backfilled with clean borrow soil. The surface of the cap would be sloped and includes surface drains to direct stormwater on the cap to flow southeast towards the drainage channel near PSCT-1. The stormwater in the drainage channel will flow under a culvert on RCF Road to Pond 13 and then offsite through or around the wetlands under the site's General NPDES permit. Hotpsot Location 1 will be excavated and paved with a new 4" asphalt cap. For Hotspot Location 10 (RISBON-59), excavation of an area about 175 feet by 175 feet with a total depth of 50 feet below RCF Road for a total impacted soil volume of 65,000 cy for onsite disposal at the PCB Landfill.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ 75,000	$ 75,000	Addtnl site investigations to define extent
Geotechnical testing/Geophysical Investigation/Surveying	1	ls	$ 75,000	$ 75,000	Evaluate site stability, buried waste, geotech soil properties
Site Work					
Demo Maintenance Shed Building	1	ls	$ 100,000	$ 100,000	Includes removal and disposal of MSA bldg and foundation
UST Removals, 2 Tanks	1	ls	$ 100,000	$ 100,000	Includes excavation, disposal, sampling, reporting and consultant costs for two USTs 5,000 gal and 2,000 gal
Existing wells protection/new aboveground well completion	15	wells	$ 5,000	$ 75,000	Protect well, raise well completion to reach new cap topo surface
Site Clearance/Grubbing for RCRA cap	6.6	acre	$ 6,500	$ 43,000	Site clearance/grading prep for cap starting with the foundation layer
Excavation/Backfill/Asphalt Cap (5') - Location 1 (1 ac)					Only a portion of the 2 acre area is excavated
Excavation (5'): Soil portion of Location 1	8,000	cy	$ 6	$ 48,000	Based on estimated remediation area, existing slopes; contractor cost
Backfill from Borrow Area and compact	8,800	cy	$ 6	$ 53,000	Borrow area transport and compact
Excavated Soil onsite Placement at PCB Landfill	8,800	cy	$ 2	$ 18,000	
4" Asphalt Pavement capping (with 4" aggregate base)	43,500	sf	$ 5	$ 218,000	Assumes asphalt paving of unpaved areas, approx 1 acre
RCRA Cap - Location 2 (MSA, N of PSCT) (2.8 ac)					Location 2 area (acres) 2.8
Cut/Fill Leveling Layer (grading)	17,000	cy	$ 5	$ 85,000	Based on estimate from CAD; contractor unit cost
Foundation layer (2'): borrow and compact	9,900	cy	$ 6	$ 59,000	Site clearance/grading prep for cap starting with the foundation layer. Soil volume based on cap area, contractor unit cost quote
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote incl. tax, shipping
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.70/sf for 60 mil HDPE liner per GSE Liner quote
Geocomposite 200 mil fabrinet, matl+labor	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote incl. tax, shipping
Vegetative cover (2')	9,900	cy	$ 6	$ 59,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding

TABLE E-3-3
FS AREA 3 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Excavation/Backfill (20') - Location 3 (2.2 ac)					Location 3 (acres) 2.2
Excavation (0-20')	71,000	cy	$ 6	$ 426,000	Based on estimated remediation area and 1:1 side slopes. Assume no shoring is necessary. Segregate unimpacted soils as fill.
Segregate unimpacted soils use as fill and compact	24,000	cy	$ 3	$ 72,000	Assume unimpacted soil is 1/3rd of excavated soil
Backfill: borrow and compact	54,000	cy	$ 6	$ 324,000	Borrow from NW Borrow area; no pre-processing
Revegetation/Hydroseeding	2.2	acre	$ 4,000	$ 9,000	Top soil and hydroseeding
Excavated Soil Transport/Dispose PCB Landfill	47,000	cy	$ 2	$ 94,000	Assume PCB landfill disposal of 2/3rds of excavated soil
Excavation/Backfill (5') - Location 4 (1.6 ac)					
Excavation	13,000	cy	$ 6	$ 78,000	Based on estimated remediation area, existing slopes; contractor cost
Backfill: borrow and compact	14,300	cy	$ 6	$ 86,000	Borrow from NW Borrow area; no pre-processing
Revegetation/Hydroseeding	1.6	acre	$ 4,000	$ 6,000	Top soil and hydroseeding
Excavated Soil Transport/Dispose at PCB Landfill	13,000	cy	$ 2	$ 26,000	Assume PCB Landfill disposal
Excavation/Backfill (50') - Location 10 (175'x175')					
Excavation (50 feet down to 400 ft MSL)	65,000	cy	$ 6	$ 390,000	Based on estimated remediation area, and side slopes at 1:1; contractor unit cost
Dewatering: trench based extraction	1	ls	$ 100,000	$ 100,000	Assumed lump sum cost for dewatering; disch to pond, no water treatment
Backfill: borrow and compact	71,500	cy	$ 6	$ 429,000	Based on estimated remediation area, existing slopes; contractor cost; no pre-processing
Revegetation/Hydroseeding	0.6	acre	$ 4,000	$ 2,000	Top soil and hydroseeding
Excavated Soil onsite Placement at PCB Landfill	65,000	cy	$ 2	$ 130,000	Assume disposal in PCB Landfill
Stormwater Controls					
Surface features - Stormwater ditches, Bench V-ditches	1,800	lf	$ 30	$ 54,000	Estimated length of surface drainage ditches
BMPs - Grading to remove rills and gullies	15	acre	$ 20,000	$ 300,000	Assumed areas that needs BMPs is 15 out of 40 acres
BMPs - Turf reinforcement mats, jute mesh, silt fence	15	acre	$ 43,500	$ 653,000	Assumed areas that needs BMPs
BMPs - hydroseeding	15	acre	$ 4,000	$ 60,000	Assumed areas that needs BMPs
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during remedy implementation)	50	samples	$ 500	$ 25,000	50 air/dust samples, analysis+labor
Soil Confirmation Sampling and Analyses	100	samples	$ 100	$ 10,000	for tank removals, Locs 1,,2,3,4,10 excavations
Compaction testing: Geotech engr	40	days	$ 500	$ 20,000	30 days of testing w Geotech engr/nuclear gage at $500/day

TABLE E-3-3
FS AREA 3 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 150,000	$ 150,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 5,103,000**	
			Contingency (35%)	**$ 1,786,000**	
			Direct Capital Total:	**$ 6,889,000**	Direct Capital Cost per Acre = $837,000
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 5,103,000	$ 255,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 5,103,000	$ 153,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$ 5,103,000	$ 510,000	
Construction Management	5%	of	$ 5,103,000	$ 255,000	
			Total PM/CM Cost:	**$ 1,173,000**	
			Total Capital Cost:	**$ 8,062,000**	
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 30,000	$ 30,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Groundwater monitoring (RISBON-59 area, Location 10)	1	year	$ -	$ -	Included in Area 5 cost estimate for sitewide gw monitoring
Misc repairs, ODCs	1	year	$ 40,000	$ 40,000	
			Subtotal Annual O&M Cost:	$ 110,000	
			Contingency (50%)	$ 55,000	
Project Management/Technical Support	1	year	$ 24,000	$ 24,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 189,000**	

TABLE E-3-3
FS AREA 3 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Caps	1	100-year	$ 4,031,000	$ 4,031,000	Assume 1/2 of caps would need to be replaced

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
PRESENT VALUE ANALYSIS (2012 $K)						
Capital Cost		$8,062		$8,062	$8,062	
Annual O&M Cost (post construction)	0 - 5	$970	$194	$888	$795	
Annual O&M Cost (post construction)	6 - 30	$4,850	$194	$2,914	$1,612	
Annual O&M Cost (post construction)	31 - 100	$17,261	$247	$2,959	$459	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$11,864,000**	**$10,469,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$14,823,000**	**$10,928,000**	

TABLE E-3-3
FS AREA 3 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
Total Capital Cost (2014):					**$ 8,368,356**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost, Annual (2014):					**$ 196,182**	
Periodic Cost, 5-year (2014):					**$ 25,950**	
Periodic Cost, 100-year (2014):					**$ 4,184,178**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$8,368	$1,673.67	$7,442	$6,413	FS Area 3 remedy is expected to be constructed during the second construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,007	$201.37	$922	$826	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$5,034	$201.37	$3,025	$1,673	
Annual O&M Cost (post construction)	31 - 100	$17,917	$255.96	$3,071	$476	
Present Value of Capital				**$7,442,000**	**$6,413,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M				**$3,947,000**	**$2,499,000**	
Present Value of 100 Year O&M				**$7,018,000**	**$2,975,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$11,389,000**	**$8,912,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)				**$14,460,000**	**$9,388,000**	

NOTES/ASSUMPTIONS

1. This alternative addresses the ten impacted soil locations identified for FS Area 3 in Figure 11-15A.
2. Location 1 is in Liquid Treatment Area and partial excavation of hot spots is assumed with asphalt replacement where needed.
3. Location 2 is to capped with a RCRA cap that will tie into the Area 1 RCRA cap.
4. Locations 3 and 4 are to be excavated down to 20' bgs and 5' bgs respectively and disposed in the PCB Landfill.
5. Locations 5-9 - No action based on ecological risk modeling and statistical analysis that confirm area-wide risk-based requirements are met.
6. Location 10, RISBON-59 is a SVOC impact in deep soil in an area about 175 feet by 175 feet that is excavated and placed in the PCB Landfill.
7. Capital cost for Maintenance Shed building demolition and removal of 2 USTs are included prior to remedial activities.

TABLE E-3-4
FS AREA 3 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Excavate (Locations 2, 4) (5’) + Excavate (Location 3) (20’) and (Location 10) (50’)/Offsite Disposal + Excavate/Asphalt Cap (Location 1) (5’) + Grading/BMPs (Uncapped Areas) + Stormwater Controls + ICs + Monitoring

Alternative Description : This remedial alternative assumes excavation of the top 5 feet of Locations 1, 2 and 4 covering an area of 6.2 acres (38,000 cy) and excavation of Location 3 (former Ponds A/B)down to 20 feet bgs for a total of 93,000 and Location 10 that is an area about 175 feet by 175 feet with a total excavation depth of 50 feet below RCF Road for a total impacted soil volume of 65,000 cy for offsite disposal at a permitted landfill (Figure 11-16A). These excavations are backfilled with clean soil imported from offsite sources due to the large amount of fill needed. The stormwater runoff from these backfilled areas will be graded such that the stormwater sheet flows towards the southern portion of the site to Pond 13 and then offsite through or around the wetlands under the site’s General NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ 150,000	$ 150,000	Addtnl site investigations to define extent, Locations 3, and 10
Geotechnical testing/Geophysical Investigation/Surveying	1	ls	$ 75,000	$ 75,000	Evaluate site stability, buried waste, geotech soil properties
Site Work					
Demo Maintenance Shed Building	1	ls	$ 100,000	$ 100,000	Includes removal and disposal of MSA bldg and foundation
UST Removals, 2 Tanks	1	ls	$ 100,000	$ 100,000	Includes excavation, disposal, sampling, reporting and consultant costs for two USTs 5,000 gal and 2,000 gal
Existing wells protection/new aboveground well completion	20	wells	$ 5,000	$ 100,000	Protect well, raise well completion to reach new cap topo surface
Reconstruct RCF Road (4" Asph Pavement + 4" road base)	3,600	sf	$ 5	$ 18,000	Assume 150' by 24' section of road must be replaced
Excavation/Backfill/Asphalt Cap (5') - Location 1 (1 ac)					
Excavation (0-5')	8,000	cy	$ 6	$ 48,000	Based on estimated remediation area, existing slopes; contractor cost
Backfill: borrow and compact	8,800	cy	$ 6	$ 53,000	Borrow from NW Borrow area
Revegetation/Hydroseeding	1.0	acre	$ 4,000	$ 4,000	Top soil and hydroseeding
Excavated Soil onsite Placement at PCB Landfill	8,000	cy	$ 2	$ 16,000	
Excavation/Backfill (5') - Location 2 (2.8 ac)					
Excavation (0-5')	23,000	cy	$ 6	$ 138,000	Based on estimated remediation area, existing slopes; contractor cost
Backfill: borrow and compact	25,300	cy	$ 6	$ 152,000	Borrow from NW Borrow area
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding
Excavated Soil onsite Placement at PCB Landfill	23,000	cy	$ 2	$ 46,000	

TABLE E-3-4
FS AREA 3 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Excavation/Backfill (20') - Location 3 (2.2 ac)					
Excavation (0-20')	71,000	cy	$ 6	$ 426,000	Based on estimated remediation area and 1:1 side slopes. Assume no shoring is necessary. Segregate unimpacted soils as fill.
Segregate unimpacted soils as fill and compact	31,000	cy	$ 3	$ 93,000	Assume unimpacted soil is 1/3rd, 31,000 cy
Backfill: borrow and compact	47,000	cy	$ 6	$ 282,000	Borrow from NW Borrow area
Revegetation/Hydroseeding	2.2	acre	$ 4,000	$ 9,000	Top soil and hydroseeding
Excavated Soil Off-Site Disposal	60,000	tons	$ 60	$ 3,600,000	Assume offsite disposal of 2/3rds (62,000 cy) with 1/2 as non-RCRA hazardous waste and 1/2 as nonhaz at Buttonwillow
Excavation/Backfill (5') - Location 4 (1.6 ac)					
Excavation	13,000	cy	$ 6	$ 78,000	Based on estimated remediation area, existing slopes; contractor cost
Backfill: borrow and compact	14,300	cy	$ 6	$ 86,000	Borrow from NW Borrow area
Revegetation/Hydroseeding	1.6	acre	$ 4,000	$ 6,000	Top soil and hydroseeding
Excavated Soil onsite Placement at PCB Landfill	13,000	cy	$ 2	$ 26,000	Disposal in PCB Landfill
Excavation/Backfill (50') - Location 10 (175'x175')					
Excavation (50 feet down to 400 ft MSL)	65,000	cy	$ 6	$ 390,000	Based on estimated remediation area, and side slopes at 1:1; contractor unit cost
Dewatering: trench based extraction	1	ls	$ 100,000	$ 100,000	Assumed lump sum cost for dewatering; disch to pond, no water treatment
Backfill: borrow and compact	71,500	cy	$ 6	$ 429,000	Based on estimated remediation area, existing slopes; contractor cost
Revegetation/Hydroseeding	0.6	acre	$ 4,000	$ 2,000	Top soil and hydroseeding
Excavated Soil Off-Site Disposal	97,500	tons	$ 60	$ 5,850,000	Assume offsite disposal as 1/2 non-RCRA hazardous waste and 1/2 nonhaz at Buttonwillow; PCB landfill disposal will be a lot lower
Stormwater Controls					
Surface features - Stormwater ditches, Bench V-ditches	1,800	lf	$ 30	$ 54,000	Estimated length of surface drainage ditches
BMPs - Grading to remove rills and gullies	15	acre	$ 20,000	$ 300,000	Assumed areas that needs BMPs is 15 out of 40 acres
BMPs - Turf reinforcement mats, jute mesh, silt fence	15	acre	$ 43,500	$ 653,000	Assumed areas that needs BMPs
BMPs - hydroseeding	15	acre	$ 4,000	$ 60,000	Assumed areas that needs BMPs
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during remedy implementation)	50	samples	$ 500	$ 25,000	50 air/dust samples, analysis+labor
Soil Confirmation Sampling and Analyses	100	samples	$ 100	$ 10,000	for tank removals, Locs 1,,2,3,4,10 excavations
Compaction testing: Geotech engr	40	days	$ 500	$ 20,000	40 days of testing w Geotech engr/nuclear gage at $500/day
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 200,000	$ 200,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 75,000	$ 75,000	Based on contractor quotes

TABLE E-3-4
FS AREA 3 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
			Direct Capital Total:	**$ 14,235,000**	Direct Capital Cost per Acre = $ 2,296,000
			Contingency (50%)	**$ 7,118,000**	
			Total Direct Capital Cost:	**$ 21,353,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 14,235,000	$ 712,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 14,235,000	$ 427,000	
EPA Oversight Costs	10%	of	$ 14,235,000	$ 1,424,000	Engineering and management costs based on industry standards and experience.
Construction Management	5%	of	$ 14,235,000	$ 712,000	
			Total PM/CM Cost:	**$ 3,275,000**	
			Total Capital Cost:	**$ 24,628,000**	
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Soil Cover, V-Drains Inspection and Maintenance	1	year	$ 10,000	$ 10,000	Based on current site O&M
Settlement repair/Regrading/Erosion control	1	year	$ 12,000	$ 12,000	Based on current site O&M
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 24,000	$ 24,000	Based on current site O&M
			Subtotal Annual O&M Cost:	$ 46,000	
			Contingency (50%):	$ 23,000	
Project Management/Technical Support	1	year	$ 24,000	$ 24,000	Based on current site O&M
			Total Annual O&M Cost:	**$ 93,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)
Capital Cost		$24,628		$24,628	$24,628
Annual O&M Cost (post construction)	0 - 5	$490	$98	$449	$402
Annual O&M Cost (post construction)	6 - 30	$2,450	$98	$1,472	$814
Annual O&M Cost (post construction)	31 - 100	$6,510	$93	$1,116	$173

TABLE E-3-4
FS AREA 3 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Total Present Value of Alternative (Capital + 30 Year O&M)				**$26,549,000**	**$25,844,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$27,665,000**	**$26,017,000**	
PRESENT VALUE ANALYSIS (2014 $)						
Total Capital Cost (2014):					**$ 25,563,864**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost, Annual (2014):					**$ 96,534**	
Periodic Cost, 5-year (2014):					**$ 25,950**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$25,564	$5,113	$22,733	$19,592	FS Area 3 remedy is expected to be constructed during the second construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$509	$101.72	$466	$417	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$2,543	$101.72	$1,528	$845	
Annual O&M Cost (post construction)	31 - 100	$6,757	$97	$1,158	$180	
Present Value of Capital				**$22,733,000**	**$19,592,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M				**$1,994,000**	**$1,262,000**	
Present Value of 100 Year O&M				**$3,152,000**	**$1,442,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$24,727,000**	**$20,854,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)				**$25,885,000**	**$21,034,000**	

NOTES/ASSUMPTIONS

1 This alternative addresses the impacted soil locations identified for FS Area 3 in Figure 11-16A.
2 The remedy for each varies and Locations 1, 2 and 4 are involve excavation and and disposal of excavated soil at PCB Landfill
3 Location 1 is in Liquid Treatment Area with shallow soil excavation in about 1 acre of area that is not currently capped with concrete or asphalt.
4 Locations 2 and 4 are to be excavated to 5' bgs and Location 3 excavated to 20 feet bgs, and backfilled with offsite NW Borrow soil and compacted.
5 Locations 5-9 - No action based on ecological risk modeling and statistical analysis that confirm area-wide risk-based requirements are met.
6 Location 10, RISBON-59 is a SVOC impact in deep soil in an area about 175 feet by 175 feet that is excavated and sent to a permitted landfill for offsite disposal.
7 Capital cost for Maintenance Shed building demolition and removal of 2 USTs are included prior to remedial activities.
8 Assume soil from Location 3 and Location 10 is disposed offsite as nonRCRA haz at Buttonwillow.

AREA 4 TABLES

TABLE E-4-0
AREA 4 COST SUMMARY
Casmalia Resources Superfund Site
Feasibility Study

Summary of Area 4 Remedial Alternative Costs						
Alt	**PROPOSED REMEDIAL ALTERNATIVE**	**CAPITAL COST (2014 $)**	**ANNUAL O&M (2014 $)**	**TIME FRAME**	**PRESENT WORTH CAPITAL + O&M 3% DISCOUNT RATE (2014 $)**	**PRESENT WORTH CAPITAL + O&M 7% DISCOUNT RATE (2014 $)**
2	Eco-Cap (RCF, A-Series Pond) (2') + Lined Retention Basin (Pond A-5, Pond 13) + Construct new 11-acre Lined Evaporation Pond (North of RCF Pond) + RCRA Cap (Pond 18) + Storm water Controls + ICs + Monitoring	$ 18,272,000	$ 458,000	30-year	$29,436,000	$22,217,000
				100-year	$41,378,000	$24,068,000
3	Eco-Cap (RCF Pond) (2') + Segregate East RCF with Berm + Construct 11-acre Lined Evaporation Pond (A-Series Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Storm water Controls + ICs + Monitoring	$ 13,739,000	$ 458,000	30-year	$25,447,000	$18,771,000
				100-year	$36,631,000	$20,505,000
4	Eco-Cap (RCF Pond)(2') + Construct 11-acre Lined Evaporation Pond (A-Series Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring	$ 14,092,000	$ 458,000	30-year	$25,761,000	$19,042,000
				100-year	$37,005,000	$20,785,000
5	Eco-Cap (RCF Pond, portion of A-Series Pond) + Construct 6-acre Lined Evaporation Pond (A-Series Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Ponds A-5, 13) + Stormwater Controls + ICs + Monitoring	$ 13,131,000	$ 386,000	30-year	$21,621,000	$16,287,000
				100-year	$30,318,000	$17,636,000
6	Eco-Cap (RCF Pond, A-Series Pond)(2') + RCRA Cap (Pond 18) + Lined Retention Basin (Ponds A-5, 13) + Stormwater Controls + ICs + Monitoring	$ 10,590,000	$ 255,000	30-year	$14,524,000	$11,349,000
				100-year	$19,403,000	$12,105,000
7	ET Cap (RCF Pond, portion of A-Series Pond) + Construct 6-acre Lined Evaporation Pond (A-Series Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Ponds A-5, 13) + Stormwater Controls + ICs + Monitoring	$ 15,658,000	$ 386,000	30-year	$23,869,000	$18,225,000
				100-year	$32,999,000	$19,640,000
8	Excavate and clean backfill (RCF Pond, A-Series Pond) (2'-5') + Construct new 11-acre Lined Evaporation Pond (North of RCF Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13)	$ 40,759,000	$ 411,000	30-year	$48,520,000	$38,878,000
				100-year	$58,495,000	$40,424,000

NOTES
1. Total Present Worth Cost (Capital + O&M in 2014 $) is shown for a 3% and 7% net discount rate and a 30-year and a 100-year timeframe and includes contingency on capital and O&M costs.
2. FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs.
3. PV of Capital Cost (in 2014 $) is shown for a 3% and 7% net discount rate based on the average capital cost for each year of the 5 year construction period.

TABLE E-4-1
FS AREA 4 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Feasibility Study

Remedial Alternative: ALT 2 - Eco-Cap (RCF, A-Series Pond) (2') + Construct New 11-Acre Evaporation Pond + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring

Alternative Description: This remedial alternative involves managing existing storm water in the A-Series Pond and RCF Pond as discussed in the body of the FS to reduce or eliminate those volumes prior to FS construction. The impacted bottom areas of the RCF and A-Series Pond sediments will be raised to 415 feet bgs and 425 feet bgs respectively and capped with an eco-cap (discussed previously) which is comprised of a 2-foot soil cover over a HDPE biotic barrier. The remedial alternative assumes the construction of a new lined 11-acre evaporation pond south of the PSCT (Figure 11-17A). A new lined retention basin will be constructed in the footprint of Pond A-5 (which will be partially backfilled to ensure the pond bottom is above projected groundwater levels). Pond 18 will be backfilled to match surface grades and ensure storm water flows off that area of the site and will be capped with a RCRA cap. Pond 13 will be partially backfilled filled using the Pond 13 dike and then lined with a HDPE material to serve as a stormwater retention basin that discharge offsite to the B-drainage under the site's General NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Pre-Remedial Testing					
Site Investigation/Delineation/Reporting	1	ls	$ 150,000	$ 150,000	Addtnl investigations (env., geotech, geophys); refine nature & extent
Geotechnical testing/Geophysical Investigation	1	ls	$ -	$ -	
Site Work					
Pump existing pond water to new pond	1	ls	$ 5,000	$ 5,000	Assumed cost for transferring pond water to new evaporation pond
Dust controls	100	days	$ 1,000	$ 100,000	Based on contractor unit cost-water truck-4 mths, 80 days
Pond A-5 - Lined Retention Basin					Pond A-5 area (acres) = 2.50
Fill from WCSA excavation/transport/compact	40,000	cy	$ 6	$ 240,000	Transport and compact WCSA 5' excav soil, raise bottom and place liner to serve as retention basin
Foundation layer (2')	9,000	cy	$ 6	$ 54,000	Transport and compact 2' foundation layer soil. Use remaining WCSA excav soil as fill, 49,000-40,000=9,000
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	2.5	acre	$ 56,500	$ 141,000	Assume $1.30/sf for GCL Bentomat CL pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1')	4,400	cy	$ 6	$ 26,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	2.5	acre	$ 4,000	$ 10,000	Top soil and hydroseeding
Pond 18 - RCRA Cap					Pond 18 area (acres) = 2.80
Cut/Fill (grading): borrow dike material	8,000	cy	$ 4	$ 32,000	Volume from CAD figure; Knockdown dike adjacent to A-Series Pond and raise pond bottom with fill and compact
Foundation layer (2'): borrow dike material	10,000	cy	$ 4	$ 40,000	Borrow soils from dike excavation
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote incl. tax, shipping
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf for 60 mil HDPE liner per GSE Liner quote incl tax
Geocomposite 200 mil fabrinet, (matl+labor)	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl. tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote

TABLE E-4-1
FS AREA 4 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Vegetative cover (2')	10,000	cy	$ 6	$ 60,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding
A-Series Pond - Eco Cap (2')					A-Series expanded (acres) 11.00
Cut Pont NE shoreline, fill Pond bottom, foundation layer	85,000	cy	$ 6	$ 510,000	Cut soil from NE shoreline to expand pond and obtain fill for pond bottom to raise to 425' MSL minimum
Soil cover (2'): Borrow and compact	39,000	cy	$ 6	$ 234,000	Based on 11 acres of eco-cap with 1' soil cover offsite NW borrow
Biotic barrier (200 mil Geonet)	0	acre	$ 21,800	$ -	Based on $0.50/sf per GSE Liner quote incl. tax, shipping
Drainage: V-drains, ditches	4,000	lf	$ 30	$ 120,000	Assume2500 lf of concrete V drains incl. Area 1 drainage channel
Erosion control BMPs for sideslopes, jute mesh, TRM	0.0	acre	$ 8,700	$ -	Assume 50% of remaining A-Series Pond need erosion control
RCF Pond - Eco Cap (2')					RCF Pond_acres 11.40
Fill to raise pond bottom: Borrow and compact	95,000	cy	$ 6	$ 570,000	Raise pond bottom well above 415 MSL minimum on east end with 1% slope; estimated by CAD; Borrow soil from NW borrow area
Soil cover (2'): Borrow and compact	40,000	cy	$ 6	$ 240,000	Based on 11 acres of eco-cap with 2' soil cover offsite NW borrow
Biotic barrier (200 mil Geonet)	0.0	acre	$ 21,800	$ -	Based on $0.50/sf per GSE Liner quote incl. tax, shipping
Drainage: V-drains, ditches	4,000	lf	$ 30	$ 120,000	Assume2500 lf of concrete V drains incl. Area 1 drainage channel
Erosion control BMPs for sideslopes, jute mesh, TRM	5	acre	$ 8,700	$ 44,000	Assume 5 acres of steep sides of RCF Pond need erosion control
Pond 13 - Lined Retention Basin connects to Wetlands					Pond 13_acres 1.90
Fill from borrow area to raise bottom	6,000	cy	$ 6	$ 36,000	Transport and compact borrow soil, raise bottom above WT and place liner to serve as retention basin that connects to wetlands
Foundation layer (2')	7,000	cy	$ 6	$ 42,000	Transport and compact borrow soil that is 2' thick
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	1.9	acre	$ 56,500	$ 107,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1')	3,500	cy	$ 6	$ 21,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	1.9	acre	$ 4,000	$ 8,000	Top soil and hydroseeding
Construct 11-acre Evaporation Pond, South of PSCT					
Excavation for new 11 acre pond bottom	74,000	cy	$ 6	$ 444,000	Assume new evap pond north of RCF is 700'x700' and excavation for new pond is 500'x400'x10' on the northern half of pond footprint
Foundation layer and Berm, Place and compact	74,000	cy	$ 6	$ 444,000	Place, compact for foundation and berm, grade bottom slope 2%
Construct sumps for leachate collection and leak detection	6	ls	$ 50,000	$ 300,000	Bottom sloped to sumps for leachate collection and leak detection filled with gravel and piping laid up the sideslope to a recovery tank
HDPE geomembrane, 60 mil, primary liner	14	acre	$ 34,800	$ 478,500	60 mil HDPE primary liner, 25% larger for sideslopes and anchor
Geonet 200 mil	14	acre	$ 21,750	$ 299,063	Intermediate drainage layer, 25% larger for sideslopes and anchor
HDPE geomembrane, 60 mil, secondary liner	14	acre	$ 34,800	$ 478,500	60 mil HDPE secondary liner, 25% larger for sideslopes and anchor
Foundation layer + 1' soil cover	54,000	cy	$ 6	$ 324,000	1' clean soil cover borrowed from northeast shore of A-Series Pond
Erosion control for sideslopes: jute mesh	4	acre	$ 8,700	$ 34,800	Use unit cost for jute mesh
Revegetation/hydroseeding	4	acre	$ 4,000	$ 16,000	Based on contractor unit cost

TABLE E-4-1
FS AREA 4 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost		Estimated Cost		Notes / Assumptions
			Capital Costs (continued)				
Ecological Protection - Evaporation Pond							Wildlife controls including outer fencing, netting, inner fencing, hazing
Eco-protection, outer fencing	8,000	lf	$	15	$	120,000	Chain link fence, 6' high, get-a-quote.com
Eco-protection, hazing (radar system)	1	ls	$	400,000	$	400,000	Bird-Avert system; 50% higher than for 6-acre pond
Eco-protection, drift fencing	8,000	lf	$	11	$	88,000	tin flashing material doitbest.com ($150 per 50-foot incl. tax) + labor ($100/hr x 2 workers x 8 weeks x 50 hrs); $3+$8/foot
Eco-protection, netting	11	acre	$	40,645	$	447,000	Material $0.60/sf for pond netting, online price at pondbiz.com; Framing material and labor $15k per acre
Initial Biological Surveys and Vegetation clearing	1	ls	$	80,000	$	80,000	Initial biosurveys every 3 months for 1st year
Stormwater Controls							
Stormwater ditches, bench roads/V-ditches	4,000	lf	$	30	$	120,000	Surface features for drainage - grading, swales, V-drains to drain RCF Pond and Pond 18 stormwater
Stormwater drain pipes	1,200	lf	$	100	$	120,000	Based on contractor unit cost quote
Stormwater inlet/outlet structures, rip-rap	1	ls	$	50,000	$	50,000	Based on contractor budgetary estimate
Culvert under RCF Road to Pond 13	250	lf	$	800	$	200,000	Based on contractor unit cost quote
Drainage channel, 750 ft for Area 1	750	lf	$	60	$	45,000	concrete channel, double unit cost for wider channel to Pond 13
Enhanced Evaporation System (New Evap Pond)							
TurboMist System to enhance evaporation, 80 gpm	1	ea	$	100,000	$	100,000	Assumed cost for 1 land-based turbo mister systems 80 gpm each based on quote from Slimline, maker of Turbomister
Remedial Monitoring/Sampling							
Air Monitoring/Sampling (during implementation)	120	samples	$	500	$	60,000	150 air/dust samples analyzed for VOCs, PCBs, DDT, metals
Soil Confirmation Sampling and Analysis	100	samples	$	100	$	10,000	Analyze for metals including 6010 total metals, Ba, Ni, Cr, Cu, soluble metals
Green Remediation	1	ls	$	50,000	$	50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control							
Construction QA/QC Program	1	ls	$	250,000	$	250,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$	50,000	$	50,000	Based on contractor quotes
			Direct Capital Total:		**$**	**8,620,000**	
Contingency - Pond Water Treatment (GAC+RO)							Contingency is relevant if ponds cannot be closed due to residual water that cannot be addressed by evaporation pond
GAC and Reverse Osmosis to treat pond water with high TDS for discharge under site specific NPDES permit	20,000,000	gal	$	0.1	$	2,000,000	Assume unit cost of $0.10/gallon for GAC/RO treatment based on verbal discussion with Siemens vendor
			Contingency (35%)		**$**	**3,017,000**	
			Direct Capital Total:		**$**	**13,637,000**	

TABLE E-4-1
FS AREA 4 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 8,620,000	$ 431,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 8,620,000	$ 259,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$ 8,620,000	$ 862,000	
Construction Management	5%	of	$ 8,620,000	$ 431,000	
			Total PM/CM Cost:	**$ 1,983,000**	
			Total Capital Cost:	**$ 17,603,000**	
Operation and Maintenance Costs					
Cap/Pond Inspection / Maintenance					
Pond, Storm channel, liner inspection and monitoring	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
Pond, Liner repair and maintenance/erosion control	1	year	$ 100,000	$ 100,000	Based on current site O&M costs
Evap Pond - Annual biological survey, Vegetation removal	1	year	$ 24,000	$ 24,000	Annual bio survey labor and reporting - 50% greater than 6-acre pond
Drainage, Culvert maintenance, monitoring	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
Utilities: electricity	1	year	$ 36,000	$ 36,000	Utilities for turbomister system, 40HP motor, 20HP pump, 30KW, operating 8 months per year
Misc: Equipment rentals / PID / FID / ODCs	1	year	$ 24,000	$ 24,000	
			Subtotal Annual O&M Cost:	$ 270,000	
			Contingency (50%)	$ 135,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 441,000**	

TABLE E-4-1
FS AREA 4 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace eco-protection drift fence, netting	1	5-year	$ 520,000	$ 520,000	Assumes replacement every 5 years
Replace eco-protection outer fence, radar system	1	10-year	$ 535,000	$ 535,000	Assumes replacement every 10 years
Evaporation Pond Sediment sampling (every 5 years)	6	5-year	$ 75,000	$ 450,000	Sampling sediment at 15 locations in A-Series Pond and analysis for inorganics/metals
Periodic dredging of sediment	1	20-year	$ 1,643,000	$ 1,643,000	Assume 6 acres of upper 12 inches of sediment is dredged ($50/cy) and sent to Kettleman for disposal as nonRCRA haz ($80/ton)
Replace EcoCap/Biotic barrier and Pond liners	1	50-year	$ 8,801,500	$ 8,801,500	Assume 1/2 of area of pond liner and cap would need to be replaced in a 50-year period

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$17,603		$17,603	$17,603	
Annual O&M Cost (post construction)	0 - 5	$2,825	$565	$2,588	$2,317	
Annual O&M Cost (post construction)	6 - 30	$17,373	$695	$10,438	$5,774	
Annual O&M Cost (post construction)	31 - 100	$67,120	$959	$11,505	$1,784	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$30,629,000**	**$25,694,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$42,134,000**	**$27,477,000**	

TABLE E-4-1
FS AREA 4 - ALTERNATIVE 2
Casmalia Resources Superfund Site
Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 18,271,914**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 457,758**	
				Periodic Cost, 5-year (2014):	**$ 643,560**	
				Periodic Cost, 10-year (2014):	**$ 555,330**	
				Periodic Cost, 20-year (2014):	**$ 1,705,434**	
				Periodic Cost, 50-year (2014):	**$ 9,135,957**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$18,272	$3,654	$16,249	$14,003	FS Area 4 remedy is expected to be constructed during the third and fourth construction seasons (2018 and 2019) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$2,932	$586	$2,686	$2,405	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$17,478	$699	$10,501	$5,809	
Annual O&M Cost (post construction)	31 - 100	$69,671	$995	$11,942	$1,851	
			Present Value of Capital	**$16,249,000**	**$14,003,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$13,187,000**	**$8,213,000**	
			Present Value of 100 Year O&M	**$25,129,000**	**$10,065,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$29,436,000**	**$22,217,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$41,378,000**	**$24,068,000**	

NOTES/ASSUMPTIONS
1. This alternative involves pumping existing pond water to the new evaporation pond located north of the RCF Pond.
2. The A-Series and RCF Pond will be graded and filled to raise the low lying areas of the ponds to ensure there is no groundwater intrusion.
3. The A-Series, Pond A-5 and Pond 13 will be lined with the following: foundation layer, geocomposite liner (HDPE membrane/geotextile), gravel and a soil cap.
4. Pond A-5 will be filled using WCSA excavation soil and lined to be used as a retention basin for capped RCRA Canyon stormwater.
5. Pond 18 will also be capped with a RCRA cap after the adjacent berm is knocked down to provide fill soil.
6. RCF Pond will be covered with an eco-cap that is sloped to drain water out of the RCF to Pond 13.
7. RCF Pond will include a drainage channel that conveys clean stormwater out of the Capped Landfills.
8. Stormwater from the capped RCRA Canyon, the Capped Landfills and the eco-capped RCF will be drained out through or around the wetlands through Pond 13.

TABLE E-4-2
FS AREA 4 -ALTERNATIVE 3
Casmalia Resources Superfund Site
Feasibility Study

Remedial Alternative: ALT 3 - Eco-Cap (RCF Pond, Segregate East RCF) (2') + Construct Lined Evaporation Pond (A-Series Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring

Alternative Description: This alternative involves managing pumping liquids in the existing stormwater ponds as discussed in detail in the FS (the management plan utilizes to a new lined evaporation pond which is constructed in the footprint of the at the location of the A-Series Pond) (Figure 11-18A). The RCF Pond is lined with an eco-cap after it is drained. The RCF Pond is partially filled to raise the western portion of the pond bottom to 415 ft MSL while and the east end of the RCF is segregated with a 5-foot high berm. The A-Series Pond bottom is raised to 425 ft MSL with fill soil from the northeast shore line (which and that excavation also serves to expand the size of the new evaporation pond to 11 acres). The A-Series Pond bottom is then lined with a geocomposite HDPE liner to convert it to thean evaporation pond. Pond 18 is capped with a RCRA cap and graded to allow stormwater to sheet flow south to the A-Series Pond. The other ponds (Pond A-5 and 13) are filled to raise the pond bottom and then lined to serve as retention basins that drain storm water through or around the wetlands and discharge offsite to the B drainage under the site's General NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Pre-Remedial Testing					
Site Investigation/Delineation/Reporting	1	ls	$ 150,000	$ 150,000	Addtnl investigations (env., geotech, geophys); refine nature & extent
Geotechnical testing/Geophysical Investigation	1	ls	$ -	$ -	
Site Work					
Pump existing pond water to new evap pond	1	ls	$ 5,000	$ 5,000	Assumed cost for transferring pond water to new evaporation pond
Dust controls	80	ls	$ 1,000	$ 80,000	Based on contractor unit cost-water truck-4 mths, 80 days
Pond A-5 - Lined Retention Basin					
Fill from WCSA excavation/transport/compact	40,000	cy	$ 6	$ 240,000	Transport and compact WCSA 5' excav soil, raise bottom and place liner to serve as retention basin; 49,000 cy - 9,000 cy = 40,000 cy
Foundation layer (2')	9,000	cy	$ 6	$ 54,000	Transport and compact 2' foundation layer soil. Use WCSA excav soil as fill
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	2.5	acre	$ 56,500	$ 141,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1'): borrow and compact	4,400	cy	$ 6	$ 26,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	2.5	acre	$ 4,000	$ 10,000	Top soil and hydroseeding
Pond 18 - RCRA Cap					
Cut/Fill (grading)	8,000	cy	$ 4	$ 32,000	Volume from CAD figure; Knockdown dike adjacent to A-Series Pond and raise pond bottom with fill and compact
Foundation layer (2'): borrow dike and compact	10,000	cy	$ 4	$ 40,000	Borrow soils from dike excavation
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote incl. tax, shipping
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf for 60 mil HDPE liner per GSE Liner quote, tax
Geocomposite 200 mil fabrinet, (matl+labor)	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl. tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote incl. tax
Vegetative cover (2')	10,000	cy	$ 6	$ 60,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding

TABLE E-4-2
FS AREA 4 -ALTERNATIVE 3
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
A-Series Pond - Lined Evaporation Pond					A-Series proposed (acres) 11.00
Cut Pont NE shoreline, fill Pond bottom	48,000	cy	$ 6	$ 288,000	Cut soil from NE shoreline to expand pond and obtain fill for pond bottom
Additional Fill for Pond bottom	37,000	cy	$ 6	$ 222,000	Additional fill to raise bottom to 425' MSL based on CAD estimate including foundation layer
Construct sumps for leachate collection and leak detection	6	ls	$ 50,000	$ 300,000	Bottom sloped to sumps for leachate collection and leak detection filled with gravel and piping laid up the sideslope to a recovery tank
HDPE geomembrane, 60 mil, primary liner	14	acre	$ 34,800	$ 478,500	60 mil HDPE primary liner, 25% larger for sideslopes and anchor
Geonet 200 mil	14	acre	$ 21,750	$ 299,063	Intermediate drainage layer, 25% larger for sideslopes and anchor
HDPE geomembrane, 60 mil, secondary liner	14	acre	$ 34,800	$ 478,500	60 mil HDPE secondary liner, 25% larger for sideslopes and anchor
Foundation layer + 1' soil cover	54,000	cy	$ 6	$ 324,000	1' clean soil cover borrowed from northeast shore of A-Series Pond
Ecological Protection - Evaporation Pond					Wildlife controls including outer fencing, netting, inner fencing, hazing
Eco-protection, outer fencing	8,000	lf	$ 15	$ 120,000	Chain link fence, 6' high, get-a-quote.com
Eco-protection, hazing (radar system)	1	ls	$ 400,000	$ 400,000	Bird-Avert system; 50% higher than for 6-acre pond
Eco-protection, drift fencing	8,000	lf	$ 11	$ 88,000	tin flashing material doitbest.com ($150 per 50-foot incl. tax) + labor ($100/hr x 2 workers x 8 weeks x 50 hrs); $3+$8/foot
Eco-protection, netting	11	acre	$ 40,645	$ 447,000	Material $0.60/sf for pond netting, online price at pondbiz.com; Framing material and labor $15k per acre
Initial Biological Surveys and Vegetation clearing	1	ls	$ 80,000	$ 80,000	Initial biosurveys every 3 months for 1st year
RCF Pond - Eco Cap West RCF (8.6 ac) + Berm to segregate East RCF (2.8 ac)					RCF Pond Area (acres) 11.40
Raise Pond Bottom: Borrow and compact	55,000	cy	$ 6	$ 330,000	Raise pond bottom well above modeled GW level 390-400 MSL to 415 MSL on west RCF. Borrow soil from Offsite NW borrow area
Ecocap Soil cover (2')	37,000	cy	$ 6	$ 222,000	Based on 10.4 acres of eco-cap with 2' soil cover because 1 acre taken up by berm
Biotic barrier (200 mil Geonet)	0.0	acre	$ 21,800	$ -	Based on $0.50/sf per GSE Liner quote incl. tax, shipping
Construct berms, 750 feet long, 5' high, 25' wide	6,000	cy	$ 12	$ 72,000	Clean import fill from borrow area, transport and compact for berm; 750 ft long, 25 ft wide, 5 to 8 ft high
Drainage: V-drains, ditches	3,000	lf	$ 30	$ 90,000	Assume 3,000 ft of concrete drains incl. diversion ditch above RCF
Erosion control BMPs for sideslopes, jute mesh, TRM	5	acre	$ 8,700	$ 44,000	Assume 5 acres of steep sides of RCF Pond need erosion control
Pond 13 - Lined Retention Basin connects to Wetlands					
Fill from borrow area to raise bottom	6,000	cy	$ 6	$ 36,000	Transport and compact borrow soil, raise bottom above WT and place liner to serve as retention basin that connects to wetlands
Foundation layer (2')	7,000	cy	$ 6	$ 42,000	Transport and compact borrow soil that is 2' thick
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	1.9	acre	$ 56,500	$ 107,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1')	3,500	cy	$ 6	$ 21,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	1.9	acre	$ 4,000	$ 8,000	Top soil and hydroseeding

TABLE E-4-2
FS AREA 4 -ALTERNATIVE 3
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Stormwater Controls					
Stormwater ditches, bench roads/V-ditches	3,000	lf	$ 30	$ 90,000	Surface features for drainage - grading, swales, V-drains to drain RCF Pond and Pond 18 stormwater; use 25% less drains
Stormwater drain pipes	1,200	lf	$ 100	$ 120,000	Based on contractor unit cost quote
Stormwater inlet/outlet structures, rip-rap	1	ls	$ 50,000	$ 50,000	Based on contractor budgetary estimate
Culvert under RCF Road to Pond 13	250	lf	$ 800	$ 200,000	Based on contractor unit cost quote
Drainage channel, 750 ft for Area 1 drainage	750	lf	$ 60	$ 45,000	concrete channel, double unit cost for wider channel to Pond 13
Enhanced Evaporation System (A-Series Evap Pond)					
TurboMist System to enhance evaporation, 80 gpm	1	ea	$ 100,000	$ 100,000	Assumed cost for 1 land-based turbo mister systems 80 gpm each based on quote from Slimline, maker of Turbomister
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	120	samples	$ 500	$ 60,000	150 air/dust samples analyzed for VOCs, PCBs, DDT, metals
Compaction testing: Geotech engr	100	days	$ 500	$ 50,000	100 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	100	samples	$ 100	$ 10,000	Analyze for metals including 6010 total metals, Ba, Ni, Cr, Cu, soluble metals
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 7,111,000**	
Contingency - Pond Water Treatment (GAC+RO)					Contingency is relevant if ponds cannot be closed due to residual water that cannot be addressed by evaporation pond
GAC and Reverse Osmosis to treat pond water with high TDS for discharge under site specific NPDES permit	20,000,000	gal	$ 0.10	$ 2,000,000	Assume unit cost of $0.10/gallon for GAC/RO treatment based on verbal discussion with Siemens vendor
			Contingency (35%)	**$ 2,489,000**	
			Direct Capital Total:	**$ 11,600,000**	

TABLE E-4-2
FS AREA 4 -ALTERNATIVE 3
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 7,111,000	$ 356,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 7,111,000	$ 213,000	
EPA Oversight Costs	10%	of	$ 7,111,000	$ 711,000	
Construction Management	5%	of	$ 7,111,000	$ 356,000	
			Total PM/CM Cost:	**$ 1,636,000**	
			Total Capital Cost:	**$ 13,236,000**	
Operation and Maintenance Costs					
Cap/Pond Inspection / Maintenance					
Pond, Storm channel, liner inspection and monitoring	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
Pond, Liner repair and maintenance/erosion control	1	year	$ 100,000	$ 100,000	Based on current site O&M costs
Evap Pond - Annual biological survey, Vegetation removal	1	year	$ 24,000	$ 24,000	Annual bio survey labor and reporting - 50% greater than 6-acre pond
Drainage, Culvert maintenance, monitoring	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
Utilities: electricity	1	year	$ 36,000	$ 36,000	Utilities for turbomister system, 40HP motor, 20HP pump, 30KW, operating 8 months per year
Misc: Equipment rentals / PID / FID / ODCs	1	year	$ 24,000	$ 24,000	
			Subtotal Annual O&M Cost:	$ 270,000	
			Contingency (50%):	$ 135,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 441,000**	

TABLE E-4-2
FS AREA 4 -ALTERNATIVE 3
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace eco-protection drift fence, netting	1	5-year	$ 535,000	$ 535,000	Assumes replacement every 5 years
Replace eco-protection outer fence, radar system	1	10-year	$ 520,000	$ 520,000	Assumes replacement every 10 years
Evaporation Pond Sediment sampling (every 5 years)	6	5-year	$ 75,000	$ 450,000	Sampling sediment at 15 locations in A-Series Pond and analysis for inorganics/metals
Periodic dredging of sediment	1	20-year	$ 1,643,000	$ 1,643,000	Assume 6 acres of upper 12 inches of sediment is dredged ($50/cy) and sent to Kettleman for disposal as nonRCRA haz ($80/ton)
Replace EcoCap/Biotic barrier and Pond liners	1	50-year	$ 6,618,000	$ 6,618,000	Assume 1/2 of capital cost of pond liner and cap would need to be replaced in a 100-year period

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$13,236		$13,236	$13,236	
Annual O&M Cost (post construction)	0 - 5	$2,840	$568	$2,601	$2,329	
Annual O&M Cost (post construction)	6 - 30	$17,403	$696	$10,456	$5,784	
Annual O&M Cost (post construction)	31 - 100	$62,858	$898	$10,774	$1,670	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$26,294,000**	**$21,349,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$37,068,000**	**$23,019,000**	

TABLE E-4-2
FS AREA 4 -ALTERNATIVE 3
Casmalia Resources Superfund Site
Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 13,738,968**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 457,758**	
				Periodic Cost, 5-year (2014):	**$ 659,130**	
				Periodic Cost, 10-year (2014):	**$ 539,760**	
				Periodic Cost, 20-year (2014):	**$ 1,705,434**	
				Periodic Cost, 50-year (2014):	**$ 6,869,484**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$13,739	$2,748	$12,218	$10,529	FS Area 4 remedy is expected to be constructed during the third and fourth construction seasons (2018 and 2019) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$2,948	$590	$2,700	$2,417	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$17,525	$701	$10,529	$5,824	
Annual O&M Cost (post construction)	31 - 100	$65,247	$932.09	$11,184	$1,734	
			Present Value of Capital	**$12,218,000**	**$10,529,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$13,229,000**	**$8,242,000**	
			Present Value of 100 Year O&M	**$24,413,000**	**$9,976,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$25,447,000**	**$18,771,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$36,631,000**	**$20,505,000**	

NOTES/ASSUMPTIONS

1. This alternative involves pumping existing pond water to the new evaporation pond located on the footprint of the existing A-Series Pond.
2. The A-Series and RCF Pond will be graded and filled to raise the low lying areas of the ponds to ensure there is no groundwater intrusion.
3. Pond A-5 and Pond 13 will be lined with the following: foundation layer, geocomposite liner (HDPE membrane/geotextile), gravel and a soil cap.
4. Pond A-5 will be filled using WCSA excavation soil and lined to be used as a retention basin for capped RCRA Canyon stormwater.
5. Pond 18 will also be capped with a RCRA cap after the adjacent berm is knocked down to provide fill soil.
6. RCF Pond will be covered with an eco-cap that is sloped to drain water out of the RCF to Pond 13.
7. RCF Pond will include a drainage channel that conveys clean stormwater out of the Capped Landfills.
8. Stormwater from the capped RCRA Canyon, the Capped Landfills and the eco-capped RCF will be drained out through or around the wetlands through Pond 13.

TABLE E-4-3
FS AREA 4 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Feasibility Study

Remedial Alternative: ALT 4 - Eco-Cap (RCF Pond) (2') + Construct 11-acre Lined Evaporation Pond (A-Series Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring

Alternative Description: This alternative involves managing liquids in the existing stormwater ponds as discussed in detail in the FS. The RCF Pond is lined with an eco-cap after it is drained and the pond bottom is raised to 415 feet MSL with borrow soil (Figure 11-19A). The A-Series Pond bottom is raised to 425 feet MSL with fill soil from the northeast shore line (which also serves to expand the size of the new evaporation pond to 11 acres). The A-Series Pond bottom is then lined with a dual HDPE liner to convert it to the evaporation pond. Pond 18 is capped with a RCRA cap and graded to allow stormwater to sheet flow south to the A-Series Pond. The other ponds (Pond A-5 and 13) are filled to raise the pond bottom and then lined to serve as retention basins that drain storm water through or around the wetlands and discharge offsite to the B drainage under the site's General NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Pre-Remedial Testing					
Site Investigation/Delineation/Reporting	1	ls	$ 150,000	$ 150,000	Addtnl investigations (env., geotech, geophys); refine nature & extent
Geotechnical testing/Geophysical Investigation	1	ls	$ -	$ -	
Site Work					
Pump existing pond water to new evap pond	1	ls	$ 5,000	$ 5,000	Assumed cost for transferring pond water to new evaporation pond
Dust controls	80	ls	$ 1,000	$ 80,000	Based on contractor unit cost-water truck-4 mths, 80 days
Pond A-5 - Lined Retention Basin					
Fill from WCSA excavation/transport/compact	40,000	cy	$ 6	$ 240,000	Transport and compact WCSA 5' excav soil, raise bottom and place liner to serve as retention basin; 49,000 cy - 9,000 cy = 40,000 cy
Foundation layer (2')	9,000	cy	$ 6	$ 54,000	Transport and compact 2' foundation layer soil. Use WCSA excav soil as fill
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	2.5	acre	$ 56,500	$ 141,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1'): borrow and compact	4,400	cy	$ 6	$ 26,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	2.5	acre	$ 4,000	$ 10,000	Top soil and hydroseeding
Pond 18 - RCRA Cap					
Cut/Fill (grading)	8,000	cy	$ 4	$ 32,000	Volume from CAD figure; Knockdown dike adjacent to A-Series Pond and raise pond bottom with fill and compact
Foundation layer (2'): borrow dike and compact	10,000	cy	$ 4	$ 40,000	Borrow soils from dike excavation
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote incl. tax, shipping
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf for 60 mil HDPE liner per GSE Liner quote, tax
Geocomposite 200 mil fabrinet, (matl+labor)	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl. tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote incl. tax
Vegetative cover (2')	10,000	cy	$ 6	$ 60,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding

TABLE E-4-3
FS AREA 4 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
A-Series Pond - Lined Evaporation Pond, 11-acre					A-Series large evap pond (acres) 11.00
Cut Pont NE shoreline, fill Pond bottom	48,000	cy	$ 6	$ 288,000	Cut soil from NE shoreline to expand pond and obtain fill for pond bottom
Additional Fill for Pond bottom	37,000	cy	$ 6	$ 222,000	Additional fill to raise bottom to 425' MSL based on CAD estimate including foundation layer
Construct sumps for leachate collection and leak detection	6	ls	$ 50,000	$ 300,000	Bottom sloped to sumps for leachate collection and leak detection filled with gravel and piping laid up the sideslope to a recovery tank
HDPE geomembrane, 60 mil, primary liner	14	acre	$ 34,800	$ 478,500	60 mil HDPE primary liner, 25% larger for sideslopes and anchor
Geonet 200 mil	14	acre	$ 21,750	$ 299,063	Intermediate drainage layer, 25% larger for sideslopes and anchor
HDPE geomembrane, 60 mil, secondary liner	14	acre	$ 34,800	$ 478,500	60 mil HDPE secondary liner, 25% larger for sideslopes and anchor
Foundation layer + 1' soil cover	54,000	cy	$ 6	$ 324,000	1' clean soil cover borrowed from northeast shore of A-Series Pond
Ecological Protection - Evaporation Pond					Wildlife controls including outer fencing, netting, inner fencing, hazing
Eco-protection, outer fencing	8,000	lf	$ 15	$ 120,000	Chain link fence, 6' high, get-a-quote.com
Eco-protection, hazing (radar system)	1	ls	$ 400,000	$ 400,000	Bird-Avert system, 50% higher than for 6-acre pond
Eco-protection, drift fencing	8,000	lf	$ 11	$ 88,000	tin flashing material doitbest.com ($150 per 50-foot incl. tax) + labor ($100/hr x 2 workers x 8 weeks x 50 hrs); $3+$8/foot
Eco-protection, netting	11	acre	$ 40,645	$ 447,000	Material $0.60/sf for pond netting, online price at pondbiz.com; Framing material and labor $15k per acre
Initial Biological Surveys and Vegetation clearing	1	ls	$ 80,000	$ 80,000	Initial biosurveys every 3 months for 1st year
RCF Pond - Eco Cap (2')					RCF Pond_acres 11.40
Fill to raise pond bottom: Borrow and compact	95,000	cy	$ 6	$ 570,000	Raise pond bottom well above 415 MSL minimum on east end with 1% slope; estimated by CAD; Borrow soil from NW borrow area
Soil cover (2'): Borrow and compact	40,000	cy	$ 6	$ 240,000	Based on 11 acres of eco-cap with 1' soil cover offsite NW borrow
Biotic barrier (200 mil Geonet)	0	acre	$ 21,800	$ -	Based on $0.50/sf per GSE Liner quote incl. tax, shipping
Drainage: V-drains, ditches	4,000	lf	$ 30	$ 120,000	Assume2500 lf of concrete V drains; Area 1 drainage is not included
Erosion control BMPs for sideslopes, jute mesh, TRM	5	acre	$ 8,700	$ 44,000	Assume 5 acres of steep sides of RCF Pond need erosion control
Pond 13 - Lined Retention Basin connects to Wetlands					
Fill from borrow area to raise bottom	6,000	cy	$ 6	$ 36,000	Transport and compact borrow soil, raise bottom above WT and place liner to serve as retention basin that connects to wetlands
Foundation layer (2')	7,000	cy	$ 6	$ 42,000	Transport and compact borrow soil that is 2' thick
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	1.9	acre	$ 56,500	$ 107,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1')	3,500	cy	$ 6	$ 21,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	1.9	acre	$ 4,000	$ 8,000	Top soil and hydroseeding

TABLE E-4-3
FS AREA 4 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Stormwater Controls					
Stormwater ditches, bench roads/V-ditches	3,000	lf	$ 30	$ 90,000	Surface features for drainage - grading, swales, V-drains to drain RCF Pond and Pond 18 stormwater; use 25% less drains
Stormwater drain pipes	1,200	lf	$ 100	$ 120,000	Based on contractor unit cost quote
Stormwater inlet/outlet structures, rip-rap	1	ls	$ 50,000	$ 50,000	Based on contractor budgetary estimate
Culvert under RCF Road to Pond 13	250	lf	$ 800	$ 200,000	Based on contractor unit cost quote
Drainage channel, 750 ft	750	lf	$ 60	$ 45,000	concrete channel, double unit cost for wider channel
Enhanced Evaporation System (A-Series Evap Pond)					
TurboMist System to enhance evaporation, 80 gpm	1	ea	$ 100,000	$ 100,000	Assumed cost for 1 land-based turbo mister system 80 gpm based on quote from Slimline, maker of Turbomister
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	120	samples	$ 500	$ 60,000	150 air/dust samples analyzed for VOCs, PCBs, DDT, metals
Compaction testing: Geotech engr	100	days	$ 500	$ 50,000	100 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	100	samples	$ 100	$ 10,000	Analyze for metals including 6010 total metals, Ba, Ni, Cr, Cu, soluble metals
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 7,327,000**	
Contingency - Pond Water Treatment (GAC+RO)					Contingency is relevant if ponds cannot be closed due to residual water that cannot be addressed by evaporation pond
GAC and Reverse Osmosis to treat pond water with high TDS for discharge under site specific NPDES permit	20,000,000	gal	$ 0.10	$ 2,000,000	Assume unit cost of $0.10/gallon for GAC/RO treatment based on verbal discussion with Siemens vendor
			Contingency (35%)	**$ 2,564,000**	
			Direct Capital Total:	**$ 11,891,000**	

TABLE E-4-3
FS AREA 4 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 7,327,000	$ 366,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 7,327,000	$ 220,000	
EPA Oversight Costs	10%	of	$ 7,327,000	$ 733,000	
Construction Management	5%	of	$ 7,327,000	$ 366,000	
			Total PM/CM Cost:	**$ 1,685,000**	
			Total Capital Cost:	**$ 13,576,000**	
Operation and Maintenance Costs					
Cap/Pond Inspection / Maintenance					
Pond, Storm channel, liner inspection and monitoring	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
Pond, Liner repair and maintenance/erosion control	1	year	$ 100,000	$ 100,000	Based on current site O&M costs
Evap Pond - Annual biological survey, Vegetation removal	1	year	$ 24,000	$ 24,000	Annual bio survey labor and reporting - 50% greater than 6-acre pond
Drainage, Culvert maintenance, monitoring	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
Utilities: electricity	1	year	$ 36,000	$ 36,000	Utilities for turbomister system, 40HP motor, 20HP pump, 30KW, operating 8 months per year
Misc: Equipment rentals / PID / FID / ODCs	1	year	$ 24,000	$ 24,000	
			Subtotal Annual O&M Cost:	$ 270,000	
			Contingency (50%):	$ 135,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 441,000**	

TABLE E-4-3
FS AREA 4 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace eco-protection drift fence, netting	1	5-year	$ 535,000	$ 535,000	Assumes replacement every 5 years
Replace eco-protection outer fence, radar system	1	10-year	$ 520,000	$ 520,000	Assumes replacement every 10 years
Evaporation Pond Sediment sampling (every 5 years)	6	5-year	$ 75,000	$ 450,000	Sampling sediment at 15 locations in A-Series Pond and analysis for inorganics/metals
Periodic dredging of sediment	1	20-year	$ 1,643,000	$ 1,643,000	Assume 6 acres of upper 12 inches of sediment is dredged ($50/cy) and sent to Kettleman for disposal as nonRCRA haz ($80/ton)
Replace EcoCap/Biotic barrier and Pond liners	1	50-year	$ 6,788,000	$ 6,788,000	Assume 1/2 of capital cost of pond liner and cap would need to be replaced in a 100-year period

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$13,576		$13,576	$13,576	
Annual O&M Cost (post construction)	0 - 5	$2,840	$568	$2,601	$2,329	
Annual O&M Cost (post construction)	6 - 30	$16,883	$675	$10,144	$5,611	
Annual O&M Cost (post construction)	31 - 100	$63,198	$903	$10,833	$1,679	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$26,321,000**	**$21,516,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$37,154,000**	**$23,195,000**	

TABLE E-4-3
FS AREA 4 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
Total Capital Cost (2014):					**$ 14,091,888**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost, Annual (2014):					**$ 457,758**	
Periodic Cost, 5-year (2014):					**$ 659,130**	
Periodic Cost, 10-year (2014):					**$ 539,760**	
Periodic Cost, 20-year (2014):					**$ 1,705,434**	
Periodic Cost, 50-year (2014):					**$ 7,045,944**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$14,092	$2,818.38	$12,531	$10,800	FS Area 4 remedy is expected to be constructed during the third and fourth construction seasons (2018 and 2019) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$2,948	$590	$2,700	$2,417	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$17,525	$700.98	$10,529	$5,824	
Annual O&M Cost (post construction)	31 - 100	$65,600	$937.14	$11,244	$1,743	
Present Value of Capital				**$12,531,000**	**$10,800,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M				**$13,229,000**	**$8,242,000**	
Present Value of 100 Year O&M				**$24,474,000**	**$9,985,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$25,761,000**	**$19,042,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)				**$37,005,000**	**$20,785,000**	

NOTES/ASSUMPTIONS

1. This alternative involves pumping existing pond water to the new evaporation pond located on the footprint of the existing A-Series Pond.
2. The A-Series and RCF Pond will be graded and filled to raise the low lying areas of the ponds to ensure there is no groundwater intrusion.
3. Pond A-5 and Pond 13 will be lined with the following: foundation layer, geocomposite liner (HDPE membrane/geotextile), gravel and a soil cap.
4. Pond A-5 will be filled using WCSA excavation soil and lined to be used as a retention basin for capped RCRA Canyon stormwater.
5. Pond 18 will also be capped with a RCRA cap after the adjacent berm is knocked down to provide fill soil.
6. RCF Pond will be covered with an eco-cap that is sloped to drain water out of the RCF to Pond 13.
7. RCF Pond will include a drainage channel that conveys clean stormwater out of the Capped Landfills.
8. Stormwater from the capped RCRA Canyon, the Capped Landfills and the eco-capped RCF will be drained out through or around the wetlands through Pond 13.

TABLE E-4-4
FS AREA 4 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Feasibility Study

Remedial Alternative: Eco-Cap (RCF Pond, portion of A-Series Pond) + Construct 6-acre Lined Evaporation Pond (A-Series Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring

Alternative Description: This alternative involves managing liquids in existing stormwater ponds as discussed in detail in the FS. The RCF Pond is lined with an eco-cap after it is drained and the bottom raised to 415 feet MSL across the entire pond (Figure 11-20A). The A-Series Pond bottom is raised to 425 feet MSL with fill soil from the northeast shore line and a portion of the A-Series Pond is then converted to a 6-acre lined evaporation pond using a dual HDPE liner with the remaining area (5 acres) covered with an eco-cap. Pond 18 is capped with a RCRA cap and graded to allow stormwater to sheet flow south to the A-Series Pond. The eco-caps on the RCF and A-Series Ponds would be sloped to direct stormwater towards Pond 13 and then to the wetlands. The other ponds (Pond A-5 and 13) are backfilled with soil and lined to serve as retention basins to drain storm water through or around the wetlands and discharge offsite to the B-Drainage under the site's General NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Pre-Remedial Testing					
Site Investigation/Delineation/Reporting	1	ls	$ 150,000	$ 150,000	Addtnl investigations (env., geotech, geophys); refine nature & extent
Geotechnical testing/Geophysical Investigation	1	ls	$ -	$ -	
Site Work					
Pump existing pond water to new evap pond	1	ls	$ 5,000	$ 5,000	Assumed cost for transferring pond water to new evaporation pond
Dust controls	80	ls	$ 1,000	$ 80,000	Based on contractor unit cost-water truck-4 mths, 80 days
Pond A-5 - Lined Retention Basin					
Fill from WCSA excavation/transport/compact	40,000	cy	$ 6	$ 240,000	Transport and compact WCSA 5' excav soil, raise bottom and place liner to serve as retention basin; 49,000 cy - 9,000 cy = 40,000 cy
Foundation layer (2')	9,000	cy	$ 6	$ 54,000	Transport and compact 2' foundation layer soil. Use WCSA excav soil as fill
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	2.5	acre	$ 56,500	$ 141,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1'): borrow and compact	4,400	cy	$ 6	$ 26,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	2.5	acre	$ 4,000	$ 10,000	Top soil and hydroseeding
Pond 18 - RCRA Cap					
Cut/Fill (grading)	8,000	cy	$ 4	$ 32,000	Volume from CAD figure; Knockdown dike adjacent to A-Series Pond and raise pond bottom with fill and compact
Foundation layer (2'): borrow dike and compact	10,000	cy	$ 4	$ 40,000	Borrow soils from dike excavation
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote incl. tax, shipping
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf for 60 mil HDPE liner per GSE Liner quote, tax
Geocomposite 200 mil fabrinet, (matl+labor)	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl. tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote incl. tax
Vegetative cover (2')	10,000	cy	$ 6	$ 60,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding

TABLE E-4-4
FS AREA 4 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
A-Series Pond - Lined Evaporation Pond, 6-acre+ecocap					A-Series small evap pond (acres) 6.00
Cut Pont NE shoreline, fill Pond bottom	48,000	cy	$ 6	$ 288,000	Cut soil from NE shoreline to expand pond and obtain fill for pond bottom
Additional Fill for Pond bottom	35,000	cy	$ 6	$ 210,000	Additional fill to raise bottom to 425' MSL based on CAD estimate
Berm construction for six 1-acre pond cells	46,000	cy	$ 6	$ 276,000	Based on CAD estimate
Construct sumps for leachate collection and leak detection	6	ls	$ 50,000	$ 300,000	Bottom sloped to sumps for leachate collection and leak detection filled with gravel and piping laid up the sideslope to a recovery tank
HDPE geomembrane, 60 mil, primary liner	9	acre	$ 34,800	$ 313,200	60 mil HDPE primary liner, 50% larger for sideslopes and anchor
Geonet 200 mil	9	acre	$ 21,750	$ 195,750	Intermediate drainage layer, 50% larger for sideslopes and anchor
HDPE geomembrane, 60 mil, secondary liner	9	acre	$ 34,800	$ 313,200	60 mil HDPE secondary liner, 50% larger for sideslopes and anchor
Foundation layer + 1' soil cover	41,400	cy	$ 6	$ 248,000	1' clean soil cover borrowed from northeast shore of A-Series Pond
Ecological Protection - Evaporation Pond					Wildlife controls including outer fencing, netting, inner fencing, hazing
Eco-protection, outer fencing	4,000	lf	$ 15	$ 60,000	Chain link fence, 6' high, get-a-quote.com
Eco-protection, hazing (radar system)	1	ls	$ 250,000	$ 250,000	Bird-Avert system
Eco-protection, drift fencing	4,000	lf	$ 11	$ 44,000	tin flashing material doitbest.com ($150 per 50-foot incl. tax) + labor ($100/hr x 2 workers x 8 weeks x 50 hrs); $3+$8/foot
Eco-protection, netting	6	acre	$ 40,645	$ 244,000	Material $0.60/sf for pond netting, online price at pondbiz.com; Framing material and labor $15k per acre
Initial Biological Surveys and Vegetation clearing	1	ls	$ 50,000	$ 50,000	Initial biosurveys every 3 months for 1st year
A-Series Pond remaining area - Eco Cap (2'), 5 acres					A-Series remaining area 5.00
Soil cover (2'): Borrow and compact	18,000	cy	$ 6	$ 108,000	Based on 11 acres of eco-cap with 1' soil cover offsite NW borrow
Biotic barrier (200 mil Geonet)	0	acre	$ 21,800	$ -	Based on $0.50/sf per GSE Liner quote incl. tax, shipping
Drainage: V-drains, ditches	1,000	lf	$ 30	$ 30,000	Assume2500 lf of concrete V drains incl. Area 1 drainage channel
Erosion control BMPs for sideslopes, jute mesh, TRM	1.0	acre	$ 8,700	$ 9,000	Assume 50% of remaining A-Series Pond need erosion control
RCF Pond - Eco Cap (2')					RCF Pond_acres 11.40
Fill to raise pond bottom: Borrow and compact	95,000	cy	$ 6	$ 570,000	Raise pond bottom well above 415 MSL minimum on east end with 1% slope; estimated by CAD; Borrow soil from NW borrow area
Soil cover (2'): Borrow and compact	40,000	cy	$ 6	$ 240,000	Based on 11 acres of eco-cap with 2' soil cover offsite NW borrow
Biotic barrier (200 mil Geonet)	0	acre	$ 21,800	$ -	Based on $0.50/sf per GSE Liner quote incl. tax, shipping
Drainage: V-drains, ditches	4,000	lf	$ 30	$ 120,000	Assume2500 lf of concrete V drains incl. Area 1 drainage channel
Erosion control BMPs for sideslopes, jute mesh, TRM	5	acre	$ 8,700	$ 44,000	Assume 5 acres of steep sides of RCF Pond need erosion control

TABLE E-4-4
FS AREA 4 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Pond 13 - Lined Retention Basin connects to Wetlands					
Fill from borrow area to raise bottom	6,000	cy	$ 6	$ 36,000	Transport and compact borrow soil, raise bottom above WT and place liner to serve as retention basin that connects to wetlands
Foundation layer (2')	7,000	cy	$ 6	$ 42,000	Transport and compact borrow soil that is 2' thick
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	1.9	acre	$ 56,500	$ 107,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1')	3,500	cy	$ 6	$ 21,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	1.9	acre	$ 4,000	$ 8,000	Top soil and hydroseeding
Stormwater Controls					
Stormwater ditches, bench roads/V-ditches	3,000	lf	$ 30	$ 90,000	Surface features for drainage - grading, swales, V-drains to drain RCF Pond and Pond 18 stormwater; use 25% less drains
Stormwater drain pipes	1,200	lf	$ 100	$ 120,000	Based on contractor unit cost quote
Stormwater inlet/outlet structures, rip-rap	1	ls	$ 50,000	$ 50,000	Based on contractor budgetary estimate
Culvert under RCF Road to Pond 13	250	lf	$ 800	$ 200,000	Based on contractor unit cost quote
Drainage channel, 750 ft, Area 1 drainage	750	lf	$ 60	$ 45,000	concrete channel, double unit cost for wider channel to Pond 13
Enhanced Evaporation System (A-Series Evap Pond)					
TurboMist System to enhance evaporation, 80 gpm	1	ea	$ 100,000	$ 100,000	Assumed cost for 1 land-based turbo mister system 80 gpm based on quote from Slimline, maker of Turbomister
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	120	samples	$ 500	$ 60,000	150 air/dust samples analyzed for VOCs, PCBs, DDT, metals
Compaction testing: Geotech engr	100	days	$ 500	$ 50,000	100 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	100	samples	$ 100	$ 10,000	Analyze for metals including 6010 total metals, Ba, Ni, Cr, Cu, soluble metals
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 6,741,000**	
Contingency - Pond Water Treatment (GAC+RO)					Contingency is relevant if ponds cannot be closed due to residual water that cannot be addressed by evaporation pond
GAC and Reverse Osmosis to treat pond water with high TDS for discharge under site specific NPDES permit	20,000,000	gal	$ 0.10	$ 2,000,000	Assume unit cost of $0.10/gallon for GAC/RO treatment based on verbal discussion with Siemens vendor
			Contingency (35%)	**$ 2,359,000**	
			Direct Capital Total:	**$ 11,100,000**	

TABLE E-4-4
FS AREA 4 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 6,741,000	$ 337,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 6,741,000	$ 202,000	
EPA Oversight Costs	10%	of	$ 6,741,000	$ 674,000	
Construction Management	5%	of	$ 6,741,000	$ 337,000	
			Total PM/CM Cost:	**$ 1,550,000**	
			Total Capital Cost:	**$ 12,650,000**	
Operation and Maintenance Costs					
Cap/Pond Inspection / Maintenance					
Pond, Storm channel, liner inspection and monitoring	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
Evap Pond, Liner repair and maintenance/erosion control	1	year	$ 60,000	$ 60,000	Based on current site O&M costs; 60% of 11-acre evap pond
Evap Pond - Annual biological survey, vegetation removal	1	year	$ 18,000	$ 18,000	Annual bio survey labor and reporting
Drainage, Culvert maintenance, monitoring	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
Utilities: electricity	1	year	$ 36,000	$ 36,000	Utilities for turbomister system, 40HP motor, 20HP pump, 30KW, operating 8 months per year
Misc: Equipment rentals / PID / FID / ODCs	1	year	$ 24,000	$ 24,000	
			Subtotal Annual O&M Cost:	$ 224,000	
			Contingency (50%):	$ 112,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 372,000**	

TABLE E-4-4
FS AREA 4 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace eco-protection drift fence, netting	1	5-year	$ 288,000	$ 288,000	Assumes replacement every 5 years
Replace eco-protection outer fence, radar system	1	10-year	$ 310,000	$ 310,000	Assumes replacement every 5 years
Evaporation Pond Sediment sampling (every 5 years)	6	5-year	$ 50,000	$ 300,000	Sampling sediment at 10 locations in A-Series Pond and analysis for inorganics/metals
Periodic dredging of sediment	1	20-year	$ 822,000	$ 822,000	Assume 3 acres of upper 12 inches of sediment is dredged ($50/cy) and sent to Kettleman for disposal as nonRCRA haz ($80/ton)
Replace EcoCap and Pond liners	1	50-year	$ 6,325,000	$ 6,325,000	Assume 1/2 of capital cost of pond liner and cap would need to be replaced in a 100-year period

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$12,650		$12,650	$12,650	
Annual O&M Cost (post construction)	0 - 5	$2,223	$445	$2,036	$1,823	
Annual O&M Cost (post construction)	6 - 30	$12,557	$502	$7,545	$4,173	
Annual O&M Cost (post construction)	31 - 100	$48,880	$698	$8,378	$1,299	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$22,231,000**	**$18,646,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$30,609,000**	**$19,945,000**	

TABLE E-4-4
FS AREA 4 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 13,130,700**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 386,136**	
				Periodic Cost, 5-year (2014):	**$ 376,794**	
				Periodic Cost, 10-year (2014):	**$ 321,780**	
				Periodic Cost, 20-year (2014):	**$ 853,236**	
				Periodic Cost, 50-year (2014):	**$ 6,565,350**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$13,131	$2,626.14	$11,677	$10,063	FS Area 4 remedy is expected to be constructed during the third and fourth construction seasons (2018 and 2019) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$2,307	$461	$2,114	$1,892	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$13,034	$521	$7,831	$4,332	
Annual O&M Cost (post construction)	31 - 100	$50,737	$725	$8,697	$1,348	
			Present Value of Capital	**$11,677,000**	**$10,063,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$9,945,000**	**$6,224,000**	
			Present Value of 100 Year O&M	**$18,642,000**	**$7,572,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$21,621,000**	**$16,287,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$30,318,000**	**$17,636,000**	

NOTES/ASSUMPTIONS
1. This alternative involves pumping existing pond water to the new evaporation pond located on the footprint of the existing A-Series Pond.
2. The A-Series and RCF Pond will be graded and filled to raise the low lying areas of the ponds to ensure there is no groundwater intrusion.
3. Pond A-5 and Pond 13 will be lined with the following: foundation layer, geocomposite liner (HDPE membrane/geotextile), gravel and a soil cap.
4. Pond A-5 will be filled using WCSA excavation soil and lined to be used as a retention basin for capped RCRA Canyon stormwater.
5. Pond 18 will also be capped with a RCRA cap after the adjacent berm is knocked down to provide fill soil.
6. RCF Pond will be covered with an eco-cap that is sloped to drain water out of the RCF to Pond 13.
7. RCF Pond will include a drainage channel that conveys clean stormwater out of the Capped Landfills.
8. Stormwater from the capped RCRA Canyon, the Capped Landfills and the eco-capped RCF will be drained out through or around the wetlands through Pond 13.

TABLE E-4-5
FS AREA 4 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Feasibility Study

Remedial Alternative: Eco-Cap (RCF Pond, A-Series Pond) (2’) + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring

Alternative Description: This alternative involves managing liquids in the existing stormwater ponds as discussed in the FS. This alternative does not include an evaporation pond and complements the remedial alternatives in Area 5 groundwater where the groundwater is treated for both VOCs and inorganics. The RCF Pond is lined with an eco-cap after it is drained and the pond bottom is raised to 415 feet MSL with borrow soil (Figure 11-21A). The A-Series Pond bottom is raised to 425 feet MSL with fill soil from the northeast shore line and then covered with an eco-cap. Pond 18 is capped with a RCRA cap and graded to allow stormwater to sheet flow south to the A-Series Pond. The other ponds (Pond A-5 and 13) are filled to raise the pond bottom and then lined to serve as retention basins that drain storm water through or around the wetlands and then offsite to the B-drainage under the site’s General NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Pre-Remedial Testing					
Site Investigation/Delineation/Reporting	1	ls	$ 150,000	$ 150,000	Addtnl investigations (env., geotech, geophys); refine nature & extent
Geotechnical testing/Geophysical Investigation	1	ls	$ -	$ -	
Site Work					
Pump existing pond water to new evap pond	1	ls	$ 5,000	$ 5,000	Assumed cost for transferring pond water to new evaporation pond
Dust controls	120	ls	$ 1,000	$ 120,000	Based on contractor unit cost-water truck-4 mths, 80 days
Pond A-5 - Lined Retention Basin					
Fill from WCSA excavation/transport/compact	40,000	cy	$ 6	$ 240,000	Transport and compact WCSA 5' excav soil, raise bottom and place liner to serve as retention basin; 49,000 cy - 9,000 cy = 40,000 cy
Foundation layer (2')	9,000	cy	$ 6	$ 54,000	Transport and compact 2' foundation layer soil. Use WCSA excav soil as fill
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	2.5	acre	$ 56,500	$ 141,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1'): borrow and compact	4,400	cy	$ 6	$ 26,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	2.5	acre	$ 4,000	$ 10,000	Top soil and hydroseeding
Pond 18 - RCRA Cap					
Cut/Fill (grading)	8,000	cy	$ 4	$ 32,000	Volume from CAD figure; Knockdown dike adjacent to A-Series Pond and raise pond bottom with fill and compact
Foundation layer (2'): borrow dike and compact	10,000	cy	$ 4	$ 40,000	Borrow soils from dike excavation
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote incl. tax, shipping
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf for 60 mil HDPE liner per GSE Liner quote, tax
Geocomposite 200 mil fabrinet, (matl+labor)	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl. tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote incl. tax
Vegetative cover (2')	10,000	cy	$ 6	$ 60,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding

TABLE E-4-5
FS AREA 4 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
A-Series Pond - Eco Cap (2')					
Cut Pont NE shoreline, fill Pond bottom, foundation layer	85,000	cy	$ 6	$ 510,000	Cut soil from NE shoreline to expand pond and obtain fill for pond bottom to raise to 425' MSL minimum
Soil cover (2'): Borrow and compact	39,000	cy	$ 6	$ 234,000	Based on 11 acres of eco-cap with 1' soil cover offsite NW borrow
Biotic barrier (200 mil Geonet)	0	acre	$ 21,800	$ -	Based on $0.50/sf per GSE Liner quote incl. tax, shipping
Drainage: V-drains, ditches	4,000	lf	$ 30	$ 120,000	Assume2500 lf of concrete V drains incl. Area 1 drainage channel
Erosion control BMPs for sideslopes, jute mesh, TRM	5.0	acre	$ 8,700	$ 44,000	Assume 50% of remaining A-Series Pond need erosion control
RCF Pond - Eco Cap (2')					RCF Pond_acres 11.40
Fill to raise pond bottom: Borrow and compact	95,000	cy	$ 6	$ 570,000	Raise pond bottom well above 415 MSL minimum on east end with 1% slope; estimated by CAD; Borrow soil from NW borrow area
Soil cover (2'): Borrow and compact	40,000	cy	$ 6	$ 240,000	Based on 11 acres of eco-cap with 2' soil cover offsite NW borrow
Biotic barrier (200 mil Geonet)	0	acre	$ 21,800	$ -	Based on $0.50/sf per GSE Liner quote incl. tax, shipping
Drainage: V-drains, ditches	4,000	lf	$ 30	$ 120,000	Assume2500 lf of concrete V drains incl. Area 1 drainage channel
Erosion control BMPs for sideslopes, jute mesh, TRM	5	acre	$ 8,700	$ 44,000	Assume 5 acres of steep sides of RCF Pond need erosion control
Pond 13 - Lined Retention Basin connects to Wetlands					
Fill from borrow area to raise bottom	6,000	cy	$ 6	$ 36,000	Transport and compact borrow soil, raise bottom above WT and place liner to serve as retention basin that connects to wetlands
Foundation layer (2')	7,000	cy	$ 6	$ 42,000	Transport and compact borrow soil that is 2' thick
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	1.9	acre	$ 56,500	$ 107,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1')	3,500	cy	$ 6	$ 21,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	1.9	acre	$ 4,000	$ 8,000	Top soil and hydroseeding
Stormwater Controls					
Stormwater ditches, bench roads/V-ditches	9,000	lf	$ 30	$ 270,000	Surface features for drainage - grading, swales, V-drains to drain RCF, A-Series and Pond 18 stormwater
Stormwater drain pipes	3,600	lf	$ 100	$ 360,000	Based on contractor unit cost quote
Stormwater inlet/outlet structures, rip-rap	1	ls	$ 50,000	$ 50,000	Based on contractor budgetary estimate
Culvert under RCF Road to Pond 13	250	lf	$ 800	$ 200,000	Based on contractor unit cost quote
Drainage channel, 750 ft, Area 1 drainage	750	lf	$ 60	$ 45,000	concrete channel, double unit cost for wider channel to Pond 13
Enhanced Evaporation System (A-Series Evap Pond)					
TurboMist System to enhance evaporation, 80 gpm	0	ea	$ 100,000	$ -	

TABLE E-4-5
FS AREA 4 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	150	samples	$ 500	$ 75,000	150 air/dust samples analyzed for VOCs, PCBs, DDT, metals
Compaction testing: Geotech engr	200	days	$ 500	$ 100,000	200 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	150	samples	$ 100	$ 15,000	Analyze for metals including 6010 total metals, Ba, Ni, Cr, Cu, soluble metals
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 300,000	$ 300,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 5,190,000**	
Contingency - Pond Water Treatment (GAC+RO)					Contingency is relevant if ponds cannot be closed due to residual water that cannot be addressed by evaporation pond
GAC and Reverse Osmosis to treat pond water with high TDS for discharge under site specific NPDES permit	20,000,000	gal	$ 0.10	$ 2,000,000	Assume unit cost of $0.10/gallon for GAC/RO treatment based on verbal discussion with Siemens vendor
			Contingency (35%)	**$ 1,817,000**	
			Direct Capital Total:	**$ 9,007,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 5,190,000	$ 260,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 5,190,000	$ 156,000	
EPA Oversight Costs	10%	of	$ 5,190,000	$ 519,000	
Construction Management	5%	of	$ 5,190,000	$ 260,000	
			Total PM/CM Cost:	**$ 1,195,000**	
			Total Capital Cost:	**$ 10,202,000**	

TABLE E-4-5
FS AREA 4 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
Cap/Pond Inspection / Maintenance					
Pond, Storm channel, liner inspection and monitoring	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
Erosion control BMPs	1	year	$ 24,000	$ 24,000	Based on current site O&M costs; 60% of 11-acre evap pond
Drainage, Culvert maintenance, monitoring	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
Utilities: electricity	1	year	$ 6,000	$ 6,000	
Misc: Equipment rentals / PID / FID / ODCs	1	year	$ 24,000	$ 24,000	
			Subtotal Annual O&M Cost:	$ 140,000	
			Contingency (50%):	$ 70,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 246,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace eco-protection drift fence and netting	1	5-year		$ -	No evaporation pond
Evaporation Pond Sediment sampling (every 5 years)	6	5-year		$ -	No evaporation pond
Periodic dredging of sediment	1	20-year		$ -	No evaportion pond
Replace EcoCap and Pond liners	1	50-year	$ 5,101,000	$ 5,101,000	Assume 1/2 of capital cost of cap would need to be replaced in a 100-year period

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$10,202		$10,202	$10,202	
Annual O&M Cost (post construction)	0 - 5	$1,255	$251	$1,150	$1,029	
Annual O&M Cost (post construction)	6 - 30	$6,275	$251	$3,770	$2,086	
Annual O&M Cost (post construction)	31 - 100	$27,422	$392	$4,700	$729	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$15,122,000**	**$13,317,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$19,822,000**	**$14,045,000**	

TABLE E-4-5
FS AREA 4 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 10,589,676**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 255,348**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 50-year (2014):	**$ 5,294,838**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$10,590	$2,117.94	$9,417	$8,116	FS Area 4 remedy is expected to be constructed during the third and fourth construction seasons (2018 and 2019) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,303	$261	$1,193	$1,068	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$6,513	$261	$3,913	$2,165	
Annual O&M Cost (post construction)	31 - 100	$28,464	$407	$4,879	$756	
			Present Value of Capital	**$9,417,000**	**$8,116,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$5,107,000**	**$3,233,000**	
			Present Value of 100 Year O&M	**$9,986,000**	**$3,989,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$14,524,000**	**$11,349,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$19,403,000**	**$12,105,000**	

NOTES/ASSUMPTIONS

1. The A-Series and RCF Pond will be graded and filled to raise the low lying areas of the ponds to ensure there is no groundwater intrusion. There is no evaporation pond in this alterntive.
2. Pond A-5 and Pond 13 will be lined with the following: foundation layer, geocomposite liner (HDPE membrane/geotextile), gravel and a soil cap.
3. Pond A-5 will be filled using WCSA excavation soil and lined to be used as a retention basin for capped RCRA Canyon stormwater.
4. Pond 18 will also be capped with a RCRA cap after the adjacent berm is knocked down to provide fill soil.
5. RCF Pond will be covered with an eco-cap that is sloped to drain water out of the RCF to Pond 13.
6. RCF Pond will include a drainage channel that conveys clean stormwater out of the Capped Landfills.
7. Stormwater from the capped RCRA Canyon, the Capped Landfills and the eco-capped RCF will be drained out through or around the wetlands through Pond 13.

TABLE E-4-6
FS AREA 4 - ALTERNATIVE 7
Casmalia Resources Superfund Site
Feasibility Study

Remedial Alternative: ET Cap (RCF Pond, portion of A-Series Pond) + Construct 6-acre Lined Evaporation Pond (A-Series Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring

Alternative Description: This alternative involves managing liquids in existing stormwater ponds as discussed in detail in the FS. The RCF Pond is lined with an ET cap after it is drained and the bottom raised to 415 feet MSL (Figure 11-22A). The A-Series Pond bottom is raised to 425 feet MSL with fill soil from the northeast shore line. A portion of the A-Series Pond is then converted to a 6-acre lined evaporation pond using a dual HDPE liner. The remaining portion (5 acres) of the A-Series Pond is covered with an ET cap. Pond 18 is capped with a RCRA cap and graded to allow stormwater to sheet flow south to the A-Series Pond. The other ponds (Pond A-5 and 13) are backfilled with soil and lined to serve as retention basins to drain storm water through or around the wetlands that discharge offsite to the B-drainage under the site's General NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Pre-Remedial Testing					
Site Investigation/Delineation/Reporting	1	ls	$ 150,000	$ 150,000	Addtnl investigations (env., geotech, geophys); refine nature & extent
Geotechnical testing/Geophysical Investigation	1	ls	$ -	$ -	
Site Work					
Pump existing pond water to new evap pond	1	ls	$ 5,000	$ 5,000	Assumed cost for transferring pond water to new evaporation pond
Dust controls	80	ls	$ 1,000	$ 80,000	Based on contractor unit cost-water truck-4 mths, 80 days
Pond A-5 - Lined Retention Basin					
Fill from WCSA excavation/transport/compact	40,000	cy	$ 6	$ 240,000	Transport and compact WCSA 5' excav soil, raise bottom and place liner to serve as retention basin; 49,000 cy - 9,000 cy = 40,000 cy
Foundation layer (2')	9,000	cy	$ 6	$ 54,000	Transport and compact 2' foundation layer soil. Use WCSA excav soil as fill
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	2.5	acre	$ 56,500	$ 141,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1'): borrow and compact	4,400	cy	$ 6	$ 26,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	2.5	acre	$ 4,000	$ 10,000	Top soil and hydroseeding
Pond 18 - RCRA Cap					
Cut/Fill (grading)	8,000	cy	$ 4	$ 32,000	Volume from CAD figure; Knockdown dike adjacent to A-Series Pond and raise pond bottom with fill and compact
Foundation layer (2'): borrow dike and compact	10,000	cy	$ 4	$ 40,000	Borrow soils from dike excavation
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote incl. tax, shipping
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf for 60 mil HDPE liner per GSE Liner quote, tax
Geocomposite 200 mil fabrinet, (matl+labor)	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl. tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote incl. tax
Vegetative cover (2')	10,000	cy	$ 6	$ 60,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding

TABLE E-4-6
FS AREA 4 - ALTERNATIVE 7
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
A-Series Pond - Lined Evaporation Pond, 6-acre+ecocap					A-Series small evap pond (acres) 6.00
Cut Pont NE shoreline, fill Pond bottom	48,000	cy	$ 6	$ 288,000	Cut soil from NE shoreline to expand pond and obtain fill for pond bottom based on CAD
Additional Fill for Pond bottom	82,000	cy	$ 6	$ 492,000	Additional fill to raise bottom to 425' MSL based on CAD estimate
Berm construction for six 1-acre pond cells	46,000	cy	$ 6	$ 276,000	Based on CAD estimate
Construct sumps for leachate collection and leak detection	6	ls	$ 50,000	$ 300,000	Bottom sloped to sumps for leachate collection and leak detection filled with gravel and piping laid up the sideslope to a recovery tank
HDPE geomembrane, 60 mil, primary liner	9	acre	$ 34,800	$ 313,200	60 mil HDPE primary liner, 50% larger for sideslopes and anchor
Geonet 200 mil	9	acre	$ 21,750	$ 195,750	Intermediate drainage layer, 50% larger for sideslopes and anchor
HDPE geomembrane, 60 mil, secondary liner	9	acre	$ 34,800	$ 313,200	60 mil HDPE secondary liner, 50% larger for sideslopes and anchor
Foundation layer + 1' soil cover	41,400	cy	$ 6	$ 248,000	1' clean soil cover borrowed from northeast shore of A-Series Pond
Ecological Protection - Evaporation Pond					Wildlife controls including outer fencing, netting, inner fencing, hazing
Eco-protection, outer fencing	4,000	lf	$ 15	$ 60,000	Chain link fence, 6' high, get-a-quote.com
Eco-protection, hazing (radar system)	1	ls	$ 250,000	$ 250,000	Bird-Avert system
Eco-protection, drift fencing	4,000	lf	$ 11	$ 44,000	tin flashing material doitbest.com ($150 per 50-foot incl. tax) + labor ($100/hr x 2 workers x 8 weeks x 50 hrs); $3+$8/foot
Eco-protection, netting	6	acre	$ 40,645	$ 244,000	Material $0.60/sf for pond netting, online price at pondbiz.com; Framing material and labor $15k per acre
Initial Biological Surveys and Vegetation clearing	1	ls	$ 50,000	$ 50,000	Initial biosurveys every 3 months for 1st year
A-Series Pond remaining area - ET Cap (5'), 5 acres					A-Series remaining area 5.00
Clay cover (1'): borrow and process	9,000	cy	$ 14	$ 126,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cost
Place clay soil and compact, 6" lifts	9,000	cy	$ 3	$ 27,000	Based on contractor unit cost
Vegetative Layer, Clay (4'): borrow and process	35,000	cy	$ 6	$ 210,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cost
Place clay soil and compact, 12" lifts	35,000	cy	$ 2	$ 70,000	Based on contractor unit cost
Soil Amendments: fertilizer, gypsum, biosolids	5.0	acre	$ 20,000	$ 100,000	Based on gypsum, fertilizer, biosolids costs for 4 ft thickness
Revegetation/Hydroseeding	11.4	acre	$ 4,000	$ 46,000	Top soil and hydroseeding
Drainage: V-drains, ditches	1,000	lf	$ 30	$ 30,000	Assume1000 lf of concrete V drains
Erosion control BMPs for sideslopes, jute mesh, TRM	2.5	acre	$ 8,700	$ 22,000	Assume 50% of remaining A-Series Pond need erosion control

TABLE E-4-6
FS AREA 4 - ALTERNATIVE 7
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
RCF Pond - Evapotranspirative ET Cap (5')					RCF Pond_acres 11.40
Fill to raise pond bottom: Borrow and compact	95,000	cy	$ 6	$ 570,000	Raise pond bottom well above 415 MSL minimum on east end with 1% slope; estimated by CAD; Borrow soil from NW borrow area
Clay cover (1'): borrow and process	20,000	cy	$ 14	$ 280,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cost
Place clay soil and compact, 6" lifts	20,000	cy	$ 3	$ 60,000	Based on contractor unit cost
Vegetative Layer, Clay (4'): borrow and process	81,000	cy	$ 6	$ 486,000	Assume clayey soil from NW borrow area that is pre-processed with screens and some portion is crushed in a pugmill raises unit cost
Place clay soil and compact, 12" lifts	81,000	cy	$ 2	$ 162,000	Based on contractor unit cost
Revegetation/Hydroseeding	11.4	acre	$ 4,000	$ 46,000	Top soil and hydroseeding
Drainage: V-drains, ditches	4,000	lf	$ 30	$ 120,000	Assume2500 lf of concrete V drains incl. Area 1 drainage channel
Erosion control BMPs for sideslopes, jute mesh, TRM	2.9	acre	$ 8,700	$ 25,000	Assume 25% of RCF Pond area need erosion control
Pond 13 - Lined Retention Basin connects to Wetlands					
Fill from borrow area to raise bottom	6,000	cy	$ 6	$ 36,000	Transport and compact borrow soil, raise bottom above WT and place liner to serve as retention basin that connects to wetlands
Foundation layer (2')	7,000	cy	$ 6	$ 42,000	Transport and compact borrow soil that is 2' thick
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	1.9	acre	$ 56,500	$ 107,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1')	3,500	cy	$ 6	$ 21,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	1.9	acre	$ 4,000	$ 8,000	Top soil and hydroseeding
Stormwater Controls					
Stormwater ditches, bench roads/V-ditches	3,000	lf	$ 30	$ 90,000	Surface features for drainage - grading, swales, V-drains to drain RCF Pond and Pond 18 stormwater; use 25% less drains
Stormwater drain pipes	1,200	lf	$ 100	$ 120,000	Based on contractor unit cost quote
Stormwater inlet/outlet structures, rip-rap	1	ls	$ 50,000	$ 50,000	Based on contractor budgetary estimate
Culvert under RCF Road to Pond 13	250	lf	$ 800	$ 200,000	Based on contractor unit cost quote
Drainage channel, 750 ft, Area 1 drainage	750	lf	$ 60	$ 45,000	concrete channel, double unit cost for wider channel to Pond 13
Enhanced Evaporation System (A-Series Evap Pond)					
TurboMist System to enhance evaporation, 80 gpm	1	ea	$ 100,000	$ 100,000	Assumed cost for 1 land-based turbo mister system 80 gpm based on quote from Slimline, maker of Turbomister

TABLE E-4-6
FS AREA 4 - ALTERNATIVE 7
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	120	samples	$ 500	$ 60,000	150 air/dust samples analyzed for VOCs, PCBs, DDT, metals
Compaction testing: Geotech engr	100	days	$ 500	$ 50,000	100 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	100	samples	$ 100	$ 10,000	Analyze for metals including 6010 total metals, Ba, Ni, Cr, Cu, soluble metals
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 8,282,000**	
Contingency - Pond Water Treatment (GAC+RO)					Contingency is relevant if ponds cannot be closed due to residual water that cannot be addressed by evaporation pond
GAC and Reverse Osmosis to treat pond water with high TDS for discharge under site specific NPDES permit	20,000,000	gal	$ 0.10	$ 2,000,000	Assume unit cost of $0.10/gallon for GAC/RO treatment based on verbal discussion with Siemens vendor
			Contingency (35%)	**$ 2,899,000**	
			Direct Capital Total:	**$ 13,181,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 8,282,000	$ 414,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 8,282,000	$ 248,000	
EPA Oversight Costs	10%	of	$ 8,282,000	$ 828,000	
Construction Management	5%	of	$ 8,282,000	$ 414,000	
			Total PM/CM Cost:	**$ 1,904,000**	
			Total Capital Cost:	**$ 15,085,000**	
Operation and Maintenance Costs					
Cap/Pond Inspection / Maintenance					
Pond, Storm channel, liner inspection and monitoring	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
Evap Pond, Liner repair and maintenance/erosion control	1	year	$ 60,000	$ 60,000	60% of 11-acre evap pond
Evap Pond - Annual biological survey, vegetation removal	1	year	$ 18,000	$ 18,000	Annual bio survey labor and reporting
Drainage, Culvert maintenance, monitoring	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
Utilities: electricity	1	year	$ 36,000	$ 36,000	Utilities for turbomister system, 40HP motor, 20HP pump, 30KW, operating 8 months per year
Misc: Equipment rentals / PID / FID / ODCs	1	year	$ 24,000	$ 24,000	

TABLE E-4-6
FS AREA 4 - ALTERNATIVE 7
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
			Subtotal Annual O&M Cost:	$ 224,000	
			Contingency (50%):	$ 112,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 372,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace eco-protection drift fence, netting	1	5-year	$ 288,000	$ 288,000	Assumes replacement every 5 years
Replace eco-protection outer fence, radar system	1	10-year	$ 310,000	$ 310,000	Assumes replacement every 10 years
Evaporation Pond Sediment sampling (every 5 years)	6	5-year	$ 50,000	$ 300,000	Sampling sediment at 10 locations in A-Series Pond and analysis for inorganics/metals
Periodic dredging of sediment	1	20-year	$ 822,000	$ 822,000	Assume 3 acres of upper 12 inches of sediment is dredged ($50/cy) and sent to Kettleman for disposal as nonRCRA haz ($80/ton)
Replace EcoCap/Biotic barrier and Pond liners	1	50-year	$ 7,542,500	$ 7,542,500	Assume 1/2 of capital cost of pond liner and cap would need to be replaced in a 100-year period

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$15,085		$15,085	$15,085	
Annual O&M Cost (post construction)	0 - 5	$2,223	$445	$2,036	$1,823	
Annual O&M Cost (post construction)	6 - 30	$12,557	$502	$7,545	$4,173	
Annual O&M Cost (post construction)	31 - 100	$51,315	$733	$8,796	$1,364	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$24,666,000**	**$21,081,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$33,461,000**	**$22,445,000**	

TABLE E-4-6
FS AREA 4 - ALTERNATIVE 7
Casmalia Resources Superfund Site
Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 15,658,230**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 386,136**	
				Periodic Cost, 5-year (2014):	**$ 376,794**	
				Periodic Cost, 10-year (2014):	**$ 321,780**	
				Periodic Cost, 20-year (2014):	**$ 853,236**	
				Periodic Cost, 50-year (2014):	**$ 7,829,115**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$15,658	$3,131.65	$13,924	$12,000	FS Area 4 remedy is expected to be constructed during the third and fourth construction seasons (2018 and 2019) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$2,307	$461	$2,114	$1,892	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$13,034	$521	$7,831	$4,332	
Annual O&M Cost (post construction)	31 - 100	$53,265	$761	$9,130	$1,415	
			Present Value of Capital	**$13,924,000**	**$12,000,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$9,945,000**	**$6,224,000**	
			Present Value of 100 Year O&M	**$19,075,000**	**$7,640,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$23,869,000**	**$18,225,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$32,999,000**	**$19,640,000**	

NOTES/ASSUMPTIONS

1. This alternative involves pumping existing pond water to the new evaporation pond located on the footprint of the existing A-Series Pond.
2. The A-Series and RCF Pond will be graded and filled to raise the low lying areas of the ponds to ensure there is no groundwater intrusion.
3. Pond A-5 and Pond 13 will be lined with the following: foundation layer, geocomposite liner (HDPE membrane/geotextile), gravel and a soil cap.
4. Pond A-5 will be filled using WCSA excavation soil and lined to be used as a retention basin for capped RCRA Canyon stormwater.
5. Pond 18 will also be capped with a RCRA cap after the adjacent berm is knocked down to provide fill soil.
6. RCF Pond will be covered with an eco-cap that is sloped to drain water out of the RCF to Pond 13.
7. RCF Pond will include a drainage channel that conveys clean stormwater out of the Capped Landfills.
8. Stormwater from the capped RCRA Canyon, the Capped Landfills and the eco-capped RCF will be drained out through or around the wetlands through Pond 13.

TABLE E-4-7
FS AREA 4 - ALTERNATIVE 8
Casmalia Resources Superfund Site
Feasibility Study

Remedial Alternative: Excavate/Clean Backfill (RCF Pond, A-Series Pond) + Construct New 11-Acre Lined Evaporation Pond (North of RCF Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring

Alternative Description : This alternative involves constructing a new 11-acre lined evaporation pond north of the RCF Pond and managing emptying the existing stormwater in the all the ponds by pumping the remaining stormwater to the new evaporation pond (Figure 11-23A). After emptying the two ponds, Then the RCF and A-Series Pond sediments are excavated down to 5 feet below surface and backfilled/graded to ensure the stormwater flows out of the ponds through the culvert under RCF Road. Additional backfill soil would be needed on the eastside of the RCF to ensure there is adequate slope to drain water to the culvert under RCF Road. From this culvert, the stormwater would then go through Pond 13, through or around the wetlands and offsite B-drainage under the Site's General NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 300,000	$ 300,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 125,000	$ 125,000	Based on previous remediation project experience
Pre-Remedial Testing					
Site Investigation/Delineation/Reporting	1	ls	$ 150,000	$ 150,000	Addtnl investigations (env., geotech, geophys); refine nature & extent, revisit risk calcs
Geotechnical testing/Geophysical Investigation	1	ls	$ -	$ -	
Site Work					
Pump existing pond water to new evap pond	1	ls	$ 100,000	$ 100,000	Assumed cost for transferring pond water to new evaporation pond
Dust controls	1	ls	$ 60,000	$ 80,000	Based on contractor quotes
Pond A-5 - Lined Retention Basin					
Fill from WCSA excavation/transport/compact	40,000	cy	$ 6	$ 240,000	Transport and compact WCSA 5' excav soil, raise bottom and place liner to serve as retention basin; 49,000 cy - 9,000 cy = 40,000 cy
Foundation layer (2')	9,000	cy	$ 6	$ 54,000	Transport and compact 2' foundation layer soil. Use WCSA excav soil as fill
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	2.5	acre	$ 56,500	$ 141,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1')	4,400	cy	$ 6	$ 26,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	2.5	acre	$ 4,000	$ 10,000	Top soil and hydroseeding
Pond 18 - RCRA Cap					
Cut/Fill (grading)	8,000	cy	$ 4	$ 32,000	Volume from CAD figure; Knockdown dike adjacent to A-Series Pond and raise pond bottom with fill and compact
Foundation layer (2')	10,000	cy	$ 4	$ 40,000	Borrow soils from dike excavation
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.70/sf for 60 mil HDPE liner per GSE Liner quote
Geocomposite 200 mil fabrinet, (matl+labor)	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl. tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote
Vegetative cover (2')	10,000	cy	$ 6	$ 60,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding

TABLE E-4-7
FS AREA 4 - ALTERNATIVE 8
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
A-Series Pond - Excavate (2'-5')/backfill					A-Series expanded (acres) 11.00
Excavate 2'-5' pond bottom (sediment)	53,000	cy	$ 6	$ 318,000	Assume avg 3' pond sediment
Offsite disposal of sediment	79,500	ton	$ 60	$ 4,770,000	Assume 50:50 nonRCRA haz: nonhaz disposal at Buttonwillow and use average price of $80/ton and $40/ton
Backfill/compact	58,300	cy	$ 6	$ 350,000	Borrow and compact from NW borrow area
Fill Pond bottom to raise Pond bottom to 420 ft MSL	62,000	cy	$ 6	$ 372,000	Fill Pond bottom to raise to average depth to 420' MSL with bottom sloping down to the east 1%; volume estim from CAD
Drainage: Culvert to RCF Pond	500	lf'	$ 100	$ 50,000	
Drainage: V-drains, ditches	2,000	lf'	$ 30	$ 60,000	contractor unit cost
Erosion control BMPs for sideslopes, jute mesh, TRM	3	acre	$ 8,700	$ 26,000	Assume 3 acres of steep sides of A-Series Pond need erosion control
RCF Pond - Excavate (2'-5')/backfill					
Excavate 2 to 5 feet of pond bottom (sediment)	55,000	cy	$ 6	$ 330,000	Excavate 2 to 5 feet; assume average of 3 feet depth
Offsite disposal of sediment	82,500	ton	$ 60	$ 4,950,000	Assume 50:50 nonRCRA haz: nonhaz disposal at Buttonwillow
Backfill/compact	60,500	cy	$ 6	$ 363,000	Based on use of NW borrow area soil
Raise pond bottom, fill from NW Borrow area	60,000	cy	$ 6	$ 360,000	Raise pond bottom to above 410 MSL with highest elevation on the east end and 1% slope to west to drain water, CAD estimate
Drainage: V-drains, ditches	2,500	acre	$ 30	$ 75,000	
Erosion control BMPs for sideslopes, jute mesh, TRM	5	acre	$ 8,700	$ 44,000	Assume 5 acres of steep sides of RCF Pond need erosion control
Pond 13 - Lined Retention Basin connects to Wetlands					
Fill from borrow area to raise bottom	6,000	cy	$ 6	$ 36,000	Transport and compact borrow soil, raise bottom above WT ~380 ft MSL and place liner for a retention basin that connects to wetlands
Foundation layer (2')	7,000	cy	$ 6	$ 42,000	Transport and compact borrow soil that is 2' thick
Construct 11-acre Evaporation Pond, South of PSCT					
Excavation for new 11 acre pond bottom	74,000	cy	$ 6	$ 444,000	Assume new evap pond north of RCF is 700'x700' and excavation for new pond is 500'x400'x10' on the northern half of pond footprint
Foundation layer and Berm, Place and compact	74,000	cy	$ 6	$ 444,000	Place, compact for foundation and berm, grade bottom slope 2%
Construct sumps for leachate collection and leak detection	6	ls	$ 75,000	$ 450,000	Bottom sloped to sumps for leachate collection and leak detection filled with gravel and piping laid up the sideslope to a recovery tank
HDPE geomembrane, 60 mil, primary liner	14	acre	$ 34,800	$ 478,500	60 mil HDPE primary liner, 25% larger for sideslopes and anchor
Geonet 200 mil	14	acre	$ 21,750	$ 299,063	Intermediate drainage layer, 25% larger for sideslopes and anchor
HDPE geomembrane, 60 mil, secondary liner	14	acre	$ 34,800	$ 478,500	60 mil HDPE secondary liner, 25% larger for sideslopes and anchor
Foundation layer + 1' soil cover	54,000	cy	$ 6	$ 324,000	1' clean soil cover borrowed from northeast shore of A-Series Pond
Erosion control for sideslopes: jute mesh	4	acre	$ 8,700	$ 34,800	Use unit cost for jute mesh
Revegetation/hydroseeding	4	acre	$ 4,000	$ 16,000	Based on contractor unit cost

TABLE E-4-7
FS AREA 4 - ALTERNATIVE 8
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Ecological Protection - Evaporation Pond					Wildlife controls including outer fencing, netting, inner fencing, hazing
Eco-protection, outer fencing	8,000	lf	$ 15	$ 120,000	Chain link fence, 6' high, get-a-quote.com
Eco-protection, hazing (radar system)	1	ls	$ 400,000	$ 400,000	Bird-Avert system; 50% higher than for 6-acre pond
Eco-protection, drift fencing	8,000	lf	$ 11	$ 88,000	tin flashing material doitbest.com ($150 per 50-foot incl. tax) + labor ($100/hr x 2 workers x 8 weeks x 50 hrs); $3+$8/foot
Eco-protection, netting	11	acre	$ 40,645	$ 447,000	Material $0.60/sf for pond netting, online price at pondbiz.com; Framing material and labor $15k per acre
Initial Biological Surveys and Vegetation clearing	1	ls	$ 80,000	$ 80,000	Initial biosurveys every 3 months for 1st year
Stormwater Controls					
Stormwater ditches, bench roads/V-ditches	4,000	lf	$ 30	$ 120,000	Surface features for drainage - grading, swales, V-drains to drain RCF Pond and Pond 18 stormwater
Stormwater drain pipes	1,200	lf	$ 100	$ 120,000	Based on contractor unit cost quote
Stormwater inlet/outlet structures, rip-rap	1	ls	$ 50,000	$ 50,000	Based on contractor budgetary estimate
Culvert under RCF Road to Pond 13	250	lf	$ 800	$ 200,000	Based on contractor unit cost quote
Drainage channel, 750 ft	750	lf	$ 60	$ 45,000	Assume double unit cost for double wide concrete drain
Enhanced Evaporation System (New Evap Pond)					
TurboMist System to enhance evaporation, 80 gpm	1	ea	$ 100,000	$ 100,000	Assumed cost for 1 land-based turbo mister system 80 gpm based on quote from Slimline, maker of Turbomister
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	120	samples	$ 500	$ 60,000	150 air/dust samples analyzed for VOCs, PCBs, DDT, metals
Soil Confirmation Sampling and Analysis	100	samples	$ 100	$ 10,000	Analyze for metals including 6010 total metals, Ba, Ni, Cr, Cu, soluble metals
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Based on contractor experience with previous EE/CA and P/S cap
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor experience with previous EE/CA and P/S cap
			Direct Capital Total:	**$ 19,014,000**	
Contingency - Pond Water Treatment (GAC+RO)					Contingency is relevant if ponds cannot be closed due to residual water that cannot be addressed by evaporation pond
GAC and Reverse Osmosis to treat pond water with high TDS for discharge under site specific NPDES permit	20,000,000	gal	$ 0.10	$ 2,000,000	Assume unit cost of $0.10/gallon for GAC/RO treatment based on verbal discussion with Siemens vendor
			Contingency (50%)	**$ 9,507,000**	
			Direct Capital Total:	**$ 30,521,000**	

TABLE E-4-7
FS AREA 4 - ALTERNATIVE 8
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 19,014,000	$ 951,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 19,014,000	$ 570,000	
EPA Oversight Costs	10%	of	$ 19,014,000	$ 1,901,000	
Construction Management	5%	of	$ 19,014,000	$ 951,000	
			Total PM/CM Cost:	**$ 4,373,000**	
			Total Capital Cost:	**$ 39,267,000**	
Operation and Maintenance Costs					
Cap/Pond Inspection / Maintenance					
Pond, Storm channel, liner inspection and monitoring	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Pond, Liner repair and maintenance/erosion control	1	year	$ 80,000	$ 80,000	Based on current site O&M costs
Evap Pond - Annual biological survey, vegetation removal	1	year	$ 24,000	$ 24,000	Annual bio survey labor and reporting - 50% greater than 6-acre pond
Drainage, Culvert maintenance, monitoring	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
Utilities: electricity	1	year	$ 36,000	$ 36,000	Utilities for turbomister system, 40HP motor, 20HP pump, 30KW, operating 8 months per year
Misc: Equipment rentals / PID / FID / ODCs	1	year	$ 24,000	$ 24,000	Based on current site O&M costs
			Subtotal Annual O&M Cost:	$ 240,000	
			Contingency (50%):	$ 120,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 396,000**	

TABLE E-4-7
FS AREA 4 - ALTERNATIVE 8
Casmalia Resources Superfund Site
Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace eco-protection drift fence, netting	1	5-year	$ 535,000	$ 535,000	Assumes replacement every 5 years
Replace eco-protection outer fence, radar system	1	10-year	$ 488,000	$ 488,000	Assumes replacement every 5 years
Evaporation Pond Sediment sampling (every 5 years)	6	5-year	$ 75,000	$ 450,000	Sampling sediment at 15 locations in A-Series Pond and analysis for inorganics/metals
Periodic dredging of sediment	1	20-year	$ 1,643,000	$ 1,643,000	Assume 6 acres of upper 12 inches of sediment is dredged ($50/cy) and sent to Kettleman for disposal as nonRCRA haz ($80/ton)
Replace liner for evap pond	1	100-year	$ 9,816,750	$ 9,816,750	Assume 1/4 of total capital cost would need to be replaced in a 100-year period

PRESENT VALUE ANALYSIS (2014 $)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$39,267		$39,267	$39,267	
Annual O&M Cost (post construction)	0 - 5	$2,615	$523	$2,395	$2,144	
Annual O&M Cost (post construction)	6 - 30	$16,182	$647	$9,723	$5,378	
Annual O&M Cost (post construction)	31 - 100	$56,065	$801	$9,610	$1,490	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$51,385,000**	**$46,790,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$60,995,000**	**$48,279,000**	

TABLE E-4-7
FS AREA 4 - ALTERNATIVE 8
Casmalia Resources Superfund Site
Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $K)						
				Total Capital Cost (2014):	**$ 40,759,146**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 411,048**	
				Periodic Cost, 5-year (2014):	**$ 659,130**	
				Periodic Cost, 10-year (2014):	**$ 506,544**	
				Periodic Cost, 20-year (2014):	**$ 1,705,434**	
				Periodic Cost, 100-year (2014):	**$ 10,189,787**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$40,759	$8,152	$36,246	$31,237	FS Area 4 remedy is expected to be constructed during the third and fourth construction seasons (2018 and 2019) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$2,714	$543	$2,486	$2,226	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$16,290	$652	$9,788	$5,414	
Annual O&M Cost (post construction)	31 - 100	$58,195	$831	$9,975	$1,547	
			Present Value of Capital	**$36,246,000**	**$31,237,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$12,274,000**	**$7,640,000**	
			Present Value of 100 Year O&M	**$22,249,000**	**$9,187,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$48,520,000**	**$38,878,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$58,495,000**	**$40,424,000**	

NOTES/ASSUMPTIONS

1 This alternative involves pumping existing pond water to the new evaporation pond located north of the RCF Pond.
2 The A-Series and RCF Pond will be excavated and filled to raise the low lying areas of the ponds to ensure there is no groundwater intrusion.
3 Pond A-5 will be filled using WCSA excavation soil and lined to be used as a retention basin for capped RCRA Canyon stormwater.
4 Pond 18 will also be capped with a RCRA cap after the adjacent berm is knocked down to provide fill soil.
5 RCF Pond will be covered with an eco-cap that is sloped to drain water out of the RCF to Pond 13.
6 RCF Pond will include a drainage channel that conveys clean stormwater out of the Capped Landfills.
7 Stormwater from the capped RCRA Canyon, the Capped Landfills and the eco-capped RCF will be drained out through or around the wetlands to the B-drainage.

AREA 5 NORTH TABLES

TABLE E-5-0
AREA 5 NORTH COST SUMMARY
Casmalia Resources Superfund Site
Final Feasibility Study

SUMMARY OF AREA 5 NORTH REMEDIAL ALTERNATIVE COSTS

Alt	PROPOSED REMEDIAL ALTERNATIVE	CAPITAL COST (2014 $)	ANNUAL O&M (2014 $)	TIME FRAME	PRESENT WORTH CAPITAL + O&M 3% DISCOUNT RATE (2014 $)	PRESENT WORTH CAPITAL + O&M 7% DISCOUNT RATE (2014 $)
2	Extraction (PSCT, Gallery Well) + Treat and Discharge PSCT Groundwater to Onsite Evaporation Pond + ICs + Monitoring	$ 1,771,000	$ 1,834,000	30-year	$23,833,000	$16,551,000
				100-year	$34,039,000	$18,134,000
3	Extraction (PSCT, Gallery Well) + Extraction (NAPL-only in P/S Landfill) + Monitoring (12 new LHSU wells) + Treat and Discharge PSCT Groundwater to Onsite Evaporation Pond + ICs + Monitoring	$ 6,068,000	$ 2,128,000	30-year	$31,445,000	$22,402,000
				100-year	$43,294,000	$24,240,000
4	Extraction (PSCT, Gallery Well) + Extraction (NAPL-only in P/S Landfill) + Monitoring (12 new LHSU wells) + Treat and Discharge PSCT Groundwater Offsite (No Evap Pond) + ICs + Monitoring	$ 9,348,000	$ 3,118,000	30-year	$53,750,000	$37,191,000
				100-year	$77,898,000	$40,935,000
5	Extraction (PSCT, Gallery Well) + Extraction (Aggressive, 16 large NAPL wells) + Extraction (NAPL-only in CDA, 4 existing wells) + Monitoring (12 new LHSU wells) + Treat and Discharge to Onsite Evaporation Pond + ICs + Monitoring	$ 17,576,000	$ 3,021,000	30-year	$44,037,000	$33,926,000
				100-year	$57,316,000	$35,985,000
6	Extraction (PSCT, Gallery Well) + Dewater P/S Landfill (5 Horizontal Wells)/Offsite Disposal + Extraction (NAPL-only in CDA, 4 existing wells) + Monitoring (12 new LHSU wells) + Treat and Discharge PSCT GW to Onsite Evaporation Pond + ICs + Monitoring	$ 13,824,000	$ 6,527,000	30-year	$56,755,000	$45,424,000
				100-year	$69,821,000	$47,450,000
7	Extraction (PSCT, Gallery Well) + Dewater P/S Landfill (5 Horizontal Wells)/Offsite Disposal + Extraction (NAPL-only in CDA, 12 new wells) + Extraction (4 new LHSU wells) + Monitoring (8 new LHSU wells) + Treat and Discharge PSCT GW offsite + ICs + Monitoring	$ 17,558,000	$ 7,536,000	30-year	$79,820,000	$60,789,000
				100-year	$105,225,000	$64,727,000

NOTES
1. Total Present Worth Cost (Capital + O&M in 2014 $) is shown for a 3% and 7% net discount rate and a 30-year and a 100-year timeframe and includes contingency on capital and O&M costs.
2. FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs.
3. PV of Capital Cost (in 2014 $) is shown for a 3% and 7% net discount rate based on the average capital cost for each year of the 5 year construction period.
4. Annual O&M cost includes the fixed annual costs and the average of the significant variable O&M cost items such as liquids and NAPL disposal costs for the first five years that decrease significantly in the long term.

TABLE E-5-1
FS AREA 5N - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Fesibility Study

Remedial Alternative: Extraction (PSCT, Gallery Well) + Treat and Discharge PSCT Groundwater to Onsite Evaporation Pond + ICs + Monitoring

Alternative Description: This remedial alternative includes continued extraction of liquids and DNAPL from Gallery Well and the PSCT (1-2-3-4) extraction features as is required to meet current action levels. The NAPL and liquids from the Gallery Well would be sent to an offsite TSDF for disposal similar to how as they are currently managed. The PSCT liquids would be treated onsite for removal of organics (via an upgraded GAC system). The treated PSCT liquids will be pumped to the new lined evaporation pond which is proposed to be located in the footprint of the A-Series Pond. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Remediation Documentation/Reporting	1	ea	$ 75,000	$ 75,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Preparation/Geophysical survey	1	ls	$ 20,000	$ 20,000	Include surveying location of existing collection piping runs
GWTS System Upgrade for PSCT extraction					
DNAPL stainless steel tanks: Primary, Secondary	2	ls	$ 150,000	$ 300,000	Based on TS7C tank replacement costs
Water storage tank: carbon steel	2	ls	$ 40,000	$ 80,000	Based on previous tank replacement cost
GW extraction pumps, controllers	5	ea	$ 10,000	$ 50,000	4 pumps in PCT-A, B wells, 4 pumps in PSCT wells, 1 in Gallery well
6x2,000 lb LPGAC pressure vessels	6	ea	$ 25,000	$ 150,000	Means Cost Handbook 2005
Transfer pumps, filters, piping	1	ls	$ 35,000	$ 35,000	Assumed based on experience with other projects
Control system	1	ls	$ 75,000	$ 75,000	Estimated based on experience with other projects
Collection-discharge piping upgrade	3,000	ft	$ 30	$ 90,000	Assume 8,000 ft of piping to connect 11 wells
Treatment system pad	1	ls	$ 30,000	$ 30,000	Means Cost Handbook 2005; 40x100' at $10/SF
Construction, startup, shakedown	1	ls	$ 50,000	$ 50,000	Assumed based on experience
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Health and Safety Program, ODCs	1	ls	$ 25,000	$ 25,000	Based on contractor quotes
			Direct Capital Total:	**$ 1,080,000**	
			Contingency (35%)	**$ 378,000**	Assume lower 35% contingency for conventional extraction technology
			Direct Capital Total:	**$ 1,458,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 1,080,000	$ 54,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 1,080,000	$ 32,000	
EPA Oversight Costs	10%	of	$ 1,080,000	$ 108,000	
Construction Management	5%	of	$ 1,080,000	$ 54,000	
			Total PM/CM Cost:	**$ 248,000**	
			Total Capital Cost:	**$ 1,706,000**	

TABLE E-5-1
FS AREA 5N - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
GWTS Operation and Maintenance					
GWTS Maintenance and Monitoring (labor)	12	mths	$ 20,000	$ 240,000	Based on current site O&M. labor at $100/hr
GWTS water sampling for compliance	1	year	$ 15,000	$ 15,000	Based on current site O&M
Gallery Well liquids disposal; 450,000 gal/year	0	gal	$ 1.50	$ -	See below under Variable O&M costs
NAPL disposal - Gallery well; 3,000 gal/year	0	gal	$ 3.50	$ -	See below under Variable O&M costs
LPGAC and VPGAC carbon vessels and replacement	1	year	$ 40,000	$ 40,000	Based on current site O&M
Utilities: electricity	12	mths	$ 2,000	$ 24,000	Based on current site O&M for PSCT ext, treat and PCT-B ext
Repair, Replacement: Pumps, motors, valves, fittings, electric sul	1	year	$ 35,000	$ 35,000	Based on current site O&M for PSCText, treat and PCT-B ext
Misc: Equip rentals/PID/FID/Generator/Forklift/ODCs	1	year	$ 26,000	$ 26,000	Based on current site O&M
			Subtotal Annual O&M Cost:	$ 380,000	
			Contingency (50%):	$ 190,000	
Project Management/Technical Support	1	year	$ 24,000	$ 24,000	Based on experience previous GWTS construction experience
Sitewide Groundwater Monitoring	1	year	$ 242,000	$ 242,000	Annual cost of current sampling program + 25%
			Total Annual O&M Cost (w/o Variable cost items, Years 1-10):	**$ 836,000**	Gallery Well extraction P/S LF duration is 10 years
			Total Annual O&M Cost (w/o Variable cost items, Year 11 onwards):	**$ 752,000**	Assumes 10% reduced O&M cost after Gallery Well extraction is stopped
Annual Variable O&M Cost Items (include 50% Contingency)					
Gallery Well liquids disposal, Year 1	450,000	gal	$ 1.50	$ 1,013,000	Assume Gallery Well liquid decreases at 5% per year initially decreasing t an average of 250,000 gallons per year for years 6 through 10, at which point the landfill is desaturated.
Gallery Well liquids disposal, Year 2	427,500	gal	$ 1.50	$ 962,000	
Gallery Well liquids disposal, Year 3	406,125	gal	$ 1.50	$ 914,000	
Gallery Well liquids disposal, Year 4	385,819	gal	$ 1.50	$ 868,000	
Gallery Well liquids disposal, Year 5	366,528	gal	$ 1.50	$ 825,000	
Gallery Well liq disposal, Year 6 - 10 (average)	250,000	gal	$ 1.50	$ 563,000	
NAPL disposal, Year 1	3,000	gal	$ 3.50	$ 16,000	Assume 3,000 gallons of NAPL from GW liquids for Year 1, decreasing 5% per year in years 1 - 5, and to an average of 1,000 gallons per year for years 6 through 10.
NAPL disposal, Year 2	2,850	gal	$ 3.50	$ 15,000	
NAPL disposal, Year 3	2,708	gal	$ 3.50	$ 14,000	
NAPL disposal, Year 4	2,572	gal	$ 3.50	$ 14,000	
NAPL disposal, Year 5	2,444	gal	$ 3.50	$ 13,000	
NAPL disposal, Year 6 - 10 (average)	1,000	gal	$ 3.50	$ 5,000	

TABLE E-5-1
FS AREA 5N - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs						
US EPA Five-year Review (5,10,15,20,25 and 30 years)		6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace portion of PSCT trench		2	50-year	$ 1,500,000	$ 3,000,000	Assume 1,500 feet length would need to be replaced using a $1000/linear foot of trench estimate derived from PCT-C Trench
Replace GWTS		2	50-year	$ 860,000	$ 1,720,000	Replace GWTS for PSCT and NAPL-only system
PRESENT VALUE ANALYSIS (2012 $K)						
Cost Type	**Year**	**Total Cost (2012 $K)**	**Cost/Year (2012 $K)**	**Net Present Value at 3% DF (2012 $K)**	**Net Present Value at 7% DF (2012 $K)**	
Capital Cost		$1,706	$341	$1,706	$1,706	
Annual O&M Cost (post construction)	0 - 5	$8,859	$1,772	$8,114	$7,265	
Annual O&M Cost (post construction)	6 - 30	$22,185	$887	$13,329	$7,373	
Annual O&M Cost (post construction)	31 - 100	$57,360	$819	$9,832	$1,524	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$23,150,000**	**$16,344,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$32,982,000**	**$17,868,000**	

TABLE E-5-1
FS AREA 5N - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 1,770,828**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost Years 1-10, Annual (2014):	**$ 867,768**	
				Total Annual O&M Cost Years 11-onward, Annual (2014):	**$ 780,576**	
				Total Variable Annual O&M Cost Years 0-5 (2014):	**$ 4,830,852**	
				Total Variable Annual O&M Cost Years 6-10 (2014):	**$ 2,947,920**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 50-year (2014):	**$ 2,449,680**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$1,771	$354.17	$1,575	$1,357	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$9,196	$1,839	$8,423	$7,541	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$23,028	$921	$13,836	$7,653	
Annual O&M Cost (post construction)	31 - 100	$59,540	$850.57	$10,205	$1,582	
			Present Value of Capital	**$1,575,000**	**$1,357,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$22,259,000**	**$15,194,000**	
			Present Value of 100 Year O&M	**$32,464,000**	**$16,776,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$23,833,000**	**$16,551,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$34,039,000**	**$18,134,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through PSCT wells, Gallery well continue
2. Groundwater PSCT extraction rates are anticipated to decrease significantly from site capping and closing ponds due to reduced infiltration
3. Groundwater treatment plant is upgraded with new treatment equipment, extraction pumps, repaired/new collection/discharge piping, etc
4. Gallery well extraction rate decreases with time as the P/S Landfill is dewatered over a period of 10 years.
5. DNAPL is separated in an oil-water separator and then offsite for disposal as hazardous waste similar to current onsite operations.

TABLE E-5-2
FS AREA 5N - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Fesibility Study

Remedial Alternative: Extraction (PSCT, Gallery Well) + Extraction (NAPL-only in P/S Landfill) + Extraction (NAPL-only in CDA, 4 wells) + Monitoring (12 new LHSU wells) + Treat and Discharg PSCT Groundwater to Onsite Evaporation Pond + ICs + Monitoring

Remedial Alternative Description: This alternative includes continued extraction of liquids and NAPL from the Gallery Well and PSCT trenches as discussed in Alternative 2. In addition, this alternative adds NAPL-only extraction from 16 new NAPL-only wells in the Upper HSU under the P/S Landfill. Four wells will be located on Bench 1 and four more on a new bench road between Bench 1 and Bench 2. In addition, two new bench roads south of Bench 1 will have four wells each near the toe of the P/S Landfill (Figure 11-25A). NAPL-only extraction anticipates utilizing 4-inch diameter wells which are pumped as necessary when sufficient DNAPL and LNAPL has collected in the well. Twelve new LHSU monitoring wells are proposed just upgradient of PSCT-1 and PSCT-4 to monitor any potential VOC migration under the PSCT in the LHSU. The PSCT liquids would be treated onsite for removal of organics (via an upgraded GAC system) and pumped to a new upgraded onsite treatment system designed to remove organics. The treated PSCT liquids will be pumped to a new lined evaporation pond in the A-Series Pond footprint as in Alternative 2. The extracted NAPL and leachate will be sent offsite to a permitted facility for disposal. Sitewide groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 150,000	$ 150,000	Based on contractor budgetary quotes
Remediation Documentation/Reporting	1	ea	$ 125,000	$ 125,000	Based on previous remediation project experience
Pre-Remedial Testing					
Site Investigation/Delineation/Reporting	1	ls	$ 50,000	$ 50,000	Addtnl investigations in the vicinity of expected DNAPL at the toe of the P/S Landfill and refine nature & extent
Site Preparation/Geophysical survey	1	ls	$ -	$ -	
DNAPL-Only Extraction Pilot Testing	1	ls	$ 50,000	$ 50,000	3-month long field pilot test for periodic DNAPL-only pumping incl. rentals NAPL pumps and cost estimate
Site Work					
Construct three new bench roads	3	ea	$ 200,000	$ 600,000	400 feet long bench road construction for DNAPL well installation in the southern portion of the P/S Landfill
GWTS Upgrade for PSCT Flow (Treat VOCs)					PSCT extraction rate (gal/year) 1,900,000
DNAPL stainless steel tanks: Primary, Secondary	2	ls	$ 150,000	$ 300,000	Based on TS7C tank replacement costs
Water storage tank: carbon steel	2	ls	$ 40,000	$ 80,000	Based on previous tank replacement costs
GW extraction pumps, controllers	5	ea	$ 10,000	$ 50,000	4 pumps in PSCT wells, 1 in Gallery well
6x2,000 lb LPGAC pressure vessels	6	ea	$ 25,000	$ 150,000	Means Cost Handbook 2005
Transfer pumps, bag filters, piping	1	ls	$ 35,000	$ 35,000	Assumed based on experience
Control system	1	ls	$ 75,000	$ 75,000	Estimated based on experience with other projects
Treatment system pad	1	ls	$ 30,000	$ 30,000	Means Cost Handbook 2005; assume 40x100' at$10/SF
Collection-discharge piping upgrade	3,000	ft	$ 30	$ 90,000	Assume 8,000 ft of piping to connect 12 wells
Construction, startup, shakedown	1	ls	$ 50,000	$ 50,000	Assumed based on experience

TABLE E-5-2
FS AREA 5N - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
NAPL-Only Well Installation in P/S LF					Well install unit cost, $/lf $420
NAPL well drilling, sonic drilling, casing	16	ea	$ 30,000	$ 480,000	80 ft deep, 20 ft sump, steel casing w sonic drilling; Boart Longyear quote
Well development	16	ea	$ 2,000	$ 32,000	Well development, 8 days
Consultant oversight, reporting	16	ea	$ 5,000	$ 80,000	Assume workplan, oversight during well install, logging, reporting; 3 days per well; 10 weeks to complete well install
Waste disposal, H&S, ODCs	16	ea	$ 5,000	$ 80,000	RCRA haz disposal offsite to Kettleman at $300/drum, 15 drums/boring
NAPL-Only Treatment System for P/S LF					
NAPL skimmer pumps, wellhead assemblies, controllers	16	ea	$ 5,000	$ 80,000	Xitech vendor
Collection piping, trenching, cabling to the LTA	3,000	ft	$ 60	$ 180,000	Based on contractor estimate with double containment piping
NAPL-water separator	1	ls	$ 150,000	$ 150,000	Based on Means Cost Handbook 2005
Storage tanks, instrumentation, transfer pumps	1	ls	$ 100,000	$ 100,000	Assume use of DNAPL tanks from GWTS upgrade
Equipment installation	1	ls	$ 75,000	$ 75,000	Assumed based on experience
LHSU Well Installation					
LHSU well drilling, installation, well box	12	ea	$ 20,000	$ 240,000	50 feet deep wells just south of PSCT-1 and PSCT-4; well screened in the top 20 feet of LHSU below the contact
Well development	12	ea	$ 2,000	$ 24,000	Well development, 2 days
Consultant oversight, reporting	12	ea	$ 5,000	$ 60,000	Assume workplan, oversight during well install, logging, reporting; 2 days per well; 2 weeks of drilling to complete well install
Waste disposal, H&S, ODCs	12	ea	$ 5,000	$ 60,000	RCRA haz disposal offsite to Kettleman at $300/drum, 15 drums/boring
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	16	samples	$ 500	$ 8,000	16 air/dust samples analyze for VOCs, PCBs, DDT, metals during drilling in DNAPL area
Soil Confirmation Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, DNAPL saturation, 6010 total metals, soluble metals Ba, CrVI, other parameters
Groundwater Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, 6010 total metals, soluble metals Ba, CrVI, other parameters
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 125,000	$ 125,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 75,000	$ 75,000	Based on contractor quotes
			Direct Capital Total:	**$ 3,700,000**	
			Contingency (35%)	**$ 1,295,000**	
			Direct Capital Total:	**$ 4,995,000**	

TABLE E-5-2
FS AREA 5N - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 3,700,000	$ 185,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 3,700,000	$ 111,000	
EPA Oversight Costs	10%	of	$ 3,700,000	$ 370,000	
Construction Management	5%	of	$ 3,700,000	$ 185,000	
			Total PM/CM Cost:	**$ 851,000**	
			Total Capital Cost:	**$ 5,846,000**	
Operation and Maintenance Costs					
GWTS Operation and Maintenance					
GWTS Maintenance and Monitoring (labor)	12	mths	$ 20,000	$ 240,000	Based on current site O&M costs; labor at $100/hr
GWTS water sampling for compliance	1	year	$ 15,000	$ 15,000	Based on current site O&M costs
Gallery Well liquids disposal; 450,000 gal/year	0	gal	$ 1.50	$ -	See below under Variable O&M Costs
NAPL disposal - Gallery well; 3,000 gal/year	0	gal	$ 3.50	$ -	See below under Variable O&M Costs
LPGAC and VPGAC carbon vessels and replacement	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Utilities: electricity	12	mths	$ 2,000	$ 24,000	Based on current site O&M for PSCT ext
Repair, Replacement: Pumps, motors, valves, fittings, electric	1	year	$ 35,000	$ 35,000	Based on current site O&M for PSCText
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 26,000	$ 26,000	Same as current GWTS cost + DNAPL costs
NAPL-only extraction in P/S LF O&M					NAPL exttraction for 10 years
NAPL extraction O&M	12	mths	$ 8,000	$ 96,000	80 hrs/mth O&M labor at $100/hr
NAPL disposal - 16 NAPL-only well liquids	0	gal	$ 3.50	$ -	See below under Variable O&M Costs
LPGAC and VPGAC carbon vessels and replacement	1	year	$ 8,000	$ 8,000	Vapor phase carbon replacement used with NAPL storage tanks
Utilities: electricity	1	year	$ 2,000	$ 2,000	$300/month for periodic operation of extraction pumps
Repair/Replacement: pumps, motors, valves, electrical sub	1	year	$ 6,000	$ 6,000	Based on costs from current NAPL extraction and treatment system
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 24,000	$ 24,000	Same as current GWTS cost + DNAPL costs
LHSU Groundwater Monitoring					
Annual Sampling, Analysis, Reporting for 12 wells	1	ls	$ 24,000	$ 24,000	Sampling, analysis, reporting, annual, VOCs analysis
			Subtotal Annual O&M Cost:	$ 540,000	
			Contingency (50%):	$ 270,000	

TABLE E-5-2
FS AREA 5N - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost		Estimated Cost		Notes / Assumptions
Project Management/Technical Support	1	year	$	36,000	$	36,000	Based on experience previous GWTS construction experience
Sitewide Groundwater Monitoring	1	year	$	242,000	$	242,000	Based on current cost of annual sampling program
Total Annual O&M Cost (w/o Variable cost items, Years 1-10):					**$**	**1,088,000**	NAPL-only and Gallery Well extraction P/S LF duration is 10 years
Total Annual O&M Cost (w/o Variable cost items, Year 11 onwards):					**$**	**884,000**	Includes PSCT GWTS O&M and groundwater monitoring
Annual Variable O&M Cost Items (include 50% Contingency)							
Gallery Well liquids disposal, Year 1	450,000	gal	$	1.50	$	1,013,000	Assume Gallery Well liquid decreases at 5% per year initially decreasing to an average of 250,000 gallons per year for years 6 through 10, at which point approximately 3,286,000 gallons are recovered.
Gallery Well liquids disposal, Year 2	427,500	gal	$	1.50	$	962,000	
Gallery Well liquids disposal, Year 3	406,125	gal	$	1.50	$	914,000	
Gallery Well liquids disposal, Year 4	385,819	gal	$	1.50	$	868,000	
Gallery Well liquids disposal, Year 5	366,528	gal	$	1.50	$	825,000	
Gallery Well liq disposal, Year 6 - 10 (average)	250,000	gal	$	1.50	$	563,000	
NAPL disposal, Year 1	13,000	gal	$	3.50	$	68,000	Assume 10,000 gallons of NAPL recovered from extraction of P/S LF liquids and 3,000 gallons of NAPL from GW liquids for Year 1. The NAPL quantities in the P/S LF liquids decrease 20% per year. A more rapid decrease in NAPL recovered is assumed for the remaining years.
NAPL disposal, Year 2	10,400	gal	$	3.50	$	55,000	
NAPL disposal, Year 3	8,320	gal	$	3.50	$	44,000	
NAPL disposal, Year 4	6,700	gal	$	3.50	$	35,000	
NAPL disposal, Year 5	5,300	gal	$	3.50	$	28,000	
NAPL disposal, Year 6 - 10 (average)	1,500	gal	$	3.50	$	8,000	

TABLE E-5-2
FS AREA 5N - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs (No Contingency)					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace portion of PSCT trench	2	50-year	$ 1,500,000	$ 3,000,000	Assume 1,500 feet length would need to be replaced using a $1000/linear foot of trench estimate derived from PCT-C Trench
Replace GWTS	2	50-year	$ 860,000	$ 1,720,000	Replace GWTS for PSCT and NAPL-only system

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$5,846		$5,846	$5,846	
Annual O&M Cost (post construction)	0 - 5	$10,277	$2,055	$9,413	$8,428	
Annual O&M Cost (post construction)	6 - 30	$26,100	$1,044	$15,682	$8,674	
Annual O&M Cost (post construction)	31 - 100	$66,600	$951	$11,416	$1,770	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$30,941,000**	**$22,948,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$42,356,000**	**$24,718,000**	

TABLE E-5-2
FS AREA 5N - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
Total Capital Cost (2014):					**$ 6,068,148**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost Years 1-10, Annual (2014):					**$ 1,129,344**	
Total Annual O&M Cost Years 11-onward, Annual (2014):					**$ 917,592**	
Total Variable Annual O&M Cost Years 0-5 (2014):					**$ 4,994,856**	
Total Variable Annual O&M Cost Years 6-10 (2014):					**$ 2,963,490**	
Periodic Cost, 5-year (2014):					**$ 25,950**	
Periodic Cost, 50-year (2014):					**$ 2,449,680**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$6,068	$1,214	$5,396	$4,651	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$10,668	$2,134	$9,771	$8,748	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$27,092	$1,084	$16,278	$9,004	
Annual O&M Cost (post construction)	31 - 100	$69,131	$988	$11,849	$1,837	
Present Value of Capital				**$5,396,000**	**$4,651,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M				**$26,048,000**	**$17,752,000**	
Present Value of 100 Year O&M				**$37,898,000**	**$19,589,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$31,445,000**	**$22,402,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)				**$43,294,000**	**$24,240,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through PSCT wells, Gallery well continue as currently, and adds NAPL-only extraction with 16 extraction wells pumped periodically with the objective of NAPL-only removal as shown in Figure 11-25A.
2. Groundwater PSCT extraction rates are anticipated to decrease significantly from site capping and closing ponds due to reduced infiltration.
3. Groundwater treatment plant is upgraded with new treatment equipment, extraction pumps, repaired/new collection/discharge piping, etc
4. NAPL is extracted periodically by pumping DNAPL and LNAPL skimmer pumps from 16 wells for a duration of 10 years.
5. Gallery well extraction rate decreases with time as the P/S Landfill is dewatered over a period of 10 years.
6. NAPL-only wells are 4' dia steel casing wells about 80 feet deep located on Bench 1 and three other new bench roads in the southern part of the P/S landfill.
7. NAPL is separated in an oil-water separator and then sent offsite for disposal as hazardous waste similar to current onsite operations.

TABLE E-5-3
FS AREA 5N - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Fesibility Study

Remedial Alternative: Extraction (PSCT, Gallery Well) + Extraction (NAPL-only in P/S Landfill) + Extraction (NAPL-only in CDA, 4 wells) + Monitoring (12 new LHSU wells) + Treat and Discharge PSCT Groundwater Offsite (No Onsite Evaporation Pond) + ICs + Monitoring

Remedial Alternative Description: This alternative includes continued extraction of liquids and NAPL from the Gallery Well and PSCT trenches and NAPL-only extraction as discussed in Alternative 3. Also, 12 new LHSU monitoring wells are proposed just upgradient of PSCT-1 and PSCT-4 to monitor the any potential VOC migration under the PSCT in the LHSU. However, in this alternative, the PSCT liquids would be treated onsite for removal of organics and inorganics using carbon adsorption, and reverse osmosis for offsite discharge to the B-Drainage in accordance with the site-specific NPDES permit (Figure 11-26A). This alternative assumes that there is no evaporation pond onsite. The extracted NAPL and leachate will be sent offsite to a permitted facility for disposal. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 200,000	$ 200,000	Based on contractor budgetary quotes
Remediation Documentation/Reporting	1	ea	$ 125,000	$ 125,000	Based on previous remediation project experience
Pre-Remedial Testing					
Site Investigation/Delineation/Reporting	1	ls	$ 50,000	$ 50,000	Addtnl investigations in the vicinity of expected DNAPL at the toe of the P/S Landfill and refine nature & extent
Site Preparation/Geophysical survey	1	ls	$ -	$ -	
DNAPL-Only Extraction Pilot Testing	1	ls	$ 50,000	$ 50,000	3-month long field pilot test for periodic DNAPL-only pumping incl. rentals NAPL pumps and cost estimate
Site Work					
Construct three new bench roads	3	ea	$ 200,000	$ 600,000	400 feet long bench road construction for DNAPL well installation in the southern portion of the P/S Landfill
NAPL Well Installation					Well install unit cost, $/lf $420
NAPL well drilling, sonic drilling, casing	16	ea	$ 30,000	$ 480,000	80 ft deep, 20 ft sump, steel casing w sonic drilling; Board Longyear quote
Well development	16	ea	$ 2,000	$ 32,000	Well development, 8 days
Consultant oversight, reporting	16	ea	$ 5,000	$ 80,000	Assume workplan, oversight during well install, logging, reporting; 3 days per well; 10 weeks to complete well install
Waste disposal, H&S, ODCs	16	ea	$ 5,000	$ 80,000	RCRA haz disposal offsite to Kettleman at $300/drum, 15 drums/boring
NAPL-Only Treatment System					
NAPL skimmer pumps, wellhead assemblies, controllers	16	ea	$ 5,000	$ 80,000	Xitech vendor
Collection piping, trenching, cabling to the LTA	3,000	ft	$ 60	$ 180,000	Based on contractor estimate with double containment piping
NAPL-water separator	1	ls	$ 100,000	$ 100,000	Based on Means Cost Handbook 2005
Storage tanks, instrumentation	1	ls	$ 100,000	$ 100,000	Assume use of DNAPL tanks from GWTS upgrade
Equipment installation	1	ls	$ 75,000	$ 75,000	Assumed based on experience

TABLE E-5-3
FS AREA 5N - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
LHSU Well Installation					
LHSU well drilling, installation, well box	12	ea	$ 20,000	$ 240,000	50 feet deep wells just south of PSCT-1 and PSCT-4; well screened in the top 20 feet of LHSU below the contact
Well development	12	ea	$ 2,000	$ 24,000	Well development, 6 days
Consultant oversight, reporting	12	ea	$ 5,000	$ 60,000	Assume workplan, oversight during well install, logging, reporting; 2 days per well; 2 weeks of drilling to complete well install
Waste disposal, H&S, ODCs	12	ea	$ 5,000	$ 60,000	RCRA haz disposal offsite to Kettleman at $300/drum, 15 drums/boring
GWTS for PSCT (VOCs and Inorg treatment) (10 gpm)					PSCT extraction rate (gal/year) 1,900,000
PSCT GW extraction pumps, controllers	5	ea	$ 10,000	$ 50,000	4 pumps in PSCT wells, 1 in Gallery well
Collection piping, trenching, cabling incl offsite disch pipe	5,000	ft	$ 60	$ 300,000	Contractor unit cost including double cont. piping for leachate
Gallery Well stainless steel tanks: Primary, Secondary	2	ls	$ 150,000	$ 300,000	Based on TS7C tank replacement costs, SS316 components
Water storage tanks and transfer tanks: carbon steel	4	ls	$ 50,000	$ 200,000	Based on previous tank replacment costs
LPGAC vessels - 6x2,000 lb pressure vessels	6	units	$ 25,000	$ 150,000	2 trains of 3x2,000 lb LPGAC vessels, Siemens quote
Reverse Osmosis Units (Pair in series @ 10 gpm)	2	ls	$ 70,900	$ 142,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system
Reject concentrator (3-module VSEP system)	1	ls	$ 173,600	$ 174,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 100,000	$ 100,000	Increased costs due greater filtration requirements as pre-treatment step for reverse osmosis
Control system	1	ls	$ 150,000	$ 150,000	PLC controls, programming, alarms, level controls in pumps
Equipment pad, secondary containment, fence	1	ls	$ 75,000	$ 75,000	Means Cost Handbook 2005; assume75'x100' at$10/SF
Electrical, Utilities Hookups	1	ls	$ 50,000	$ 50,000	Assumed lump sum based on past project experience
Equipment installation and startup	1	ls	$ 150,000	$ 150,000	Subcontractor labor for equipment hookups, startup, testing
Equipment rentals, PID/FID, misc ODCs	1	ls	$ 50,000	$ 50,000	
Additional tankage for gw storage	1	ls	$ 150,000	$ 150,000	3 additional 20,000 gallon tanks for temporary storage of groundwater that cannot be discharged due to non-compliance with stringent NPDES limits for inorganics and needs re-treatment
PSCT well redevelopment	1	ls	$ 25,000	$ 25,000	Redevelop PSCT-1 through PSCT-4

TABLE E-5-3
FS AREA 5N - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	16	samples	$ 500	$ 8,000	16 air/dust samples analyze for VOCs, PCBs, DDT, metals during drilling in DNAPL area
Soil Confirmation Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, DNAPL saturation, 6010 total metals, soluble metals Ba, CrVI, other parameters
Groundwater Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, 6010 total metals, soluble metals Ba, CrVI, other parameters
NPDES Permit - Basin Plan Exception Application					
Basin Plan Exception Application, Support	1	ls	$ 150,000	$ 150,000	Assumed based on level of effort
RWQCB Application Cost	1	ls	$ 100,000	$ 100,000	Based on feedback from RWQCB rec'd through EPA
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 150,000	$ 150,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
			Direct Capital Total:	**$ 5,206,000**	Assume higher 50% contingency for challenges with RO technology, # reverse osmosis units needed, and level of pre-treatment and filtration needed, e.g. additional iron pre-treatment may be required
			Contingency (50%)	**$ 2,603,000**	
			Direct Capital Total:	**$ 7,809,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 5,206,000	$ 260,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 5,206,000	$ 156,000	
EPA Oversight Costs	10%	of	$ 5,206,000	$ 521,000	
Construction Management	5%	of	$ 5,206,000	$ 260,000	
			Total PM/CM Cost:	**$ 1,197,000**	
			Total Capital Cost:	**$ 9,006,000**	

TABLE E-5-3
FS AREA 5N - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
GWTS for PSCT - Treat Org and Inorg (10 gpm)					O&M for GAC and RO system for disch offsite; indefinite duration
GWTS Maintenance and Monitoring (Labor)	12	mths	$ 30,000	$ 360,000	1.5 FTE workers
GWTS water sampling for compliance	1	year	$ 24,000	$ 24,000	Based on current site O&M costs
Gallery Well liquids disposal; 450,000 gal/year	0	gal	$ 1.50	$ -	See below under Variable O&M Costs
NAPL disposal - Gallery well; 3,000 gal/year	0	gal	$ 3.50	$ -	See below under Variable O&M Costs
LPGAC and VPGAC carbon vessels and replacement	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Utilities: electricity	12	mths	$ 5,000	$ 60,000	Assume 50 kW (35HP) rated equipment power usage
RO Membranes replacement, filters - waste disposal	12	mths	$ 3,000	$ 36,000	Reverse osmosis membranes, filters, solid waste
Groundwater sampling for compliance	12	mths	$ 4,000	$ 48,000	GWTS influent, effluent, intermediate, LPGAC sampling
Well redevelopment, annual	1	year	$ 40,000	$ 40,000	one event per year for all wells
Evaporation Pond maintenance	12	mths	$ 5,000	$ 60,000	Periodic monthly/quarterly maintenance of eco-protection,etc
Repair/Replacement: pumps, motors, valves, electrical sub	1	year	$ 100,000	$ 100,000	Assumed based on experience
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 75,000	$ 50,000	Same as current GWTS cost + DNAPL costs
Brine disposal	285,000	gal	$ 0.66	$ 188,000	Brine concentrate disposal quote from American Integrated (AIS); per 5,000 gal truck, $0.50/gallon + $800/load for truck/driver ($0.16/gal)
NAPL-only extraction O&M					NAPL extraction duration is assumed to be 10 years
NAPL extraction O&M	12	mths	$ 8,000	$ 96,000	80 hrs/mth O&M labor at $100/hr
NAPL disposal - 16 NAPL well liquids	0	gal	$ 3.50	$ -	See below under Periodic Costs
LPGAC and VPGAC carbon vessels and replacement	1	year	$ 8,000	$ 8,000	Vapor phase carbon replacement used with NAPL storage tanks
Utilities: electricity	1	year	$ 2,000	$ 2,000	$300/month for periodic operation of extraction pumps
Repair/Replacement: pumps, motors, valves, electrical sub	1	year	$ 6,000	$ 6,000	Based on costs from current NAPL extraction and treatment system
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 24,000	$ 24,000	Same as current GWTS cost + DNAPL costs
LHSU Groundwater Monitoring					
Annual Sampling, Analysis, Reporting for 12 wells	1	ls	$ 24,000	$ 24,000	Sampling, analysis, reporting, annual, VOCs analysis
			Subtotal Annual O&M Cost:	$ 1,166,000	
			Contingency (50%):	$ 583,000	

TABLE E-5-3
FS AREA 5N - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs (continued)					
Project Management/Technical Support	1	year	$ 50,000	$ 50,000	Based on experience previous GWTS construction experience
Sitewide Groundwater Monitoring	1	year	$ 242,000	$ 242,000	Based on current cost of annual sampling program
Total Annual O&M Cost (w/o Variable cost items, Years 1-10):				**$ 2,041,000**	NAPL-only extraction P/S LF duration is 10 years
Total Annual O&M Cost (w/o Variable cost items, Year 11 onwards):				**$ 1,837,000**	Includes PSCT GWTS O&M and groundwater monitoring
Annual Variable O&M Cost Items (include 50% Contingency)					
Gallery Well liquids disposal, Year 1	450,000	gal	$ 1.50	$ 1,013,000	Assume Gallery Well liquid decreases at 5% per year initially decreasing to an average of 250,000 gallons per year for years 6 through 10, at which point approximately 3,286,000 gallons are recovered.
Gallery Well liquids disposal, Year 2	427,500	gal	$ 1.50	$ 962,000	
Gallery Well liquids disposal, Year 3	406,125	gal	$ 1.50	$ 914,000	
Gallery Well liquids disposal, Year 4	385,819	gal	$ 1.50	$ 868,000	
Gallery Well liquids disposal, Year 5	366,528	gal	$ 1.50	$ 825,000	
Gallery Well liq disposal, Year 6 - 10 (average)	250,000	gal	$ 1.50	$ 563,000	
NAPL disposal, Year 1	13,000	gal	$ 3.50	$ 68,000	Assume 10,000 gallons of NAPL recovered from extraction of P/S LF liquids and 3,000 gallons of NAPL from GW liquids for Year 1. The NAPL quantities in the P/S LF liquids decrease 20% per year. A more rapid decrease in NAPL recovered is assumed for the remaining years.
NAPL disposal, Year 2	10,400	gal	$ 3.50	$ 55,000	
NAPL disposal, Year 3	8,320	gal	$ 3.50	$ 44,000	
NAPL disposal, Year 4	6,700	gal	$ 3.50	$ 35,000	
NAPL disposal, Year 5	5,300	gal	$ 3.50	$ 28,000	
NAPL disposal, Year 6 - 10 (average)	1,500	gal	$ 3.50	$ 8,000	

TABLE E-5-3
FS AREA 5N - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs (No Contingency)					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace portion of PSCT trench	2	50-year	$ 1,500,000	$ 3,000,000	Assume 1,500 feet length would need to be replaced using a $1000/linear foot of trench estimate derived from PCT-C Trench
Replace GWTS	2	50-year	$ 2,066,000	$ 4,132,000	Replace GWTS for PSCT and NAPL-only system

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$9,006		$9,006	$9,006	
Annual O&M Cost (post construction)	0 - 5	$15,042	$3,008	$13,778	$12,335	
Annual O&M Cost (post construction)	6 - 30	$49,925	$1,997	$29,996	$16,593	
Annual O&M Cost (post construction)	31 - 100	$135,722	$1,939	$23,264	$3,607	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$52,780,000**	**$37,934,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$76,044,000**	**$41,541,000**	

TABLE E-5-3
FS AREA 5N - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 9,348,228**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost Years 1-10, Annual (2014):	**$ 2,118,558**	
				Total Annual O&M Cost Years 11-onward, Annual (2014):	**$ 1,906,806**	
				Total Variable Annual O&M Cost Years 0-5 (2014):	**$ 4,994,856**	
				Total Variable Annual O&M Cost Years 6-10 (2014):	**$ 2,963,490**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 50-year (2014):	**$ 3,701,508**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$9,348	$1,870	$8,313	$7,164	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$15,614	$3,123	$14,301	$12,804	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$51,822	$2,073	$31,136	$17,223	
Annual O&M Cost (post construction)	31 - 100	$140,879	$2,013	$24,148	$3,744	
			Present Value of Capital	**$8,313,000**	**$7,164,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$45,437,000**	**$30,027,000**	
			Present Value of 100 Year O&M	**$69,585,000**	**$33,771,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$53,750,000**	**$37,191,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$77,898,000**	**$40,935,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through PSCT wells, Gallery well continue as currently, and adds NAPL-only extraction with 16 extraction wells pumped periodically with the objective of NAPL-only removal as shown in Figure 11-26A.
2. Groundwater treatment plant is designed to treat organics and inorganics for offsite discharge through or around the wetlands to the B-Drainage.
3. Groundwater PSCT extraction rates are anticipated to decrease significantly from site capping and closing ponds due to reduced infiltration.
4. NAPL is extracted periodically by pumping DNAPL and LNAPL skimmer pumps from 16 wells for a duration of 10 years.
5. Gallery well extraction rate decreases with time as the P/S Landfill is dewatered over a period of 10 years.
6. NAPL-only wells are 4' dia steel casing wells about 80 feet deep located on Bench 1 and three other new bench roads in the southern part of the P/S landfill.
7. NAPL is separated in an oil-water separator and then sent offsite for disposal as hazardous waste similar to current onsite operations.

TABLE E-5-4
FS AREA 5N - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Extraction (PSCT, Gallery Well) + Extraction (Aggressive, 16 large Diameter NAPL Wells) + Extraction (NAPL-only in CDA, 4 wells) + Monitoring (12 new LHSU wells) + Treat and Discharge to Onsite Evaporation Pond + ICs + Monitoring

Alternative Description : This alternative includes continued extraction of liquids and NAPL from Gallery Well and PSCT trench extraction as it is currently being implemented. This alternative adds continuous aggressive total fluids extraction from 16 new large diameter (8”) NAPL wells in the vicinity of RIPZ-13 in the P/S landfill in the Upper HSU (Figure 11-27A). Four wells will be located on Bench 1 and four more on a new bench road between Bench 1 and Bench 2. In addition, two new bench roads south of Bench 1 will have four wells each near the toe of the P/S Landfill. Also, four existing monitoring wells in the CDA would be converted to LNAPL skimmer wells to recover floating product and 12 new LHSU monitoring wells are proposed just downgradient of PSCT-1 and PSCT-4 to monitor the any potential VOC migration under the PSCT in the LHSU. The aggressive extraction of total fluids is expected to produce an initial flow rate of up to10 gpm of landfill leachate that is treated in a new Liquids Treatment Plant (LTP) which removes organics. The flow rate is assumed to decrease in future years with the P/S Landfill being dewatered in 5 years. The treated leachate from the LTP along with the treated PSCT liquids will be discharged to a new evaporation pond located north of the RCF Pond to handle the additional volumes of treated liquids. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 300,000	$ 300,000	Based on Contractor quotes from previous projects
Remediation Documentation/Reporting	1	ea	$ 150,000	$ 150,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Investigation/Aquifer testing/Reporting	1	ls	$ 50,000	$ 50,000	Addtnl investigations in the vicinity of expected DNAPL at the toe of the P/S Landfill and refine nature & extent
Site Preparation/Geophysical survey	1	ls	$ 50,000	$ 50,000	Include surveying location of existing collection piping runs
Hydraulic Extraction Pilot Testing in NAPL area	1	ls	$ 250,000	$ 250,000	6-month long field pilot test for aggressive hydraulic extraction incl. rental equipment, workplan, reporting, onsite treatment, disposal
Site Work					
Construct three new bench roads	3	ea	$ 200,000	$ 600,000	400 feet long bench roads construction for DNAPL well installation in southern part of P/S Landfill
Aggressive NAPL Ext, Well Installation					Well install unit cost, $/lf $630
NAPL well drilling, sonic drilling, casing, 8" well	16	ea	$ 45,000	$ 720,000	100 feet (80 ft well+ 5 ft sump), steel casing, sonic drilling 8-inch well; Boart Longyear quote
Consultant oversight, reporting	16	ea	$ 9,000	$ 144,000	Assume workplan, oversight during well install, logging, reporting; 3 days per well; 10 weeks to complete well install
Waste disposal, H&S, ODCs	16	ea	$ 9,000	$ 144,000	RCRA haz disposal offsite to Kettleman at $300/drum, 30 drums/boring
GWTS Upgrade for PSCT Flow (Treat VOCs)					PSCT extraction rate (gal/year) 1,900,000
DNAPL stainless steel tanks: Primary, Secondary	2	ls	$ 150,000	$ 300,000	Based on TS7C tank replacement costs
Water storage tank: carbon steel	2	ls	$ 40,000	$ 80,000	Based on previous tank replacement costs
GW extraction pumps, controllers	5	ea	$ 10,000	$ 50,000	4 pumps in PSCT wells, 1 in Gallery well
6x2,000 lb LPGAC pressure vessels	6	ea	$ 25,000	$ 150,000	Means Cost Handbook 2005
Transfer pumps, bag filters, piping	1	ls	$ 35,000	$ 35,000	Assumed based on experience
Control system	1	ls	$ 75,000	$ 75,000	Estimated based on experience with other projects
Treatment system pad	1	ls	$ 30,000	$ 30,000	Means Cost Handbook 2005; assume 40x100' at$10/SF
Collection-discharge piping upgrade	3,000	ft	$ 30	$ 90,000	Assume 8,000 ft of piping to connect 12 wells
Construction, startup, shakedown	1	ls	$ 50,000	$ 50,000	Assumed based on experience

TABLE E-5-4
FS AREA 5N - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Aggressive NAPL Extraction, Treat VOCs/NAPL, Onsite disch to Evap pond, Ext flow rate 10 gpm initial, System operated in batch mode as flow rate decreases					'The groundwater/NAPL treatment system includes an air stripper and LPGAC for polishing before discharge to the onsite evaporation pond while vapor is treated by VPGAC
					Design flow rate (gpm) 20
Agg Extraction - pumps, well head assemblies, controllers	16	ea	$ 10,000	$ 160,000	Means Cost Handbook 2005
Collection piping, trenching, cabling incl offsite disch pipe	5,000	ft	$ 60	$ 300,000	Contractor unit cost including double cont. piping for leachate
NAPL separator, tanks, instrumentation	2	ls	$ 250,000	$ 500,000	Based on TS7C tank replacement costs
Stainless steel tanks: Leachate liquids, 10 tanks	10	ls	$ 150,000	$ 1,500,000	Based on TS7C tank costs; 2-week storage, 200,000 gal
VPGAC carbon drums	20	ls	$ 1,500	$ 30,000	2 carbon drums per tank for vapor emission control from tank
Water storage tanks and transfer tanks: carbon steel	4	ls	$ 50,000	$ 200,000	Based on previous tank replacment costs
Chemical Feed Inline - acidify, neutralize	1	ls	$ 10,000	$ 10,000	3 tanks, unit with flow controls
Air Stripping Unit + Blower	1	ls	$ 50,000	$ 50,000	QED 4.6, tray stripper
LPGAC vessels - 6x3,000 lb pressure vessels	6	units	$ 40,000	$ 240,000	2 trains of 3x3,000 lb LPGAC vessels, Siemens quote
VPGAC vessels - 3x3,000 lb pressure vessels	3	units	$ 40,000	$ 120,000	VPGAC vessels in series to treat off gas vapors from stripper
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 100,000	$ 100,000	Assumed based on experience
Control system	1	ls	$ 125,000	$ 125,000	PLC controls, programming, alarms, level controls in pumps
Equipment pad, secondary containment, fence	1	ls	$ 75,000	$ 75,000	Means Cost Handbook 2005; assume75'x100' at$10/SF
Electrical Utilities Hookups	1	ls	$ 50,000	$ 50,000	Assumed lump sum based on past project experience
Equipment installation and startup	1	ls	$ 100,000	$ 100,000	Subcontractor labor for equipment hookups, startup, testing
Equipment rentals, PID/FID, misc ODCs	1	ls	$ 25,000	$ 25,000	
LHSU Well Installation					
LHSU well drilling, installation, well box	12	ea	$ 20,000	$ 240,000	50 feet deep wells just south of PSCT-1 and PSCT-4; well screened in the top 20 feet of LHSU below the contact
Well development	12	ea	$ 2,000	$ 24,000	Well development, 6 days
Consultant oversight, reporting	12	ea	$ 5,000	$ 60,000	Assume workplan, oversight during well install, logging, reporting; 2 days per well; 2 weeks of drilling to complete well install
Waste disposal, H&S, ODCs	12	ea	$ 5,000	$ 60,000	RCRA haz disposal offsite to Kettleman at $300/drum, 15 drums/boring

TABLE E-5-4
FS AREA 5N - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
LNAPL Skimmers in CDA					
Active solar driven LNAPL skimmer	4	ea	$ 5,750	$ 23,000	Assume use of Xitech Solar Skimmer 2500ES remote control station incl tax+shipping, one per well that pumps to dedicated drum that is perioodically pumped and stored in LTA
Wellhead modification, new well box	4	ea	$ 2,000	$ 8,000	Modify well head and install larger well box to run hoses to drum
Misc: Equipment, Drums, Tubing, fittings, shutoffs	4	ea	$ 3,000	$ 12,000	Misc equipment incl. drums, tubing, tank high level shutoffs
Equipment installation	4	ea	$ 4,000	$ 16,000	Assume 1 FTE for 1 week per well
Incremental cost of Larger Evap Pond	1	ls	$ 2,156,000	$ 2,156,000	This alt would need a larger evaporation pond, 12 additional acres; double cost for 6 additional acres
Remedial Monitoring/Sampling (well install/startup)					
Air Monitoring/Sampling	16	samples	$ 500	$ 8,000	16 air/dust samples analyze for VOCs, PCBs, DDT, metals during drilling in DNAPL area
Soil Confirmation Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, DNAPL saturation, 6010 total metals, soluble metals Ba, CrVI, other parameters
Groundwater Sampling and Analysis	20	samples	$ 500	$ 10,000	Analyze for VOCs, 6010 total metals, soluble metals Ba, CrVI, other parameters
Treatment System Vapor Sampling at Startup	20	samples	$ 500	$ 10,000	20 vapor samples influent, effluent over 3 week startup period
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 150,000	$ 150,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 150,000	$ 150,000	Based on contractor quotes with aggress NAPL wells, hi conc
			Direct Capital Total:	**$ 9,788,000**	
			Contingency (50%)	**$ 4,894,000**	
			Direct Capital Total:	**$ 14,682,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 9,788,000	$ 489,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 9,788,000	$ 294,000	
EPA Oversight Costs	10%	of	$ 9,788,000	$ 979,000	
Construction Management	5%	of	$ 9,788,000	$ 489,000	
			Total PM/CM Cost:	**$ 2,251,000**	
			Total Capital Cost:	**$ 16,933,000**	

TABLE E-5-4
FS AREA 5N - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
PSCT & Gallery Well - GWTS O&M					Discharge to evaporation pond
GWTS Maintenance and Monitoring (labor)	12	mths	$ 20,000	$ 240,000	Based on current site O&M costs; labor at $100/hr
GWTS water sampling for compliance	1	year	$ 15,000	$ 15,000	Based on current site O&M costs
Groundwater disposal; 450,000 gal/year	0	gal	$ 1.50	$ -	See below under Variable O&M Costs
NAPL disposal - Gallery well; 3,000 gal/year	0	gal	$ 3.50	$ -	See below under Variable O&M Costs
LPGAC and VPGAC carbon vessels and replacement	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Utilities: electricity	12	mths	$ 2,000	$ 24,000	Based on current site O&M for PSCT ext
Repair, Replacement: Pumps, motors, valves, fittings, electric su	1	year	$ 35,000	$ 35,000	Based on current site O&M for PSCText
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 26,000	$ 26,000	Same as current GWTS cost + DNAPL costs
Aggressive NAPL extraction O&M (Treat VOCs, NAPL)					Use air stripping and LPGAC with VPGAC for vapor treatment. Discharge to evaporation pond
Aggressive NAPL Extraction O&M	12	mths	$ 30,000	$ 360,000	1.5 FTE workers
NAPL disposal - 16 large extract wells - see below	0	gal	$ 3.50	$ -	NAPL from phase separator is sent offsite for disposal.
Chemicals: acids, de-emulsifiers, cleaning agents	12	months	$ 2,000	$ 24,000	prior to air stripper and NAPL separator and air stripper cleaning'
LPGAC carbon vessels and replacement	12	mths	$ 6,000	$ 72,000	12x3,000 lb vessel replaced in one year at $2/lb
VPGAC carbon vessels and replacement	12	months	$ 6,000	$ 72,000	1x3,000 lb VPGAC vessel replacement per month
Utilities: electricity	12	mths	$ 10,000	$ 120,000	Assume 140 kW (105HP) rated equipment power usage
Membranes, filters - waste disposal	12	mths	$ 3,000	$ 36,000	Assumed based on vendor experience
Groundwater sampling for compliance	12	mths	$ 4,000	$ 48,000	GWTS influent, effluent, intermediate, LPGAC sampling
Vapor system sampling/influent, effluent	12	mths	$ 4,000	$ 48,000	Scubber, oxidizer, APCD compliance
Well redevelopment, annual	1	year	$ 40,000	$ 40,000	one event per year for all wells
Evaporation Pond maintenance	12	mths	$ 5,000	$ 60,000	Periodic monthly/quarterly maintenance of eco-protection,etc
Repair/Replacement: Pumps, motors, valves, electrical sub	12	mth'	$ 8,000	$ 96,000	Higher cost for cleaning and maintenance of air stripper
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 50,000	$ 50,000	Same as current GWTS cost + DNAPL costs
LHSU Groundwater Monitoring					
Annual Sampling, Analysis, Reporting for 12 wells	1	ls	$ 24,000	$ 24,000	Sampling, analysis, reporting, annual, VOCs analysis

TABLE E-5-4
FS AREA 5N - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs (continued)					
LNAPL skimming in CDA O&M					
NAPL skimming O&M	12	mths	$ 1,000	$ 12,000	80 hrs/mth O&M labor at $100/hr
NAPL disposal - 4 NAPL well liquids; 500 gal/year	500	gal	$ 3.50	$ 1,750	Assume at most 500 gal NAPL extracted per year
VPGAC carbon drums replacement	1	year	$ 4,000	$ 4,000	Vapor phase carbon replacement used with NAPL storage tanks
Utilities: electricity	1	year	$ -	$ -	solar cell operated skimmers assumed
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$ 4,000	$ 4,000	Based on costs from current NAPL extraction and treatment system
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 4,000	$ 4,000	Same as current GWTS cost + DNAPL costs
			Subtotal Annual O&M Cost:	$ 1,455,750	
			Contingency (50%):	$ 727,875	
Project Management/Technical Support	1	year	$ 80,000	$ 80,000	Based on experience previous GWTS construction experience
Sitewide Groundwater Monitoring	1	year	$ 242,000	$ 242,000	Annual cost of current sampling program
			Total Annual O&M Cost (w/o Variable cost items, Years 1-5):	**$ 2,506,000**	Aggressive extraction P/S LF and NAPL skimming is completed in 5 years
			Total Annual O&M Cost (w/o Variable cost items, Year 6 onwards):	**$ 928,000**	Includes PSCT GWTS O&M and groundwater monitoring
O&M Costs (continued)					
Annual Variable O&M Cost Items (include 50% Contingency)					
Gallery Well liquids disposal, Year 1	450,000	gal	$ 1.50	$ 1,013,000	Assume GW liquids decreases rapidly similar to the aggressive liquid removal rates.
Gallery Well liquids disposal, Year 2	112,500	gal	$ 1.50	$ 253,000	
Gallery Well liquids disposal, Year 3	112,500	gal	$ 1.50	$ 253,000	
Gallery Well liquids disposal, Year 4	56,000	gal	$ 1.50	$ 126,000	
Gallery Well liquids disposal, Year 5	56,000	gal	$ 1.50	$ 126,000	
NAPL disposal, Year 1	13,000	gal	$ 3.50	$ 68,000	Assume 10,000 gal recovered from aggressive extraction of P/S LF liquids extraction and 3,000 gallons of NAPL from GW liquids for Year 1. The NAPL quantities decrease rapidly and add up to approximately 48,000 over 5 years.
NAPL disposal, Year 2	11,000	gal	$ 3.50	$ 58,000	
NAPL disposal, Year 3	9,000	gal	$ 3.50	$ 47,000	
NAPL disposal, Year 4	8,000	gal	$ 3.50	$ 42,000	
NAPL disposal, Year 5	7,000	gal	$ 3.50	$ 37,000	

TABLE E-5-4
FS AREA 5N - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs (No Contingency)					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace portion of PSCT trench	2	50-year	$ 2,300,000	$ 4,600,000	Assume 1,500 feet length would need to be replaced using a $1000/linear foot of trench estimate derived from PCT-C Trench
Replace evaporation pond	2	50-year	$ 2,156,000	$ 4,312,000	Assume evap pond liner is replaced every 50 years
Replace GWTS	2	50-year	$ 380,000	$ 760,000	Replace GWTS for Agg Ext and PSCT ext every 50 years

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$16,933		$16,933	$16,933	
Annual O&M Cost (post construction)	0 - 5	$14,578	$2,916	$13,353	$11,955	
Annual O&M Cost (post construction)	6 - 30	$23,325	$933	$14,014	$7,752	
Annual O&M Cost (post construction)	31 - 100	$74,632	$1,066	$12,792	$1,983	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$44,300,000**	**$36,640,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$57,092,000**	**$38,623,000**	

TABLE E-5-4
FS AREA 5N - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
Total Capital Cost (2014):					**$ 17,576,454**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost Years 1-5, Annual (2014):					**$ 2,601,228**	
Total Annual O&M Cost Years 6-onward, Annual (2014):					**$ 963,264**	
Total Variable Annual O&M Cost Years 0-5 (2014):					**$ 2,099,874**	
Periodic Cost, 5-year (2014):					**$ 25,950**	
Periodic Cost, 50-year (2014):					**$ 5,019,768**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$17,576	$3,515	$15,630	$13,470	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$15,132	$3,026	$13,860	$12,409	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$24,211	$968	$14,547	$8,047	
Annual O&M Cost (post construction)	31 - 100	$77,468	$1,107	$13,279	$2,059	
Present Value of Capital				**$15,630,000**	**$13,470,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M				**$28,407,000**	**$20,456,000**	
Present Value of 100 Year O&M				**$41,685,000**	**$22,514,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$44,037,000**	**$33,926,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)				**$57,316,000**	**$35,985,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through PSCT wells, Gallery well continue as currently, and adds aggressive NAPL extraction with 16 vertical extraction wells pumped continuously
2. Groundwater from PSCT and Gallery Well and aggressive extraction are treated in separate treatment systems and discharged to onside pond.
3. Total fluids are extracted from the 16 extraction wells which yield initially 10 gpm that decreases rapidly in subsequent years to 2.5 gpm, 0.5 gpm.
4. Gallery well extraction rate decreases with time as the P/S LF is being dewatered and will have a duration of 5 years.
5. NAPL wells are 8" dia steel casing wells about 80 feet deep located on Bench 1 and three other new bench roads in the southern part of the P/S landfill.
6. DNAPL and LNAPL is separated in an oil-water separator and then offsite for disposal as hazardous waste similar to current onsite operations.
7. The total NAPL removed from P/S Landfill decreases with time over a 5-year period yielding a total of approx 48,000 gallons of NAPL liquids.

TABLE E-5-5
FS AREA 5N - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Extraction (PSCT, Gallery Well) + Dewater P/S Landfill (5 Horizontal Wells) + Extraction (NAPL-only in CDA, 4 wells) + Monitoring (12 new LHSU wells) + Treat and Discharge to Onsite Evaporation Pond + ICs + Monitoring

Alternative Description : This alternative includes extraction from the PSCT and Gallery Well and adds 5 horizontal wells under the P/S Landfill to dewater it (Figure 11-28A). The horizontal well extraction of total fluids is expected to produce a total groundwater flow rate of up to 10 gpm of landfill leachate initially and decreasing in subsequent years and these liquids would be sent offsite for disposal. The duration of the P/S LF dewatering is assumed to be 5 years. The PSCT groundwater would be treated in a new Liquids Treatment Plant (LTP) for VOCs and discharged to the onsite evaporation pond and this would have an indefinite duration. Also, as in Alternative 5, four existing monitoring wells in the CDA would be converted to LNAPL skimmer wells to recover floating product and 12 new LHSU monitoring wells are proposed just upgradient of PSCT-1 and PSCT-4 to monitor the any potential VOC migration under the PSCT in the LHSU. The extracted NAPL that is not treated will be sent offsite to a permitted facility for disposal. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan, March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 300,000	$ 300,000	Based on Contractor quotes from previous projects
Remediation Documentation/Reporting	1	ea	$ 150,000	$ 150,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Investigation/Aquifer testing/Reporting	1	ls	$ 50,000	$ 50,000	Addtnl investigations in the vicinity of expected DNAPL at the toe of the P/S Landfill and refine nature & extent
Site Preparation/Geophysical survey	1	ls	$ 50,000	$ 50,000	Include surveying location of existing collection piping runs
Hydraulic Extraction Pilot Testing in NAPL area	1	ls	$ 250,000	$ 250,000	6-month long field pilot test for aggressive hydraulic extraction incl. rental equipment, workplan, reporting, onsite treatment, disposal
Site Work					
Construct three new bench roads	0	ea	$ 200,000	$ -	No new bench roads required for horizontal wells
Horizontal Well Installation, P/S Landfill					Well install unit cost, $/lf $500
Horizontal well drilling, 8" well	5	ea	$ 240,000	$ 1,200,000	600 feet long, $400/lf, on average 300-foot stainless steel wirewrapped screen, 8-inch well;
Consultant oversight, reporting	5	ea	$ 18,000	$ 90,000	Assume workplan, oversight during well install, logging, reporting; 10 days per well; 20 weeks to complete well install
Waste disposal, H&S, ODCs	5	ea	$ 42,000	$ 210,000	RCRA haz disposal of drilling mud by incineration to Utah at $1,400/ton, 30 tons/boring
Dewater P/S LF, Offsite Liquids Disposal					Dewatering liquids extraction rate (2 gpm per well) is 10 gpm (5.2M gal/yr) for Year 1, decreases to 2.5 gpm for Years 2 and 3 and 0.5 gpm for Years 4 and 5.
Extraction pumps, well head assemblies, controllers	5	ea	$ 10,000	$ 50,000	Pumps in 5 horizontal wells
NAPL separator, tanks, instrumentation	2	ls	$ 250,000	$ 500,000	Based on TS7C tank replacement costs
Stainless steel tanks: Leachate liquids, 10 tanks	10	ls	$ 150,000	$ 1,500,000	Based on TS7C tank costs; 2-week storage, 200,000 gal
Water storage tank: carbon steel	2	ls	$ 40,000	$ 80,000	Based on previous tank replacement costs
VPGAC carbon drums	20	ls	$ 1,500	$ 30,000	2 carbon drums per tank
Transfer pumps, bag filters, piping, manifold	1	ls	$ 50,000	$ 50,000	Assumed based on experience
Collection piping, trenching, incl. offsite discharge pipe	3,000	ft	$ 60	$ 180,000	Double containment HDPE pipe
Control system, Instrumentation	1	ls	$ 75,000	$ 75,000	High level shutoffs on each tank
Treatment system pad	1	ls	$ 50,000	$ 50,000	Means Cost Handbook 2005; assume 50x100' at$10/SF
Construction, startup, shakedown	1	ls	$ 100,000	$ 100,000	Assumed based on experience

TABLE E-5-5
FS AREA 5N - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
GWTS Upgrade for PSCT, Gallery Well (Treat VOCs)					PSCT extraction rate (gal/year) 1,900,000
DNAPL stainless steel tanks: Primary, Secondary	2	ls	$ 150,000	$ 300,000	Based on TS7C tank replacement costs
Water storage tank: carbon steel	2	ls	$ 40,000	$ 80,000	Based on previous tank replacement costs
GW extraction pumps, controllers	5	ea	$ 10,000	$ 50,000	4 pumps in PSCT wells, 1 in Gallery well
6x2,000 lb LPGAC pressure vessels	6	ea	$ 25,000	$ 150,000	Means Cost Handbook 2005
Transfer pumps, bag filters, piping	1	ls	$ 35,000	$ 35,000	Assumed based on experience
Control system	1	ls	$ 75,000	$ 75,000	Estimated based on experience with other projects
Treatment system pad	1	ls	$ 30,000	$ 30,000	Means Cost Handbook 2005; assume 40x100' at$10/SF
Collection-discharge piping upgrade	3,000	ft	$ 30	$ 90,000	Assume 8,000 ft of piping to connect 12 wells
Construction, startup, shakedown	1	ls	$ 50,000	$ 50,000	Assumed based on experience
Incremental cost of Larger Evap Pond treated gw	1	ls	$ 1,078,000	$ 1,078,000	This alt would need a larger evap pond \; incremental capital cost of pond is listed for 6 acres
LHSU Well Installation					12 new LHSU wells (six clusters of two wells each) are installed north of PSCT-1 and PSCT-4
LHSU well drilling, installation, well box	12	ea	$ 20,000	$ 240,000	50 feet deep wells just north of PSCT-1 and PSCT-4; well screened in the upper and lower portions of the LHSU
Well development	12	ea	$ 2,000	$ 24,000	Well development, 2 days
Consultant oversight, reporting	12	ea	$ 5,000	$ 60,000	Assume workplan, oversight during well install, logging, reporting; 2 days per well; 2 weeks of drilling to complete well install
Waste disposal, H&S, ODCs	12	ea	$ 5,000	$ 60,000	RCRA haz disposal offsite to Kettleman at $300/drum, 15 drums/boring
LNAPL Skimmers in CDA					4 existing wells are converted to LNAPL skimming wells
Active solar driven LNAPL skimmer	4	ea	$ 5,750	$ 23,000	Assume use of Xitech Solar Skimmer 2500ES remote control station incl tax+shipping, one per well that pumps to dedicated drum that is perioodically pumped/transferred to the LTA for storage
Wellhead modification, new well box	4	ea	$ 2,000	$ 8,000	Modify well head and install larger well box to run hoses to drum
Misc: Equipment, Drums, Tubing, fittings, shutoffs	4	ea	$ 3,000	$ 12,000	Miscellaneous equipment incl. drums, tubing, tank high level shutoffs
Equipment installation	4	ea	$ 4,000	$ 16,000	Assume 1 FTE for 1 week per well
Remedial Monitoring/Sampling (well install/startup)					
Air Monitoring/Sampling	16	samples	$ 500	$ 8,000	16 air/dust samples analyze for VOCs, PCBs, DDT, metals during drilling in DNAPL area
Soil Confirmation Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, DNAPL saturation, 6010 total metals, soluble metals Ba, CrVI, other parameters
Groundwater Sampling and Analysis	32	samples	$ 500	$ 16,000	Analyze for VOCs, 6010 total metals, soluble metals Ba, CrVI, other parameters
Treatment System Sampling at Startup	40	samples	$ 500	$ 20,000	40 samples influent, effluent over 3 week startup period

TABLE E-5-5
FS AREA 5N - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 200,000	$ 200,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 150,000	$ 150,000	Use higher estimate for hazardous NAPL wells, high conc gw
			Direct Capital Total:	**$ 7,698,000**	
			Contingency (50%)	**$ 3,849,000**	
			Direct Capital Total:	**$ 11,547,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 7,698,000	$ 385,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 7,698,000	$ 231,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$ 7,698,000	$ 770,000	
Construction Management	5%	of	$ 7,698,000	$ 385,000	
			Total PM/CM Cost:	**$ 1,771,000**	
			Total Capital Cost:	**$ 13,318,000**	
Operation and Maintenance Costs					
Dewater P/S LF O&M					
O&M Labor, Maintenance	12	mths	$ 16,000	$ 192,000	1 FTE 40 hr/week on average; initial labor costs maybe higher
NAPL disposal - 5 hor ext wells - see below under Variable O&M cost items below	0	gal	$ 3.50	$ -	NAPL from phase separator is sent offsite for disposal.
Dewater Liquids Disposal - see below under Variable O&M cost items below	0	gal	$ 1.50	$ -	Sent offsite for disposal - see cost below
VPGAC carbon vessels and replacement	40	drums	$ 1,000	$ 40,000	Assume 4 drums replaced per tank per year
Utilities: electricity	12	mths	$ 2,000	$ 24,000	Average electricity usage; initial usage higher due to higher flow
Repair, Replacement: pumps, motors, valves, fittings, electric subs	1	year	$ 50,000	$ 50,000	Assume transfer pumps, hoses, valves replaced every year
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 40,000	$ 40,000	
PSCT and Gallery Well - GWTS O&M					PSCT extraction system operates indefinitely in the future
GWTS Maintenance and Monitoring (labor)	12	mths	$ 20,000	$ 240,000	Based on current site O&M costs; labor at $100/hr
GWTS water sampling for compliance	1	year	$ 15,000	$ 15,000	Based on current site O&M costs
Groundwater disposal; 450,000 gal/year - see under Variable O&M cost items below	0	gal	$ 1.50	$ -	See below under Variable O&M Costs
NAPL disposal - Gallery well; 3,000 gal for Year 1 - see below	0	gal	$ 3.50	$ -	See below under Variable O&M Costs
LPGAC and VPGAC carbon vessels and replacement	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Utilities: electricity	12	mths	$ 2,000	$ 24,000	Based on current site O&M for PSCT ext
Repair, Replacement: Pumps, motors, valves, fittings, electric subs	1	year	$ 35,000	$ 35,000	Based on current site O&M for PSCText
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 26,000	$ 26,000	Same as current GWTS cost + DNAPL costs

TABLE E-5-5
FS AREA 5N - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs (continued)					
LHSU Groundwater Monitoring					Assume monitoring of 12 LHSU wells indefinitely
Annual Sampling, Analysis, Reporting for 12 wells	1	ls	$ 24,000	$ 24,000	Sampling, analysis, reporting, annual, VOCs analysis
LNAPL skimming in CDA O&M					Assume LNAPL skimming from 4 existing wells for 5 years
NAPL skimming O&M	12	mths	$ 1,000	$ 12,000	80 hrs/mth O&M labor at $100/hr
NAPL disposal - 4 NAPL well liquids; 500 gal/year	500	gal	$ 3.50	$ 1,750	Assume at most 500 gal NAPL extracted per year
VPGAC carbon drums replacement	1	year	$ 4,000	$ 4,000	Vapor phase carbon replacement used with NAPL storage tanks
Utilities: electricity	1	year	$ -	$ -	solar cell operated skimmers assumed
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$ 4,000	$ 4,000	Based on costs from current NAPL extraction and treatment system
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 4,000	$ 4,000	Same as current GWTS cost + DNAPL costs
			Subtotal Annual O&M Cost:	$ 775,750	
			Contingency (50%):	$ 387,875	Use higher contingency due to greater uncertainty with hor wells
Project Management/Technical Support	1	year	$ 80,000	$ 80,000	Based on experience previous GWTS construction experience
Sitewide Groundwater Monitoring	1	year	$ 242,000	$ 242,000	Annual cost of current sampling program
			Total Annual O&M Cost (w/o Variable cost items, Years 1-5):	**$ 1,486,000**	Dewatering P/S LF and NAPL skimming is completed in 5 years
			Total Annual O&M Cost (w/o Variable cost items, Year 6 onwards):	**$ 928,000**	Includes PSCT GWTS O&M and groundwater monitoring
Annual Variable O&M Cost Items (include 75% Contingency)					
Dewater P/S LF Liquids disposal, Year 1	5,250,000	gal	$ 1.50	$ 13,781,000	2 gpm/well, 10 gpm, 5.2M gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 2	1,300,000	gal	$ 1.50	$ 3,413,000	0.5 gpm/well, 2.5 gpm, 1.3 M gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 3	1,300,000	gal	$ 1.50	$ 3,413,000	0.5 gpm/well, 2.5 gpm, 1.3 M gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 4	263,000	gal	$ 1.50	$ 690,000	0.1 gpm/well, 0.5 gpm, 263,000 gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 5	263,000	gal	$ 1.50	$ 690,000	0.1 gpm/well, 0.5 gpm, 263,000 gallons disposal @ $1.50

TABLE E-5-5
FS AREA 5N - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Annual Variable O&M Cost Items (include 50% Contingency)					
Gallery Well liquids disposal, Year 1	450,000	gal	$ 1.50	$ 1,013,000	Assume GW liquids decreases rapidly similar to the dewater liquids rates.
Gallery Well liquids disposal, Year 2	112,500	gal	$ 1.50	$ 253,000	
Gallery Well liquids disposal, Year 3	112,500	gal	$ 1.50	$ 253,000	
Gallery Well liquids disposal, Year 4	56,000	gal	$ 1.50	$ 126,000	
Gallery Well liquids disposal, Year 5	56,000	gal	$ 1.50	$ 126,000	
Total P/S LF liquids for Years 1-5	9,163,000				
NAPL disposal, Year 1	13,000	gal	$ 3.50	$ 68,000	Assume 10,000 gal recovered from Dewater P/S LF liquids extraction and 3,000 gallons of NAPL from GW liquids for Year 1. The NAPL quantities decrease rapidly and add up to approximately 48,000 gallons over 5 years.
NAPL disposal, Year 2	11,000	gal	$ 3.50	$ 58,000	
NAPL disposal, Year 3	9,000	gal	$ 3.50	$ 47,000	
NAPL disposal, Year 4	8,000	gal	$ 3.50	$ 42,000	
NAPL disposal, Year 5	7,000	gal	$ 3.50	$ 37,000	
Total NAPL liquids for Years 1-5	48,000				
Periodic Costs (No Contingency)					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace portion of PSCT trench	2	50-year	$ 2,300,000	$ 4,600,000	Assume 1,500 feet length would need to be replaced using a $1000/linear foot of trench estimate derived from PCT-C Trench
Replace evaporation pond	2	50-year	$ 1,078,000	$ 2,156,000	Assume evap pond liner is replaced every 50 years
Replace GWTS	2	50-year	$ 860,000	$ 1,720,000	Assume GWTS is replaced every 50 years

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$13,318		$13,318	$13,318	
Annual O&M Cost (post construction)	0 - 5	$31,465	$6,293	$28,820	$25,803	
Annual O&M Cost (post construction)	6 - 30	$23,325	$933	$14,014	$7,752	
Annual O&M Cost (post construction)	31 - 100	$73,436	$1,049	$12,587	$1,952	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$56,152,000**	**$46,873,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$68,740,000**	**$48,824,000**	

TABLE E-5-5
FS AREA 5N - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)					
Total Capital Cost (2014):				**$ 13,824,084**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost Years 1-5, Annual (2014):				**$ 1,542,468**	
Total Annual O&M Cost Years 6-onward, Annual (2014):				**$ 963,264**	
Total Variable Annual O&M Cost Years 0-5 (2014):				**$ 24,922,380**	
Periodic Cost, 5-year (2014):				**$ 25,950**	
Periodic Cost, 50-year (2014):				**$ 4,399,044**	

Cost Type		Year	Total Cost (2014 $K)	Cost/Year (2014 $K)	Net Present Value at 3% DF (2014 $K)	Net Present Value at 7% DF (2014 $K)	
Capital Cost			$13,824	$2,765	$12,293	$10,595	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost	(post construction)	0 - 5	$32,661	$6,532	$29,915	$26,783	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost	(post construction)	6 - 30	$24,211	$968	$14,547	$8,047	
Annual O&M Cost	(post construction)	31 - 100	$76,227	$1,089	$13,066	$2,026	
				Present Value of Capital	**$12,293,000**	**$10,595,000**	2014 $ = 2012 $ adjusted by 3.8%
				Present Value of 30 Year O&M	**$44,462,000**	**$34,830,000**	
				Present Value of 100 Year O&M	**$57,528,000**	**$36,855,000**	
				Total Present Value of Alternative (Capital + 30 Year O&M)	**$56,755,000**	**$45,424,000**	
				Total Present Value of Alternative (Capital + 100 Year O&M)	**$69,821,000**	**$47,450,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction PSCT wells, Gallery well continue as currently, and adds horizontal dewatering extraction wells in the P/S Landfill.
2 Groundwater from PSCT is treated onsite for organics with carbon in a GWTS and discharged to an onsite evaporation pond.
3 P/S Landfill liquids are dewatered from the 5 horizontal extraction wells which yield on average about 2 gpm/well (5.2M gal/year) initially then drops to 0.5 gpm/well and 0.1 gpm/well.
4 P/S Landfill liquids are separated in an oil-water separator to separate NAPL and liquids which are both trucked offsite for disposal.
5 Gallery Well liquids are separated in an oil-water separator and then sent offsite for disposal as hazardous waste similar to current onsite operations.
6 The total NAPL removed from P/S Landfill decreases with time over a 5-year period yielding a total of approximately 48,000 gallons of NAPL liquids.
7 The LNAPL skimmers in the CDA are assumed to operate for 5 years.

TABLE E-5-6
FS AREA 5N - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Extraction (PSCT, Gallery Well) + Dewater P/S Landfill (5 Horizontal Wells) + Extraction (NAPL-only in CDA, 12 new wells) + Extraction (4 new LHSU wells) + Monitoring (8 new LHSU wells) + Treat and Discharge Offsite + ICs + Monitoring

Alternative Description : This alternative includes extraction from the PSCT and Gallery Well and adds 5 horizontal wells under the P/S Landfill to dewater it (Figure 11-29A). The horizontal well extraction of total fluids is expected to produce a total groundwater flow rate of up to 10 gpm of landfill leachate initially and decreasing in subsequent years and these liquids would be sent offsite for disposal. The duration of the Dewatering P/S LF is assumed to be 5 years. The PSCT groundwater would be treated in a new Liquids Treatment Plant (LTP) for VOCs and dissolved solids and discharged to the offsite B-Drainage. The duration of the PSCT operation is indefinite. Also, active LNAPL extraction includes 12 new extraction wells in the CDA to recover floating product, groundwater extraction from 4 new LHSU wells, and 8 new LHSU monitoring wells are proposed just upgradient of PSCT-1 and PSCT-4 to monitor the any potential VOC migration under the PSCT in the LHSU. The extracted NAPL and concentrated leachate will be sent offsite to a permitted facility for disposal. Brine wastes generated from the onsite LTP with dissolved solids treatment will be trucked offsite for disposal to a permitted facility. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 350,000	$ 350,000	Based on Contractor quotes from previous projects
Remediation Documentation/Reporting	1	ea	$ 150,000	$ 150,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Investigation/Aquifer testing/Reporting	1	ls	$ 50,000	$ 50,000	Addtnl investigations in the vicinity of expected DNAPL at the toe of the P/S Landfill and refine nature & extent
Site Preparation/Geophysical survey	1	ls	$ 50,000	$ 50,000	Include surveying location of existing collection piping runs
Hydraulic Extraction Pilot Testing in DNAPL area	1	ls	$ 250,000	$ 250,000	6-month long field pilot test for aggressive hydraulic extraction incl. rental equipment, workplan, reporting, onsite treatment, disposal
Reverse Osmosis, bench scale/field scale testing	1	ls	$ 250,000	$ 250,000	Bench scale/field pilot test for extraction and treatment of TDS and metals incl. rental equipment, workplan, reporting, onsite treatment, disposal
Site Work					
Construct three new bench roads	0	ea	$ 200,000	$ -	No new bench roads required for horizontal wells
Horizontal Well Installation, P/S Landfill					Well install unit cost, $/lf $938
Horizontal well drilling, 8" well	5	ea	$ 240,000	$ 1,200,000	600 feet long, $400/lf, 300-foot stainless steel wirewrapped screen, 8-inch well;
Consultant oversight, reporting	5	ea	$ 18,000	$ 90,000	Assume workplan, oversight during well install, logging, reporting; 10 days per well; 20 weeks to complete well instal
Waste disposal, H&S, ODCs	5	ea	$ 42,000	$ 210,000	RCRA haz disposal of drilling mud by incineration to Utah at $1,400/ton, 30 tons/boring
Dewater P/S LF, Offsite Liquids Disposal					Dewatering liquids extraction rate (2 gpm per well) is 10 gpm (5.2M gal/yr) for Year 1, decreases to 2.5 gpm for Years 2 and 3 and 0.5 gpm for Years 4 and 5
Extraction pumps, well head assemblies, controllers	5	ea	$ 10,000	$ 50,000	Pumps in 5 horizontal wells
NAPL separator, tanks, instrumentation	2	ls	$ 250,000	$ 500,000	Based on TS7C tank replacement costs
Stainless steel tanks: Leachate liquids, 10 tanks	10	ls	$ 150,000	$ 1,500,000	Based on TS7C tank costs; 2-week storage, 200,000 gal
Water storage tank: carbon steel	2	ls	$ 40,000	$ 80,000	Based on previous tank replacement costs
VPGAC carbon drums	20	ls	$ 1,500	$ 30,000	2 carbon drums per tank
Transfer pumps, bag filters, piping, manifold	1	ls	$ 50,000	$ 50,000	Assumed based on experience
Collection piping, trenching, incl. offsite discharge pipe	3,000	ft	$ 60	$ 180,000	Double containment HDPE pipe
Control system, Instrumentation	1	ls	$ 75,000	$ 75,000	High level shutoffs on each tank
Treatment system pad, secondary containment	1	ls	$ 100,000	$ 100,000	Means Cost Handbook 2005; assume 50x100' at$20/SF
Construction, startup, shakedown	1	ls	$ 100,000	$ 100,000	Assumed based on experience

TABLE E-5-6
FS AREA 5N - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
GWTS for PSCT (VOCs and Inorg treatment) (10 gpm)					PSCT extraction rate (gal/year) 1,900,000
PSCT GW extraction pumps, controllers	5	ea	$ 10,000	$ 50,000	4 pumps in PSCT wells, 1 in Gallery well
Collection piping, trenching, cabling incl offsite disch pipe	5,000	ft	$ 60	$ 300,000	Contractor unit cost including double cont. piping for leachate
Gallery Well stainless steel tanks: Primary, Secondary	2	ls	$ 150,000	$ 300,000	Based on TS7C tank replacement costs, SS316 components
Water storage tanks and transfer tanks: carbon steel	4	ls	$ 50,000	$ 200,000	Based on previous tank replacment costs
LPGAC vessels - 6x2,000 lb pressure vessels	6	units	$ 25,000	$ 150,000	2 trains of 3x2,000 lb LPGAC vessels, Siemens quote
Reverse Osmosis Units (Pair in series @ 10 gpm)	2	ls	$ 70,900	$ 142,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system
Reject concentrator (3-module VSEP system)	1	ls	$ 173,600	$ 174,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 125,000	$ 125,000	Increased costs due greater filtration requirements as pre-treatment step for reverse osmosis
Control system	1	ls	$ 100,000	$ 100,000	PLC controls, programming, alarms, level controls in pumps
Equipment pad, secondary containment, fence	1	ls	$ 75,000	$ 75,000	Means Cost Handbook 2005; assume75'x100' at$10/SF
Electrical, Utilities Hookups	1	ls	$ 50,000	$ 50,000	Assumed lump sum based on past project experience
Equipment installation and startup	1	ls	$ 150,000	$ 150,000	Subcontractor labor for equipment hookups, startup, testing
Equipment rentals, PID/FID, misc ODCs	1	ls	$ 50,000	$ 50,000	
Additional tankage for gw storage	1	ls	$ 150,000	$ 150,000	3 additional 20,000 gallon tanks to store gw that cannot be discharged due to non-compliance with stringent NPDES limits for inorganics and may need to be treated again
PSCT well redevelopment	1	ls	$ 25,000	$ 25,000	Redevelop PSCT-1 through PSCT-4
Incremental cost of Larger Evap Pond	0	ls	$ 1,078,000	$ -	This alternative would not need an additional evaporation pond because the treated water is discharged offsite
LHSU Well and Extraction Sys Installation					Two wells next to PSCT-1 pump to one tank while two wells near PSCT-4 pump to another tank
LHSU well drilling, installation, well box	12	ea	$ 20,000	$ 240,000	50 feet deep wells just north of PSCT-1 and PSCT-4; well screened in upper and lower sections of LHSU below the contact; 8 monitoring wells and 4 extraction wells.
Well development	12	ea	$ 2,000	$ 24,000	Well development, 2 days
Consultant oversight, reporting	12	ea	$ 5,000	$ 60,000	Assume workplan, oversight during well install, logging, reporting; 2 days per well; 2 weeks of drilling to complete well instal
Waste disposal, H&S, ODCs	12	ea	$ 5,000	$ 60,000	RCRA haz disposal offsite to Kettleman at $300/drum, 15 drums/boring
Extraction pumps, well head assemblies, controllers	4	ea	$ 5,000	$ 20,000	4 extraction pumps rated for 1 gpm and controllers
Storage tank, pumps, control equipment	2	ls	$ 25,000	$ 50,000	Two 500 gal HDPE tanks
Piping/Trenching/Product piping/Air piping	500	ft	$ 30	$ 15,000	Piping below grade to 2 tanks with 250 feet of pipe for each
Electrical power hookup	1	ls	$ 25,000	$ 25,000	Bring power to treatment pad location
Misc: Equipment, Drums, Tubing, fittings, shutoffs	1	ls	$ 3,000	$ 3,000	Miscellaneous equipment incl. drums, tubing, tank high level shutoffs
Equipment installation	1	ls	$ 75,000	$ 75,000	1 month duration

TABLE E-5-6
FS AREA 5N - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
LNAPL Skimmers in CDA, 12 new wells					12 LNAPL skimmers in 12 wells across CDA, connected by piping to central tank and treatment pad. Compressor supplies air to drive skimmers and product pumped back to tank
Well Installation, 12 wells in CDA	12	ea	$ 16,000	$ 192,000	Well installation avg depth 40 feet,4" PVC wells, screened across water table.
Active LNAPL skimmer	12	ea	$ 5,000	$ 60,000	Assume use of Xitech Skimmer incl tax+shipping, one per well that pumps to dedicated drum that is perioodically pumped/transferred to the LTA for storage
Wellhead modification, new well box	12	ea	$ 2,000	$ 24,000	Modify well head and install larger well box to run hoses to drum
Steel tanks for NAPL storage	1	ls	$ 75,000	$ 75,000	1,000 gallons steel for NAPL storage with high level shutoff
Compressor, Control Equipment	1	ls	$ 50,000	$ 50,000	Include compressor, PLC controller, high level shut off, solenoids
Piping/Trenching/Product piping/Air piping	1,000	ft	$ 60	$ 60,000	Product piping below grade and hoses
Electrical power hookup	1	ls	$ 50,000	$ 50,000	Bring power to treatment pad location
Misc: Equipment, Drums, Tubing, fittings, shutoffs	1	ls	$ 3,000	$ 3,000	Miscellaneous equipment incl. drums, tubing, tank high level shutoffs
Equipment installation	1	ls	$ 100,000	$ 100,000	Assume 1 FTE for 1 week per well
Remedial Monitoring/Sampling (well install/startup)					
Air Monitoring/Sampling	16	samples	$ 500	$ 8,000	16 air/dust samples analyze for VOCs, PCBs, DDT, metals during drilling in DNAPL area
Soil Confirmation Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, DNAPL saturation, 6010 total metals, soluble metals Ba, CrVI, other parameters
Groundwater Sampling and Analysis	32	samples	$ 500	$ 16,000	Analyze for VOCs, 6010 total metals, soluble metals Ba, CrVI, other parameters
Treatment System Sampling at Startup	40	samples	$ 500	$ 20,000	System samples influent, effluent over 3 week startup period
NPDES Permit - Basin Plan Exception Application					
Basin Plan Exception Application, Support	1	ls	$ 150,000	$ 150,000	Assumed
RWQCB Application Cost	1	ls	$ 100,000	$ 100,000	Based on EPA comments
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 300,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 150,000	$ 150,000	Based on contractor quotes
			Direct Capital Total:	**$ 9,244,000**	
			Contingency (60%)	**$ 5,546,000**	
			Direct Capital Total:	**$ 14,790,000**	

TABLE E-5-6
FS AREA 5N - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 9,244,000	$ 462,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 9,244,000	$ 277,000	
EPA Oversight Costs	10%	of	$ 9,244,000	$ 924,000	
Construction Management	5%	of	$ 9,244,000	$ 462,000	
			Total PM/CM Cost:	**$ 2,125,000**	
			Total Capital Cost:	**$ 16,915,000**	
Operation and Maintenance Costs					
Dewater P/S LF O&M					
O&M Labor, Maintenance	12	mths	$ 16,000	$ 192,000	1 FTE 40 hr/week on average; initial labor costs may be higher
NAPL disposal - 5 horz ext wells-see below Variable O&M cost items below	0	gal	$ 3.50	$ -	NAPL from phase separator is sent offsite for disposal.
Dewater Liquids Disposal - see below Variable O&M cost items below	0	gal	$ 1.50	$ -	Sent offsite for disposal - see cost below
VPGAC carbon vessels and replacement	40	drums	$ 1,000	$ 40,000	Assume 4 drums replaced per tank per year
Utilities: electricity	12	mths	$ 2,000	$ 24,000	Average electricity usage; initial usage higher due to higher flow
Repair, Replacement: pumps, motors, valves, fittings, electric subs	1	year	$ 50,000	$ 50,000	Assume transfer pumps, hoses, valves replaced every year
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 40,000	$ 40,000	
GWTS for PSCT - O&M, Treat Org and Inorg, offsite					PSCT extraction system operates indefinitely in the future
GWTS Maintenance and Monitoring (Labor)	12	mths	$ 30,000	$ 360,000	1.5 FTE workers
Groundwater disposal; 450,000 gal/year - see under Variable O&M cost items b	0	gal	$ 1.50	$ -	See below under Variable O&M Costs
NAPL disposal - Gallery well; 3,000 gal for Year 1 - see below	0	gal	$ 3.50	$ -	See below under Variable O&M Costs
LPGAC and VPGAC carbon vessels and replacement	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Utilities: electricity	12	mths	$ 5,000	$ 60,000	Assume 50 kW (35HP) rated equipment power usage
RO Membranes replacement, filters - waste disposal	12	mths	$ 3,000	$ 36,000	Reverse osmosis membranes, filters, solid waste
Groundwater sampling for compliance	12	mths	$ 4,000	$ 48,000	GWTS influent, effluent, intermediate, LPGAC sampling
Well redevelopment, annual	1	year	$ 40,000	$ 40,000	one event per year for all wells
Evaporation Pond maintenance	12	mths	$ 5,000	$ 60,000	Periodic monthly/quarterly maintenance of eco-protection,etc
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$ 100,000	$ 100,000	Assumed based on experience
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 75,000	$ 50,000	Same as current GWTS cost + DNAPL costs
Brine disposal	285,000	gal	$ 0.66	$ 188,000	Brine concentrate disposal quote from American Integrated (AIS); per 5,000 gal truck, $0.50/gallon + $800/load for truck/driver ($0.16/gal)

TABLE E-5-6
FS AREA 5N - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
O&M Costs (continued)					
LHSU Groundwater Extraction					
O&M Labor, Maintenance	1	ls	$ 12,000	$ 12,000	Assume 10 hours per month O&M labor
Utilities: electricity	1	ls	$ 6,000	$ 6,000	Based on experience/judgement
Repair/Replacement: Pumps, motors, valves, electrical sub	1	ls	$ 4,000	$ 4,000	Based on experience/judgement
Misc: Equipment rentals /Generator/Forklift/ODCs	1	ls	$ 4,000	$ 4,000	Based on experience/judgement
LHSU Groundwater Monitoring					
Annual Sampling, Analysis, Reporting for 8 wells	1	ls	$ 16,000	$ 16,000	Sampling, analysis, reporting, annual, VOCs analysis
LNAPL skimming in CDA O&M					
NAPL skimming O&M	12	mths	$ 1,000	$ 12,000	80 hrs/mth O&M labor at $100/hr
NAPL disposal - 12 NAPL well liquids; 1000 gal/year	1,000	gal	$ 3.50	$ 3,500	Assume at most 1,000 gal NAPL extracted per year
VPGAC carbon drums replacement	1	year	$ 4,000	$ 4,000	Vapor phase carbon replacement used with NAPL storage tanks
Utilities: electricity	1	year	$ -	$ -	solar cell operated skimmers assumed
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$ 4,000	$ 4,000	Based on costs from current NAPL extraction and treatment system
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 4,000	$ 4,000	Same as current GWTS cost + DNAPL costs
			Subtotal Annual O&M Cost:	$ 1,397,500	
			Contingency (50%):	$ 698,750	
Project Management/Technical Support	1	year	$ 120,000	$ 120,000	Based on experience previous GWTS construction experience
Sitewide Groundwater Monitoring	1	year	$ 242,000	$ 242,000	Annual cost of current sampling program
			Total Annual O&M Cost (w/o Variable cost items, Years 1-5):	**$ 2,458,000**	Dewatering P/S LF and NAPL skimming is completed in 5 years
			Total Annual O&M Cost (w/o Variable cost items, Year 6 onwards):	**$ 1,898,000**	Includes PSCT GWTS O&M and groundwater monitoring
Annual Variable O&M Cost Items (include 75% Contingency)					
Dewater P/S LF Liquids disposal, Year 1	5,250,000	gal	$ 1.50	$ 13,781,000	2 gpm/well, 10 gpm, 5.2M gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 2	1,300,000	gal	$ 1.50	$ 3,413,000	0.5 gpm/well, 2.5 gpm, 1.3 M gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 3	1,300,000	gal	$ 1.50	$ 3,413,000	0.5 gpm/well, 2.5 gpm, 1.3 M gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 4	263,000	gal	$ 1.50	$ 690,000	0.1 gpm/well, 0.5 gpm, 263,000 gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 5	263,000	gal	$ 1.50	$ 690,000	0.1 gpm/well, 0.5 gpm, 263,000 gallons disposal @ $1.50

TABLE E-5-6
FS AREA 5N - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Annual Variable O&M Cost Items (include 50% Contingency)					
Gallery Well liquids disposal, Year 1	450,000	gal	$ 1.50	$ 1,013,000	Assume GW liquids decreases rapidly similar to the dewater liquids rates.
Gallery Well liquids disposal, Year 2	112,500	gal	$ 1.50	$ 253,000	
Gallery Well liquids disposal, Year 3	112,500	gal	$ 1.50	$ 253,000	
Gallery Well liquids disposal, Year 4	56,000	gal	$ 1.50	$ 126,000	
Gallery Well liquids disposal, Year 5	56,000	gal	$ 1.50	$ 126,000	
Total P/S LF liquids for Years 1-5	9,163,000				
NAPL disposal, Year 1	13,000	gal	$ 3.50	$ 68,000	Assume 10,000 gal recovered from Dewater P/S LF liquids extraction and 3,000 gallons of NAPL from GW liquids for Year 1. The NAPL quantities decrease rapidly and add up to approximately 48,000 gallons over 5 years.
NAPL disposal, Year 2	11,000	gal	$ 3.50	$ 58,000	
NAPL disposal, Year 3	9,000	gal	$ 3.50	$ 47,000	
NAPL disposal, Year 4	8,000	gal	$ 3.50	$ 42,000	
NAPL disposal, Year 5	7,000	gal	$ 3.50	$ 37,000	
Total NAPL liquids for Years 1-5	48,000				
Periodic Costs (No Contingency)					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace portion of PSCT trench	2	50-year	$ 2,300,000	$ 4,600,000	Assume 1,500 feet length would need to be replaced using a $1000/linear foot of trench estimate derived from PCT-C Trench
Replace evaporation pond	2	50-year	$ -	$ -	Assume evap pond liner is replaced every 50 years
Replace GWTS	2	50-year	$ 2,665,000	$ 5,330,000	Assume GWTS is replaced every 50 years

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$16,915		$16,915	$16,915	
Annual O&M Cost (post construction)	0 - 5	$36,325	$7,265	$33,272	$29,788	
Annual O&M Cost (post construction)	6 - 30	$47,575	$1,903	$28,584	$15,812	
Annual O&M Cost (post construction)	31 - 100	$142,790	$2,040	$24,475	$3,795	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$78,771,000**	**$62,515,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$103,246,000**	**$66,309,000**	

TABLE E-5-6
FS AREA 5N - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)					
Total Capital Cost (2014):				**$ 17,557,770**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost Years 1-5, Annual (2014):				**$ 2,551,404**	
Total Annual O&M Cost Years 6-onward, Annual (2014):				**$ 1,970,124**	
Total Variable Annual O&M Cost Years 0-5 (2014):				**$ 24,922,380**	
Periodic Cost, 5-year (2014):				**$ 25,950**	
Periodic Cost, 50-year (2014):				**$ 5,153,670**	

Cost Type	Year	Total Cost (2014 $K)	Cost/Year (2014 $K)	Net Present Value at 3% DF (2014 $K)	Net Present Value at 7% DF (2014 $K)	Notes / Assumptions
Capital Cost		$17,558	$3,512	$15,613	$13,456	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$37,705	$7,541	$34,536	$30,920	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$49,383	$1,975	$29,671	$16,413	
Annual O&M Cost (post construction)	31 - 100	$148,216	$2,117	$25,405	$3,939	
Present Value of Capital				**$15,613,000**	**$13,456,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M				**$64,207,000**	**$47,332,000**	
Present Value of 100 Year O&M				**$89,612,000**	**$51,271,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$79,820,000**	**$60,789,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)				**$105,225,000**	**$64,727,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction PSCT wells, Gallery well continue as currently, and adds horizontal dewatering extraction wells in the P/S Landfill.
2. PSCT groundwater is treated onsite for organics and inorg with carbon and reverse osmosis in a GWTS and discharged offsite. There is no evap pond.
3. P/S Landfill liquids are extracted from the 5 horizontal extraction wells which yield on average about 2 gpm/well (5.2M gal/year) initially then drops to 0.5 gpm/well and 0.1 gpm/well.
4. P/S Landfill liquids are separated in an oil-water separator to separate NAPL and liquids which are both trucked offsite for disposal.
5. Gallery Well liquids are separated in an oil-water separator and sent offsite for disposal as hazardous waste similar to current onsite operations.
6. The total NAPL removed from P/S Landfill decreases with time over a 5-year period yielding a total of approximately 48,000 gallons of NAPL liquids.
7. The LNAPL skimmers in the CDA are assumed to operate for 5 years.

TABLE E-6-0
AREA 5 SOUTH COST SUMMARY
Casmalia Resources Superfund Site
Final Feasibility Study

SUMMARY OF AREA 5 SOUTH REMEDIAL ALTERNATIVE COSTS						
Alt	**PROPOSED REMEDIAL ALTERNATIVE**	**CAPITAL COST (2014 $)**	**ANNUAL O&M (2014 $)**	**TIME FRAME**	**PRESENT WORTH CAPITAL + O&M 3% DISCOUNT RATE (2014 $)**	**PRESENT WORTH CAPITAL + O&M 7% DISCOUNT RATE (2014 $)**
2	Extraction (PCT-A, PCT-B) + Treat/Discharge to Onsite Evap Pond + MNA + ICs + Monitoring	$ 1,781,000	$ 305,000	30-year	$7,667,000	$5,216,000
				100-year	$11,863,000	$5,867,000
3	Extraction (PCT-A, PCT-B) + Treat/Discharge Offsite + MNA + ICs + Monitoring	$ 4,440,000	$ 1,693,000	30-year	$37,233,000	$24,475,000
				100-year	$58,575,000	$27,784,000
4	Extraction (PCT-A) + In-situ Reactive Wall (PCT-B) + Treat/Discharge to Onsite Evap Pond + MNA + ICs + Monitoring	$ 2,456,000	$ 220,000	30-year	$7,407,000	$5,124,000
				100-year	$10,863,000	$5,660,000
5	Aggressive Extraction (40 New Large Diameter Wells, Area 5S) + Extraction (PCT-A, PCT-B) + Treat/Discharge Offsite + ICs + Mon	$ 14,211,000	$ 4,030,000	30-year	$91,720,000	$60,958,000
				100-year	$141,787,000	$68,720,000

NOTES
1. Total Present Worth Cost (Capital + O&M in 2014 $) is shown for a 3% and 7% net discount rate and a 30-year and a 100-year timeframe and includes contingency on capital and O&M costs.
2. FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs.
3. PV of Capital Cost (in 2014 $) is shown for a 3% and 7% net discount rate based on the average capital cost for each year of the 5 year construction period.

TABLE E-6-1
FS AREA 5S - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Rremedial Alternative Extraction (PCT-A, PCT-B) + Treat/Discharge to Onsite Evaporation Pond + MNA + ICs + Monitoring

Alternative Description: This remedial alternative includes continued extraction of liquids from PCT-A and PCT-B as is required to meet current action levels to ensure no offsite migration. The extracted PCT-A and PCT-B liquids will be pumped to a new lined evaporation pond which we are proposing to be located in the footprint of the A-Series Pond (Figure 11-30A). Note that anticipated capping remedies for the FS Areas and 1 and 3 would minimize leaching to groundwater. This combined with natural attenuation of organics would reduce contaminant concentrations over the long term. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Preparation/Geophysical survey	1	ls	$ 20,000	$ 20,000	Include surveying location of existing collection piping runs
Refurbish PCT-B Trench					
Excavate existing trench, gravel/clay barrier	3,000	cy	$ 35	$ 105,000	Based on excavation of trench 500 feet long, 3 feet thick, 50 feet deep
Overburden excavation and backfill	12,000	cy	$ 10	$ 120,000	Assume overburden in 4 times trench volume
Backfill gravel/sand in trench	3,750	tons	$ 30	$ 113,000	Based on contractor quotes from Cal-Portland delivered; 1/2" leach rock
Backfill clay on top layer	500	cy	$ 30	$ 15,000	Based on contractor unit cost quotes
Install replacement wells	2	ea	$ 30,000	$ 60,000	80 feet deep, stainless steel casing wells
Transport and place in PCB Landfill	3,300	cy	$ 10	$ 33,000	Disposal of gravel barrier in the PCB Landfill
PCT-A, PCT-B Extraction					
GW extraction pumps, controllers	6	ea	$ 10,000	$ 60,000	6 pumps in RAP wells,
Collection-discharge piping upgrade	2,000	ft	$ 30	$ 60,000	Assume 2,000 ft of piping to connect 6 wells to GWTS/evap pond
GWTS for PCT (VOCs treatment)					PCT-A,B extraction (gal/year) 1,750,000
Water storage tanks and transfer tanks: carbon steel	4	ls	$ 50,000	$ 200,000	Based on previous tank replacment costs
LPGAC vessels - 4x2,000 lb pressure vessels	4	units	$ 25,000	$ 100,000	2 trains of 2x2,000 lb LPGAC vessels, Siemens quote
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 25,000	$ 25,000	Assumed based on experience
Health and Safety / Quality Control					PCT-C length (linear feet) = 1500
Construction QA/QC Program	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Health and Safety Program, ODCs	1	ls	$ 25,000	$ 25,000	Based on contractor quotes
			Direct Capital Total:	**$ 1,086,000**	
			Contingency (35%)	**$ 380,000**	Assume lower 35% contingency for conventional extraction technology
			Direct Capital Total:	**$ 1,466,000**	

TABLE E-6-1
FS AREA 5S - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 1,086,000	$ 54,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 1,086,000	$ 33,000	
EPA Oversight Costs	10%	of	$ 1,086,000	$ 109,000	
Construction Management	5%	of	$ 1,086,000	$ 54,000	
			Total PM/CM Cost:	**$ 250,000**	
			Total Capital Cost:	**$ 1,716,000**	
Operation and Maintenance Costs					
GWTS Operation and Maintenance					
GWTS Maintenance and Monitoring (labor)	12	mths	$ 2,000	$ 24,000	Based on current site O&M. 20 hrs/week O&M labor at $100/hr
LPGAC carbon vessels and replacement	12	mths	$ 3,000	$ 36,000	Assume 1-2000 lb vessel changed out per month
GWTS water sampling for compliance	1	year	$ 5,000	$ 5,000	Based on current site O&M
Utilities: electricity	12	mths	$ 500	$ 6,000	Based on current site O&M
Well redevelopment, annual	1	year	$ 30,000	$ 30,000	one event per year for all wells
Repair, Replacement: Pumps, motors, valves, fittings, electric su	1	year	$ 5,000	$ 5,000	Based on current site O&M
Misc: Equip rentals/PID/FID/Generator/Forklift/ODCs	1	year	$ 4,000	$ 4,000	Based on current site O&M
			Subtotal Annual O&M Cost:	$ 110,000	
			Contingency (50%):	$ 55,000	
Project Management/Technical Support	1	year	$ 8,000	$ 8,000	Assume 1/3 rd of PM cost for Alt 2 Area 5N
Sitewide Groundwater Monitoring	1	year	$ 121,000	$ 121,000	Annual 1/3rd cost of current sampling program + 25%
			Total Annual O&M Cost:	**$ 294,000**	

TABLE E-6-1
FS AREA 5S - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace PCT-A and -B trenches/wells	2	50-year	$ 1,500,000	$ 3,000,000	Assume entire length of PCT trenches (3000 feet) would need to be replaced based on unit cost for PCT-C Trench $1000/lf

PRESENT VALUE ANALYSIS (2012 $K)						
Cost Type	**Year**	**Total Cost (2012 $K)**	**Cost/Year (2012 $K)**	**Net Present Value at 3% DF (2012 $K)**	**Net Present Value at 7% DF (2012 $K)**	
Capital Cost		$1,716		$1,716	$1,716	
Annual O&M Cost (post construction)	0 - 5	$1,495	$299	$1,369	$1,226	
Annual O&M Cost (post construction)	6 - 30	$7,475	$299	$4,491	$2,484	
Annual O&M Cost (post construction)	31 - 100	$23,580	$337	$4,042	$627	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$7,577,000**	**$5,426,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$11,618,000**	**$6,053,000**	

TABLE E-6-1
FS AREA 5S - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 1,781,208**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 305,172**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 50-year (2014):	**$ 1,557,000**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$1,781	$356.24	$1,584	$1,365	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,552	$310.36	$1,421	$1,273	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$7,759	$310.36	$4,662	$2,579	
Annual O&M Cost (post construction)	31 - 100	$24,476	$349.66	$4,195	$650	
			Present Value of Capital	**$1,584,000**	**$1,365,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$6,083,000**	**$3,851,000**	
			Present Value of 100 Year O&M	**$10,279,000**	**$4,502,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$7,667,000**	**$5,216,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$11,863,000**	**$5,867,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through the RAP wells continue as currently.
2. Groundwater RAP extraction rates at PCT-A and B are assumed to decrease due to site capping and closing ponds that will reduce infiltration.
3. Groundwater treatment plant is upgraded with new treatment equipment, extraction pumps, repaired/new collection/discharge piping, etc

TABLE E-6-2
FS AREA 5S - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Rremedial Alternative Extraction (PCT-A, PCT-B) + Treat and Discharge Offsite + MNA + ICs + Monitoring

Alternative Description: This remedial alternative includes continued extraction of liquids from PCT-A and PCT-B as in Alternative 2. The extracted PCT-A and PCT-B liquids will be treated for organics and inorganics and discharged offsite in accordance with the site-specific NPDES permit (Figure 11-31A). Note that anticipated capping remedies for the FS Areas and 1 and 3 would minimize leaching to groundwater. This combined with natural attenuation of organics would reduce contaminant concentrations over the long term. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 150,000	$ 150,000	Based on Contractor quotes
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Preparation/Geophysical survey	1	ls	$ 20,000	$ 20,000	Include surveying location of existing collection piping runs
Refurbish PCT-B Trench					
Excavate existing trench, gravel/clay barrier	3,000	cy	$ 35	$ 105,000	Based on excavation of trench 500 feet long, 3 feet thick, 50 feet deep
Overburden excavation and backfill	12,000	cy	$ 10	$ 120,000	Assume overburden in 4 times trench volume
Backfill gravel/sand in trench	3,750	tons	$ 30	$ 113,000	Based on contractor quotes from Cal-Portland delivered; 1/2" leach rock
Backfill clay on top layer	500	cy	$ 30	$ 15,000	Based on contractor unit cost quotes
Install replacement wells	2	ea	$ 30,000	$ 60,000	80 feet deep, stainless steel casing wells
Transport and place in PCB Landfill	3,300	cy	$ 10	$ 33,000	Disposal of gravel barrier in the PCB Landfill
PCT-A, PCT-B Extraction					
GW extraction pumps, controllers	4	ea	$ 10,000	$ 40,000	5 pumps, level controllers in RAP wells in PCT-A, PCT-B
Collection-discharge piping upgrade	5,000	ft	$ 60	$ 300,000	Assume 5,000 ft of piping to connect 4 wells to GWTS/evap pond
GWTS for PCT (VOCs, Inorganics treatment)					PCT-A,B extraction (gal/year) 5,600,000
Water storage tanks and transfer tanks: carbon steel	4	ls	$ 50,000	$ 200,000	Based on previous tank replacment costs
LPGAC vessels - 4x2,000 lb pressure vessels	4	units	$ 25,000	$ 100,000	2 trains of 2x2,000 lb LPGAC vessels, Siemens quote
Reverse Osmosis Units (Pair in series @ 10 gpm)	2	ls	$ 70,900	$ 142,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system; 2 units in series
Reject concentrator (3-module VSEP system)	1	ls	$ 173,600	$ 174,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 75,000	$ 75,000	Assumed based on experience
Control system	1	ls	$ 75,000	$ 75,000	PLC controls, programming, alarms, level controls in pumps
Equipment pad, secondary containment, fence	1	ls	$ 75,000	$ 75,000	Means Cost Handbook 2005; assume75'x100' at$10/SF
Electrical, Utilities Hookups	1	ls	$ 50,000	$ 50,000	Assumed lump sum based on past project experience
Equipment installation and startup	1	ls	$ 125,000	$ 125,000	Subcontractor labor for equipment hookups, startup, testing

TABLE E-6-2
FS AREA 5S - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (Cont'd)					
Equipment rentals, PID/FID, misc ODCs	1	ls	$ 50,000	$ 50,000	
Additional tankage for groundwater and brine storage	6	ls	$ 50,000	$ 300,000	6 additional 20,000 gallon tanks to store gw that cannot be discharged due to non-compliance with stringent NPDES limits for inorganics and may need to be treated again
PCT well redevelopment	1	ls	$ 25,000	$ 25,000	Redevelop wells in PCT-A and PCT-B
Health and Safety / Quality Control					PCT-C length (linear feet) = 1500
Construction QA/QC Program	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Health and Safety Program, ODCs	1	ls	$ 25,000	$ 25,000	Based on contractor quotes
			Direct Capital Total:	**$ 2,472,000**	Assume higher 50% contingency for challenges with # reverse osmosis units needed, level of pre-treatment and filtration needed; e.g. iron filtration units may be required due to elevated dissolved iorn
			Contingency (50%)	**$ 1,236,000**	
			Direct Capital Total:	**$ 3,708,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 2,472,000	$ 124,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 2,472,000	$ 74,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$ 2,472,000	$ 247,000	
Construction Management	5%	of	$ 2,472,000	$ 124,000	
			Total PM/CM Cost:	**$ 569,000**	
			Total Capital Cost:	**$ 4,277,000**	
Operation and Maintenance Costs					
GWTS for PCT - Operation and Maintenance					PCT-A,B extraction (gal/year) 5,600,000 Design flow rate (gpm) 10
GWTS Maintenance and Monitoring (Labor)	12	mths	$ 15,000	$ 180,000	1 FTE worker
GWTS water sampling for compliance	12	mths	$ 2,000	$ 24,000	Assume $2000 sampling cost per month
LPGAC carbon vessels and replacement	12	mths	$ 3,000	$ 36,000	Assume 1-2000 lb vessel changed out per month
Utilities: electricity	12	mths	$ 2,000	$ 24,000	Assume 20 kW (14HP) rated equipment power usage
Membranes, filters - waste disposal	12	mths	$ 4,000	$ 48,000	RO membranes, filters, solid waste
Well redevelopment, annual	1	year	$ 30,000	$ 30,000	one event per year for all wells
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$ 50,000	$ 50,000	Assumed based on experience
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 50,000	$ 50,000	Same as current GWTS cost
Brine disposal	840,000	gal	$ 0.66	$ 554,000	Brine concentrate disposal quote from American Integrated (AIS); per 5,000 gal truck, $0.50/gallon + $800/load for truck/driver ($0.16/gal)

TABLE E-6-2
FS AREA 5S - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
			Subtotal Annual O&M Cost:	$ 996,000	
			Contingency (50%):	$ 498,000	
Project Management/Technical Support	1	year	$ 16,000	$ 16,000	Assume double PM cost for Alt 2 Area 5S
Sitewide Groundwater Monitoring	1	year	$ 121,000	$ 121,000	Annual 1/3rd cost of current sampling program + 25%
			Total Annual O&M Cost:	**$ 1,631,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace PCT-A and -B trenches/wells	2	50-year	$ 1,500,000	$ 3,000,000	Assume entire length of PCT trenches (3000 feet) would need to be replaced based on unit cost for PCT-C Trench $1000/lf
Replace GWTS	2	50-year	$ 1,391,000	$ 2,782,000	Assume entire GWTS is replaced every 50 years

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$4,277		$4,277	$4,277	
Annual O&M Cost (post construction)	0 - 5	$8,180	$1,636	$7,492	$6,708	
Annual O&M Cost (post construction)	6 - 30	$40,900	$1,636	$24,574	$13,593	
Annual O&M Cost (post construction)	31 - 100	$119,952	$1,714	$20,561	$3,188	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$36,343,000**	**$24,578,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$56,904,000**	**$27,766,000**	

TABLE E-6-2
FS AREA 5S - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 4,439,526**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 1,692,978**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 50-year (2014):	**$ 3,000,858**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$4,440	$887.91	$3,948	$3,402	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$8,491	$1,698.17	$7,777	$6,963	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$42,454	$1,698.17	$25,508	$14,110	
Annual O&M Cost (post construction)	31 - 100	$124,510	$1,778.72	$21,342	$3,309	
			Present Value of Capital	**$3,948,000**	**$3,402,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$33,285,000**	**$21,073,000**	
			Present Value of 100 Year O&M	**$54,627,000**	**$24,381,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$37,233,000**	**$24,475,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$58,575,000**	**$27,784,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through the RAP wells continue as currently.
2. Groundwater RAP extraction rates at PCT-A and B are assumed to decrease due to site capping and closing ponds that will reduce infiltration.
3. Groundwater treatment plant is upgraded with new treatment equipment, extraction pumps, repaired/new collection/discharge piping, etc

TABLE E-6-3
FS AREA 5S - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Extraction (PCT-A) + In-situ Reactive Wall (PCT-B) + MNA + ICs + Monitoring

Alternative Description: This alternative assumes that the PCT-B trench is converted to a passive, in-situ reactive wall treatment using ZVI instead of extraction (Figure 11-32A) and extraction at the PCT-A. The extracted PCT-A liquids will be pumped to a new lined evaporation pond which we are proposing to be located in the footprint of the A-Series Pond. The insitu reactive wall is constructed by cutting four slots in the clay barrier along the trench. Note that anticipated capping remedies for the FS Areas and 1 and 3 upgradient of PCT-B would minimize leaching to groundwater. This combined with natural attenuation of organics would reduce contaminant concentrations over the long term. Groundwater monitoring is included as described in the RGMEW workplan March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 75,000	$ 75,000	
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Preparation/Geophysical survey	1	ls	$ 20,000	$ 20,000	
Additional Investigation for PRB					
Hydrogeo study	1	ls	$ 250,000	$ 250,000	Based on experience at other project sites
Bench-scale treatability studies	1	ls	$ 250,000	$ 250,000	Based on experience at other project sites
Reactive Wall Construction PCT-B Trench					
Excavation, 2xGates, 12'x8'x55'D	500	cy	$ 35	$ 17,500	Means Cost Handbook 2005
Sheet pile shoring, 2xGates	5,000	sf	$ 90	$ 450,000	Based on contractor quotes
Backfill, ZVI	100	tons	$ 1,000	$ 100,000	Based on contractor quotes
Backfill, Pea gravel or sand	200	cy	$ 30	$ 6,000	Based on contractor quotes
Backfill, clay on top	400	cy	$ 35	$ 14,000	Based on contractor quotes
Additional mon wells for PRB	2	ea	$ 30,000	$ 60,000	Based on contractor quotes
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 50,000	$ 50,000	Based on contractor experience with previous GW projects onsite
Health and Safety Program, ODCs	1	ls	$ 25,000	$ 25,000	Based on contractor experience with previous GW projects onsite
			Direct Capital Total:	**$ 1,368,000**	
			Contingency (50%)	**$ 684,000**	
			Direct Capital Total:	**$ 2,052,000**	

TABLE E-6-3
FS AREA 5S - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 1,368,000	$ 68,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 1,368,000	$ 41,000	
EPA Oversight Costs	10%	of	$ 1,368,000	$ 137,000	
Construction Management	5%	of	$ 1,368,000	$ 68,000	
			Total PM/CM Cost:	**$ 314,000**	
			Total Capital Cost:	**$ 2,366,000**	
Operation and Maintenance Costs					
GWTS Operation and Maintenance					
Groundwater monitoring for PRB	1	year	$ 16,000	$ 16,000	16 wells sampling semiannually for 4 gates in PCT-C barrier
GWTS Maintenance and Monitoring (labor)	12	mths	$ 1,000	$ 12,000	Based on current site O&M. 20 hrs/week O&M labor at $100/hr
LPGAC carbon vessels and replacement	1	year	$ 20,000	$ 20,000	Based on current site O&M costs
GWTS water sampling for compliance	1	year	$ 2,500	$ 2,500	Based on current site O&M
Utilities: electricity	12	mths	$ 250	$ 3,000	Based on current site O&M
Repair, Replacement: Pumps, motors, valves, fittings, electric su	1	year	$ 2,500	$ 2,500	Based on current site O&M
Misc: Equip rentals/PID/FID/Generator/Forklift/ODCs	1	year	$ 2,000	$ 2,000	Based on current site O&M
			Subtotal Annual O&M Cost:	$ 58,000	
			Contingency (50%):	$ 29,000	
Project Management/Technical Support	1	year	$ 4,000	$ 4,000	Assume 1/2 of PM cost for Alt 2
Sitewide Groundwater Monitoring	1	year	$ 121,000	$ 121,000	Annual 1/3rd cost of current sampling program + 25%
			Total Annual O&M Cost:	**$ 212,000**	

TABLE E-6-3
FS AREA 5S - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace PCT-A trench	2	50-year	$ 1,000,000	$ 2,000,000	Assume entire length of PCT-A (1000 feet) would need to be replaced based on unit cost for PCT-C Trench $1000/lf
Replace ZVI reactive wall in PCT-B trench	6	15-year	$ 647,500	$ 3,885,000	Use total cost of reactive wall construction*1.25 to include PM/CM costs; replaced every 15 years

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$2,366		$2,366	$2,366	
Annual O&M Cost (post construction)	0 - 5	$1,085	$217	$994	$890	
Annual O&M Cost (post construction)	6 - 30	$6,720	$269	$4,038	$2,233	
Annual O&M Cost (post construction)	31 - 100	$19,430	$278	$3,330	$516	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$7,397,000**	**$5,489,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$10,728,000**	**$6,006,000**	

TABLE E-6-3
FS AREA 5S - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
Total Capital Cost (2014):					**$ 2,455,908**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost, Annual (2014):					**$ 220,056**	
Periodic Cost, 5-year (2014):					**$ 25,950**	
Periodic Cost, 15-year (2014):					**$ 672,105**	
Periodic Cost, 50-year (2014):					**$ 1,038,000**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$2,456	$491	$2,184	$1,882	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,126	$225	$1,032	$924	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$6,975	$279	$4,191	$2,318	
Annual O&M Cost (post construction)	31 - 100	$20,168	$288	$3,457	$536	
Present Value of Capital				**$2,184,000**	**$1,882,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M				**$5,223,000**	**$3,242,000**	
Present Value of 100 Year O&M				**$8,680,000**	**$3,778,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$7,407,000**	**$5,124,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)				**$10,863,000**	**$5,660,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through RAP trenches (PCT-A, PCT-B) continue as currently.
2. Groundwater RAP extraction rates are assumed to be decreased due to site capping and closing ponds.
3. Groundwater treatment plant is upgraded with new treatment equipment, extraction pumps, repaired/new collection/discharge piping, etc

TABLE E-6-4
FS AREA 5S - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative Aggressive Extraction (40 New Large Diameter Wells) + Extraction (PCT-A, PCT-B) + Treat and Discharge Offsite + MNA + ICs + Monitoring

Alternative Description : This alternative is an aggressive hydraulic extraction that would require a high density of groundwater extraction wells be installed as an attempt to achieve MCLs in groundwater throughout the site. The alternative would be required since a Technical Impracticability waiver is not included for this groundwater area. It involves installation of 40 new large diameter extraction wells distributed across Area 5 South at approximately 150-foot spacing (Figure 11-33A). Extraction from these wells would be continuous and is assumed to produce about 0.5 gpm per well and including PCT-A and PCT-B flow for a total of about 30 gpm of low VOCs and metals-impacted groundwater being treated aboveground in a dedicated treatment system for discharge offsite in accordance with a site-specific NPDES permit. Extraction at the PCT-A and PCT-B is also included to provide capture at the perimeter. Note that anticipated capping remedies for the FS Areas and 1 and 3 upgradient of PCT-A and PCT-B would minimize leaching to groundwater. This combined with natural attenuation of organics would reduce contaminant concentrations over the long term.The extracted groundwater is treated at a centralized treatment system at the LTA. The treatment system is assumed to include Reverse Osmosis and LPGAC. The treated groundwater is discharged offsite under a site-specific NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 300,000	$ 300,000	Based on Contractor quotes from previous projects
Remediation Documentation/Reporting	1	ea	$ 150,000	$ 150,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Investigation/Aquifer testing/Reporting	1	ls	$ 50,000	$ 50,000	Addtnl investigations in the vicinity of expected DNAPL at the toe of the P/S Landfill and refine nature & extent
Site Preparation/Geophysical survey	1	ls	$ 50,000	$ 50,000	Include surveying location of existing collection piping runs
Reverse Osmosis, bench scale/field scale testing	1	ls	$ 100,000	$ 100,000	Bench scale/field pilot test for extraction and treatment of TDS and metals incl. rental equipment, workplan, reporting, onsite treatment,
Extraction Well Installation					Well install unit cost, $/lf $1,575
Well drilling, 8" well, steel casing	40	ea	$ 45,000	$ 1,800,000	50 feet deep, steel casing, sonic drilling 8-inch well
Well headworks/vaults/pumps	40	ea	$ 5,000	$ 200,000	Based on experience with other wells
Consultant oversight, reporting	40	ea	$ 9,000	$ 360,000	Assume workplan, oversight during well install, logging, reporting; 3 days per well; 10 weeks to complete well install
Waste disposal, H&S, ODCs	40	ea	$ 4,000	$ 160,000	Assumed offsite disposal
GW Treatment System (Treat VOCs, Inorganics)					Extraction rate_40 well (gpm) 20
Design flow rate 30 gpm					PCT-A,B extraction (gal/yr) 5,600,000
GW extraction pumps, controllers for Agg ext wells	40	ea	$ 10,000	$ 400,000	40 pumps with level controllers capable of pumping at 1 gpm
GW extraction pumps, controllers for PCT ext wells	5	ea	$ 10,000	$ 50,000	5 pumps with level controllers capable of pumping at 1 gpm
Collection piping, trenching, cabling incl offsite disch pipe	10,000	ft	$ 60	$ 600,000	Based on contractor unit cost estimate
Water storage tanks and transfer tanks: carbon steel	6	ls	$ 50,000	$ 300,000	Based on previous tank replacment costs
LPGAC vessels - 6x2,000 lb pressure vessels	6	units	$ 25,000	$ 150,000	2 trains of 3x2,000 lb LPGAC vessels, Siemens quote
Reverse Osmosis Units (Pair in series @ 30 gpm)	2	ls	$ 153,000	$ 306,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 30 gpm RO system
Reject concentrator (3-module VSEP system)	1	ls	$ 374,500	$ 375,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 30 gpm RO system

TABLE E-6-4
FS AREA 5S - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Additional tankage for gw and brine storage: carbon steel	10	ls	$ 50,000	$ 500,000	10 additional 20,000 gallon tanks to store gw or brine - for gw cannot be discharged due to non-compliance with stringent NPDES limits for inorganics and may need to be treated again
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 150,000	$ 150,000	Assumed based on experience
Control system	1	ls	$ 125,000	$ 125,000	PLC controls, programming, alarms, level controls in pumps
Equipment pad, secondary containment, fence	1	ls	$ 75,000	$ 75,000	Means Cost Handbook 2005; assume75'x100' at$10/SF
PCT well redevelopment	1	ls	$ 25,000	$ 25,000	Redevelop wells in PCT-A and PCT-B
Electrical, Utilities Hookups	1	ls	$ 75,000	$ 75,000	Assumed lump sum based on past project experience
Equipment installation and startup	1	ls	$ 150,000	$ 150,000	Subcontractor labor for equipment hookups, startup, testing
Equipment rentals, PID/FID, misc ODCs	1	ls	$ 50,000	$ 50,000	
Refurbish PCT-C Trench					
Excavating existing gravel trench	8,000	cy	$ 35	$ 280,000	Based on 1,500 lf of trench that is 3 feet thick excavated down to an avg depth of 50 feet; unit cost from Means Handbook 2000
Overburden excavation and backfill	32,000	cy	$ 10	$ 320,000	Assume overburden in 4 times trench volume
Backfill gravel in trench	10,800	tons	$ 30	$ 324,000	Based on contractor quotes from Cal-Portland delivered; 1/2" leach rock
Backfill clay on top layer	800	cy	$ 30	$ 24,000	Based on contractor quotes
Install replacement wells	2	ea	$ 30,000	$ 60,000	80 feet deep, stainless steel casing wells
Disposal of excavated gravel	8,800	cy	$ 10	$ 88,000	Disposal of gravel/clay barrier in the PCB Landfill
Incremental cost of Larger Evap Pond	0	ls	$ 1,078,000	$ -	No evap pond because inorganics are treated for offsite disch
Remedial Monitoring/Sampling					
Air Monitoring/Sampling	16	samples	$ 250	$ 4,000	16 air/dust samples analyze for VOCs, metals
Soil Confirmation Sampling and Analysis	16	samples	$ 250	$ 4,000	Analyze for VOCs, 6010 total metals
Groundwater Sampling and Analysis	16	samples	$ 250	$ 4,000	Analyze for VOCs, 6010 total metals
Treatment System Vapor Sampling at Startup	20	samples	$ 250	$ 5,000	20 samples influent, effluent over 3 week startup period
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 200,000	$ 200,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
			Direct Capital Total:	**$ 7,914,000**	
			Contingency (50%)	**$ 3,957,000**	
			Direct Capital Total:	**$ 11,871,000**	

TABLE E-6-4
FS AREA 5S - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost		Estimated Cost		Notes / Assumptions
Project / Construction Management							
Remedial Design/Engineering	5%	of	$	7,914,000	$	396,000	
Project Management, Agency Reporting and Coordination	3%	of	$	7,914,000	$	237,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$	7,914,000	$	791,000	
Construction Management	5%	of	$	7,914,000	$	396,000	
			Total PM/CM Cost:		**$**	**1,820,000**	
			Total Capital Cost:		**$**	**13,691,000**	
Operation and Maintenance Costs							
GWTS Operation and Maintenance, Treat Organics & Inorganics, Design flow rate = 30 gpm							Extraction rate_40 well (gpm) 20 PCT-A,B extraction (gal/yr) 5,600,000
GWTS Maintenance and Monitoring (Labor)	12	mths	$	30,000	$	360,000	2 FTE workers
LPGAC carbon vessels and replacement	12	mths	$	6,000	$	72,000	Based on 2 carbon changeouts per month; $2/lb
Utilities: electricity	12	mths	$	5,000	$	60,000	Assume 50 kW (35HP) rated equipment power usage
Membranes, filters - waste disposal	12	mths	$	8,000	$	96,000	RO membranes, filters, solid waste
Groundwater sampling for compliance	12	mths	$	4,000	$	48,000	GWTS influent, effluent, intermediate, LPGAC sampling
Well redevelopment, annual	1	year	$	80,000	$	80,000	one event per year for all impacted wells
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$	100,000	$	100,000	Assumed based on experience
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$	75,000	$	75,000	
Brine disposal	2,416,800	gal	$	0.66	$	1,595,000	Brine concentrate disposal quote from American Integrated (AIS); per 5,000 gal truck, $0.50/gallon + $800/load for truck/driver ($0.16/gal)
			Subtotal Annual O&M Cost:		$	2,486,000	
			Contingency (50%):		$	1,243,000	
Project Management/Technical Support	1	year	$	32,000	$	32,000	Assume twice the PM cost of Alt 3
Sitewide Groundwater Monitoring	1	year	$	121,000	$	121,000	Annual 1/3rd cost of current sampling program + 25%
			Total Annual O&M Cost:		**$**	**3,882,000**	

TABLE E-6-4
FS AREA 5S - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace PCT-A and -B trenches	2	50-year	$ 1,500,000	$ 3,000,000	Assume entire length of PCT-A and PCT-B trenches (1500 feet) would need to be replaced based on unit cost for PCT-C Trench $1000/lf
Replace GWTS	2	50-year	$ 3,331,000	$ 6,662,000	Assume GWTS is replaced every 50 years

PRESENT VALUE ANALYSIS (2012 $K)						
Cost Type	**Year**	**Total Cost (2012 $K)**	**Cost/Year (2012 $K)**	**Net Present Value at 3% DF (2012 $K)**	**Net Present Value at 7% DF (2012 $K)**	
Capital Cost		$13,691		$13,691	$13,691	
Annual O&M Cost (post construction)	0 - 5	$19,435	$3,887	$17,801	$15,937	
Annual O&M Cost (post construction)	6 - 30	$97,175	$3,887	$58,386	$32,296	
Annual O&M Cost (post construction)	31 - 100	$281,402	$4,020	$48,234	$7,478	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$89,878,000**	**$61,925,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$138,112,000**	**$69,403,000**	

TABLE E-6-4
FS AREA 5S - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 14,211,258**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 4,029,516**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 50-year (2014):	**$ 5,014,578**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$14,211	$2,842.25	$12,638	$10,891	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$20,174	$4,034.71	$18,478	$16,543	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$100,868	$4,034.71	$60,604	$33,524	
Annual O&M Cost (post construction)	31 - 100	$292,095	$4,172.79	$50,067	$7,762	
			Present Value of Capital	**$12,638,000**	**$10,891,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$79,082,000**	**$50,067,000**	
			Present Value of 100 Year O&M)	**$129,149,000**	**$57,829,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$91,720,000**	**$60,958,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$141,787,000**	**$68,720,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the 30 gpm extracted flow is treated for offsite discharge under a site-specific NPDES permit.
2 The PCT-A and PCT-B groundwater is extracted, treated and discharged offsite to the B-Drainage.
3 The GWTS includes a LPGAC and reverse osmosis system for treatment of VOCs and inorganics for offsite discharge.

TABLE E-7-0
AREA 5 WEST COST SUMMARY
Casmalia Resources Superfund Site
Final Feasibility Study

SUMMARY OF AREA 5 WEST REMEDIAL ALTERNATIVE COSTS						
Alt	**PROPOSED REMEDIAL ALTERNATIVE**	**CAPITAL COST (2014 $)**	**ANNUAL O&M (2014 $)**	**TIME FRAME**	**PRESENT WORTH CAPITAL + O&M 3% DISCOUNT RATE (2014 $)**	**PRESENT WORTH CAPITAL + O&M 7% DISCOUNT RATE (2014 $)**
2	Extraction (PCT-C) + Treat/Discharge to Onsite Evap Pond + MNA + ICs + Monitoring	$ 2,633,000	$ 258,000	30-year	$7,509,000	$5,290,000
				100-year	$11,144,000	$5,853,000
3	Extraction (PCT-C) + Treat/Discharge Offsite + MNA + ICs + Monitoring	$ 5,005,000	$ 1,719,000	30-year	$38,244,000	$25,231,000
				100-year	$59,843,000	$28,579,000
4	In-situ Reactive Wall (PCT-C) + MNA + ICs + Monitoring	$ 4,450,000	$ 155,000	30-year	$9,834,000	$6,912,000
				100-year	$13,256,000	$7,442,000
5	Aggressive Extraction (40 New Large Diameter Wells, Area 5W) + Extraction (PCT-C) + Treat/Discharge Offsite + ICs + Mon	$ 12,844,000	$ 2,041,000	30-year	$51,522,000	$35,231,000
				100-year	$77,471,000	$39,254,000

NOTES
1. Total Present Worth Cost (Capital + O&M in 2014 $) is shown for a 3% and 7% net discount rate and a 30-year and a 100-year timeframe and includes contingency on capital and O&M costs.
2. FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs.
3. PV of Capital Cost (in 2014 $) is shown for a 3% and 7% net discount rate based on the average capital cost for each year of the 5 year construction period.

TABLE E-7-1
FS AREA 5W - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Rremedial Alternative Extraction (PCT-C) + Treat/Discharge to Onsite Evap Pond + MNA + ICs + Monitoring

Alternative Description: This remedial alternative includes continued extraction of liquids from PCT-C as is required to meet current action levels and prevent offsite migration. The extracted PCT-C liquids will be pumped to the new lined 11-acre evaporation pond which we are proposing be located in the footprint of the A-Series Pond (Figure 11-34A). Note that anticipated capping remedies for the RCRA Canyon/WCSA (FS Area 2) and Pond A-5 and A-Series Pond (FS Area 4) that are upgradient would minimize leaching to groundwater and this would attenuate inorganic concentrations over the long term. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Preparation/Geophysical survey	1	ls	$ 20,000	$ 20,000	Include surveying location of existing collection piping runs
Refurbish PCT-C Trench					Unit cost for trench per lf $ 1,000
Excavating existing gravel trench	8,000	cy	$ 35	$ 280,000	Based on 1,500 lf of trench that is 3 feet thick excavated down to an avg depth of 50 feet; unit cost from Means Handbook 2000
Overburden excavation and backfill	32,000	cy	$ 10	$ 320,000	Assume overburden in 4 times trench volume
Backfill gravel/sand in trench	10,800	tons	$ 30	$ 324,000	Based on contractor quotes from Cal-Portland delivered; 1/2" leach rock
Backfill clay on top layer	800	cy	$ 30	$ 24,000	Based on contractor quotes
Install replacement wells	2	ea	$ 30,000	$ 60,000	80 feet deep, stainless steel casing wells
Disposal of excavated gravel	8,800	cy	$ 10	$ 88,000	Disposal of gravel/clay barrier in the PCB Landfill
PCT-C Extraction					
GW extraction pumps, controllers	6	ea	$ 10,000	$ 60,000	6 pumps in RAP wells,
Collection-discharge piping upgrade	1,000	ft	$ 30	$ 30,000	Assume 1,000 ft of piping to connect 11 wells
GWTS for PCT (VOCs treatment)					PCT-C extraction (gal/year) 4,200,000
Water storage tanks and transfer tanks: carbon steel	2	ls	$ 50,000	$ 100,000	Based on previous tank replacment costs
LPGAC vessels - 4x2,000 lb pressure vessels	4	units	$ 25,000	$ 100,000	2 trains of 2x2,000 lb LPGAC vessels, Siemens quote
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 25,000	$ 25,000	Assumed based on experience
Health and Safety / Quality Control					PCT-C length (linear feet) = 1500
Construction QA/QC Program	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Health and Safety Program, ODCs	1	ls	$ 25,000	$ 25,000	Based on contractor quotes
			Direct Capital Total:	**$ 1,606,000**	
			Contingency (35%)	**$ 562,000**	Assume lower 35% contingency for conventional extraction technology
			Direct Capital Total:	**$ 2,168,000**	

TABLE E-7-1
FS AREA 5W - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 1,606,000	$ 80,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 1,606,000	$ 48,000	
EPA Oversight Costs	10%	of	$ 1,606,000	$ 161,000	
Construction Management	5%	of	$ 1,606,000	$ 80,000	
			Total PM/CM Cost:	**$ 369,000**	
			Total Capital Cost:	**$ 2,537,000**	
		Operation and Maintenance Costs			
GWTS Operation and Maintenance					
GWTS Maintenance and Monitoring (labor)	12	mths	$ 2,000	$ 24,000	Based on current site O&M. 20 hrs/week O&M labor at $100/hr
LPGAC carbon vessels and replacement	12	mths	$ 3,000	$ 36,000	Assume 1-2000 lb vessel changed out per month
GWTS water sampling for compliance	1	year	$ 5,000	$ 5,000	Based on current site O&M
Utilities: electricity	12	mths	$ 500	$ 6,000	Based on current site O&M
Repair, Replacement: Pumps, motors, valves, fittings, electric su	1	year	$ 5,000	$ 5,000	Based on current site O&M
Misc: Equip rentals/PID/FID/Generator/Forklift/ODCs	1	year	$ 4,000	$ 4,000	Based on current site O&M
			Subtotal Annual O&M Cost:	$ 80,000	
			Contingency (50%):	$ 40,000	
Project Management/Technical Support	1	year	$ 8,000	$ 8,000	Assume 1/3 rd of PM cost for Alt 2 Area 5NS
Sitewide Groundwater Monitoring	1	year	$ 121,000	$ 121,000	Annual 1/3rd cost of current sampling program + 25%
			Total Annual O&M Cost:	**$ 249,000**	

TABLE E-7-1
FS AREA 5W - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs						
US EPA Five-year Review (5,10,15,20,25 and 30 years)		6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace PCT-C trench		2	50-year	$ 1,500,000	$ 3,000,000	Assume entire length of PCT trenches (3000 feet) would need to be replaced based on unit cost for PCT-C Trench $1000/lf
PRESENT VALUE ANALYSIS (2012 $K)						
Cost Type	**Year**	**Total Cost (2012 $K)**	**Cost/Year (2012 $K)**	**Net Present Value at 3% DF (2012 $K)**	**Net Present Value at 7% DF (2012 $K)**	
Capital Cost		$2,537		$2,537	$2,537	
Annual O&M Cost (post construction)	0 - 5	$1,270	$254	$1,163	$1,041	
Annual O&M Cost (post construction)	6 - 30	$6,350	$254	$3,815	$2,110	
Annual O&M Cost (post construction)	31 - 100	$20,430	$292	$3,502	$543	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$7,516,000**	**$5,689,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$11,017,000**	**$6,232,000**	

TABLE E-7-1
FS AREA 5W - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 2,633,406**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 258,462**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 50-year (2014):	**$ 1,557,000**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$2,633	$526.68	$2,342	$2,018	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,318	$263.65	$1,207	$1,081	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$6,591	$263.65	$3,960	$2,191	
Annual O&M Cost (post construction)	31 - 100	$21,206	$302.95	$3,635	$564	
			Present Value of Capital	**$2,342,000**	**$2,018,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$5,168,000**	**$3,272,000**	
			Present Value of 100 Year O&M)	**$8,803,000**	**$3,835,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$7,509,000**	**$5,290,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$11,144,000**	**$5,853,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through RAP wells at PCT-C.
2. Groundwater RAP extraction rates are assumed to be decreased due to site capping and closing ponds.
3. Groundwater treatment plant is upgraded with new treatment equipment, extraction pumps, repaired/new collection/discharge piping, etc

TABLE E-7-2
FS AREA 5W - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Rremedial Alternative Extraction (PCT-C) + Treat/Discharge Offsite + MNA + ICs + Monitoring

Alternative Description: This remedial alternative includes continued extraction of liquids from PCT-C as is required to meet current action levels and prevent offsite migration. The extracted PCT-C liquids will be pumped to the new lined 11-acre evaporation pond which we are proposing be located in the footprint of the A-Series Pond (Figure 11-35A). Note that anticipated capping remedies for the RCRA Canyon/WCSA (FS Area 2) and Pond A-5 and A-Series Pond (FS Area 4) that are upgradient would minimize leaching to groundwater and this would attenuate inorganic concentrations over the long term. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009. The waste brine from inorganics treatment is sent offsite for disposal.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Preparation/Geophysical survey	1	ls	$ 20,000	$ 20,000	Include surveying location of existing collection piping runs
Refurbish PCT-C Trench					Unit cost for trench per lf $ 1,000
Excavating existing gravel trench	8,000	cy	$ 35	$ 280,000	Based on 1,500 lf of trench that is 3 feet thick excavated down to an avg depth of 50 feet; unit cost from Means Handbook 2000
Overburden excavation and backfill	32,000	cy	$ 10	$ 320,000	Assume overburden in 4 times trench volume
Backfill gravel/sand in trench	10,800	tons	$ 30	$ 324,000	Based on contractor quotes from Cal-Portland delivered; 1/2" leach rock
Backfill clay on top layer	800	cy	$ 30	$ 24,000	Based on contractor quotes
Install replacement wells	2	ea	$ 30,000	$ 60,000	80 feet deep, stainless steel casing wells
Disposal of excavated gravel	8,800	cy	$ 10	$ 88,000	Disposal of gravel/clay barrier in the PCB Landfill
PCT-C Extraction					
GW extraction pumps, controllers	2	ea	$ 10,000	$ 20,000	2 pumps in RAP wells
Collection-discharge piping upgrade	4,000	ft	$ 60	$ 240,000	Assume 4,000 ft of piping to connect wells to system and discharge offsit
GWTS for PCT (VOCs and Inorganics treatment)					PCT-C extraction (gal/year) 4,200,000
					Design flow rate (gpm) 10
Water storage tanks and transfer tanks: carbon steel	4	ls	$ 50,000	$ 200,000	Based on previous tank replacment costs
LPGAC vessels - 4x2,000 lb pressure vessels	4	units	$ 25,000	$ 100,000	2 trains of 2x2,000 lb LPGAC vessels, Siemens quote
Reverse Osmosis Units (Pair in series @ 10 gpm)	2	ls	$ 70,900	$ 142,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system; 2 units in series
Reject concentrator (3-module VSEP system)	1	ls	$ 173,600	$ 174,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 75,000	$ 75,000	Assumed based on experience
Control system	1	ls	$ 75,000	$ 75,000	PLC controls, programming, alarms, level controls in pumps
Equipment pad, secondary containment, fence	1	ls	$ 75,000	$ 75,000	Means Cost Handbook 2005; assume75'x100' at$10/SF
Electrical, Utilities Hookups	1	ls	$ 50,000	$ 50,000	Assumed lump sum based on past project experience
Equipment installation and startup	1	ls	$ 125,000	$ 125,000	Subcontractor labor for equipment hookups, startup, testing

TABLE E-7-2
FS AREA 5W - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Equipment rentals, PID/FID, misc ODCs	1	ls	$ 50,000	$ 50,000	
Additional tankage for gw storage	3	ls	$ 50,000	$ 150,000	3 additional 20,000 gallon tanks to store gw that cannot be discharged due to non-compliance with stringent NPDES limits for inorganics and may need to be treated again
PCT well redevelopment	1	ls	$ 20,000	$ 20,000	Redevelop wells in PCT-A and PCT-B
Health and Safety / Quality Control					PCT-C length (linear feet) = 1500
Construction QA/QC Program	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Health and Safety Program, ODCs	1	ls	$ 25,000	$ 25,000	Based on contractor quotes
			Direct Capital Total:	**$ 2,787,000**	Assume higher 50% contingency for challenges with RO technology, # reverse osmosis units needed, and level of pre-treatment and filtration needed, e.g. additional iron pre-treatment may be required
			Contingency (50%)	**$ 1,394,000**	
			Direct Capital Total:	**$ 4,181,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 2,787,000	$ 139,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 2,787,000	$ 84,000	
EPA Oversight Costs	10%	of	$ 2,787,000	$ 279,000	
Construction Management	5%	of	$ 2,787,000	$ 139,000	
			Total PM/CM Cost:	**$ 641,000**	
			Total Capital Cost:	**$ 4,822,000**	
Operation and Maintenance Costs					
GWTS for PCT (VOCs and Inorganics treatment)					PCT-C extraction (gal/year) 4,200,000 Design flow rate (gpm) 10
GWTS Maintenance and Monitoring (Labor)	12	mths	$ 20,000	$ 240,000	1.2 FTE workers
GWTS water sampling for compliance	12	mths	$ 2,000	$ 24,000	Assume $2000 sampling cost per month
LPGAC vessels and replacement	12	mths	$ 3,000	$ 36,000	Based on current site O&M costs
Utilities: electricity	12	mths	$ 5,000	$ 60,000	Assume 50 kW (35HP) rated equipment power usage
Membranes, filters - waste disposal	12	mths	$ 6,000	$ 72,000	RO membranes, filters, solid waste
Well redevelopment, annual	1	year	$ 20,000	$ 20,000	one event per year for all wells
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$ 100,000	$ 100,000	Assumed based on experience
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 75,000	$ 50,000	Same as current GWTS cost + DNAPL costs
Brine disposal	630,000	gal	$ 0.66	$ 416,000	Brine concentrate disposal quote from American Integrated (AIS); per 5,000 gal truck, $0.50/gallon + $800/load for truck/driver ($0.16/gal)

TABLE E-7-2
FS AREA 5W - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
			Subtotal Annual O&M Cost:	$ 1,018,000	
			Contingency (50%):	$ 509,000	
Project Management/Technical Support	1	year	$ 8,000	$ 8,000	Assume 1/3 rd of PM cost for Alt 2 Area 5NS
Sitewide Groundwater Monitoring	1	year	$ 121,000	$ 121,000	Annual 1/3rd cost of current sampling program + 25%
			Total Annual O&M Cost:	**$ 1,656,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace PCT-C trench	2	50-year	$ 1,500,000	$ 3,000,000	Assume entire length of PCT trenches (3000 feet) would need to be replaced based on unit cost for PCT-C Trench $1000/lf
Replace GWTS	2	50-year	$ 1,236,000	$ 2,472,000	Assume entire GWTS is replaced every 50 years
PRESENT VALUE ANALYSIS (2012 $K)					
Cost Type / **Year**	**Total Cost (2012 $K)**	**Cost/Year (2012 $K)**	**Net Present Value at 3% DF (2012 $K)**	**Net Present Value at 7% DF (2012 $K)**	
Capital Cost	$4,822		$4,822	$4,822	
Annual O&M Cost (post construction) / 0 - 5	$8,305	$1,661	$7,607	$6,810	
Annual O&M Cost (post construction) / 6 - 30	$41,525	$1,661	$24,949	$13,801	
Annual O&M Cost (post construction) / 31 - 100	$121,392	$1,734	$20,807	$3,226	
		Total Present Value of Alternative (Capital + 30 Year O&M)	**$37,378,000**	**$25,433,000**	2012 $
		Total Present Value of Alternative (Capital + 100 Year O&M)	**$58,186,000**	**$28,659,000**	

TABLE E-7-2
FS AREA 5W - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 5,005,236**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 1,718,928**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 50-year (2014):	**$ 2,839,968**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$5,005	$1,001.05	$4,451	$3,836	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$8,621	$1,724.12	$7,896	$7,069	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$43,103	$1,724.12	$25,898	$14,325	
Annual O&M Cost (post construction)	31 - 100	$126,005	$1,800.07	$21,598	$3,349	
			Present Value of Capital	**$4,451,000**	**$3,836,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$33,793,000**	**$21,395,000**	
			Present Value of 100 Year O&M)	**$55,392,000**	**$24,743,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$38,244,000**	**$25,231,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$59,843,000**	**$28,579,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through RAP wells at PCT-C.
2. Groundwater RAP extraction rates are assumed to be decreased due to site capping and closing ponds.
3. Groundwater treatment plant is upgraded with new treatment equipment, extraction pumps, repaired/new collection/discharge piping, etc

TABLE E-7-3
FS AREA 5W - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: In-situ Reactive Wall (PCT-C) + MNA + ICs + Monitoring

Alternative Description: This alternative assumes that the PCT-C trench is converted to a passive, in-situ reactive wall treatment using ZVI instead of extraction (Figure 11-36A). It is constructed by cutting four slots in the clay barrier along the 1,500-foot length of the trench. Note that anticipated capping remedies for the RCRA Canyon/WCSA (FS Area 2) and Pond A-5 and A-Series Pond (FS Area 4) that are upgradient would minimize leaching to groundwater and this would attenuate inorganic concentrations over the long term. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 75,000	$ 75,000	
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Preparation/Geophysical survey	1	ls	$ 20,000	$ 20,000	
Additional Investigation for PRB					
Hydrogeo study	1	ls	$ 250,000	$ 250,000	Based on experience at other project sites
Bench-scale treatability studies	1	ls	$ 250,000	$ 250,000	Based on experience at other project sites
Reactive Wall Construction PCT-C Trench					
Excavation, 4xGates, 12'x8'x50'D	1,000	cy	$ 35	$ 35,000	Means Cost Handbook 2005
Sheet pile shoring, 4xGates	9,000	sf	$ 90	$ 810,000	Based on contractor unit cost quotes
Backfill, ZVI	720	tons	$ 1,000	$ 720,000	Based on contractor unit cost quotes
Backfill, Pea gravel or sand	400	cy	$ 30	$ 12,000	Based on contractor unit cost quotes
Backfill, clay on top	600	cy	$ 35	$ 21,000	Based on contractor unit cost quotes
Additional mon wells	4	ea	$ 40,000	$ 160,000	80 feet deep at $500/lf
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 50,000	$ 50,000	Based on contractor experience with previous GW projects onsite
Health and Safety Program, ODCs	1	ls	$ 25,000	$ 25,000	Based on contractor experience with previous GW projects onsite
			Direct Capital Total:	**$ 2,478,000**	
			Contingency (50%)	**$ 1,239,000**	
			Direct Capital Total:	**$ 3,717,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 2,478,000	$ 124,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 2,478,000	$ 74,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$ 2,478,000	$ 248,000	
Construction Management	5%	of	$ 2,478,000	$ 124,000	
			Total PM/CM Cost:	**$ 570,000**	
			Total Capital Cost:	**$ 4,287,000**	

TABLE E-7-3
FS AREA 5W - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
GWTS Operation and Maintenance					
Groundwater monitoring for PRB	1	year	$ 16,000	$ 16,000	16 wells sampling semiannually for 4 gates in PCT-C barrier
Utilities: electricity	0	mths	$ 500	$ -	Based on current site O&M
Repair, Replacement: Pumps, motors, valves, fittings, electric sul	0	year	$ 5,000	$ -	Based on current site O&M
Misc: Equip rentals/PID/FID/Generator/Forklift/ODCs	0	year	$ 4,000	$ -	Based on current site O&M
			Subtotal Annual O&M Cost:	$ 16,000	
			Contingency (50%):	$ 8,000	
Project Management/Technical Support	1	year	$ 4,000	$ 4,000	Assume 1/2 of PM cost for Alt 2
Sitewide Groundwater Monitoring	1	year	$ 121,000	$ 121,000	Annual 1/3rd cost of current sampling program + 25%
			Total Annual O&M Cost:	**$ 149,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace ZVI reactive wall in PCT-C trench	6	15-year	$ 2,200,000	$ 13,200,000	Use total cost of reactive wall construction*1.25 to include PM/CM costs; replaced every 15 years

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$4,287		$4,287	$4,287	
Annual O&M Cost (post construction)	0 - 5	$770	$154	$705	$631	
Annual O&M Cost (post construction)	6 - 30	$8,250	$330	$4,957	$2,742	
Annual O&M Cost (post construction)	31 - 100	$19,230	$275	$3,296	$511	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$9,949,000**	**$7,660,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$13,245,000**	**$8,171,000**	

TABLE E-7-3
FS AREA 5W - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 4,449,906**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 154,662**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 15-year (2014):	**$ 2,283,600**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$4,450	$890	$3,957	$3,410	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$799	$160	$732	$655	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$8,564	$343	$5,145	$2,846	
Annual O&M Cost (post construction)	31 - 100	$19,961	$285	$3,421	$530	
			Present Value of Capital	**$3,957,000**	**$3,410,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$5,877,000**	**$3,502,000**	
			Present Value of 100 Year O&M)	**$9,299,000**	**$4,032,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$9,834,000**	**$6,912,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$13,256,000**	**$7,442,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction trench is converted to an in-situ reactive wall at PCT-C.

TABLE E-7-4
FS AREA 5W - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative Aggressive Extraction (40 New Large Diameter Wells) + Extraction (PCT-C) + Treat and Discharge Offsite + MNA + ICs + Monitoring

Alternative Description : This alternative includes aggressive hydraulic extraction from 40 new 8" diameter wells in large boreholes extracting about on average 0.05 gpm each for a total of 2 gpm extraction and includes the perimeter extraction at the PCT-C. The extracted groundwater is treated at a centralized treatment system at the LTA. The treatment system is assumed to include a Reverse Osmosis and LPGAC units. The treated groundwater is discharged offsite under a site-specific NPDES permit. The Reverse Osmosis treatment creates a large volume brine wastewater that is assumed to be sent offsite for disposal.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 300,000	$ 300,000	Based on Contractor quotes from previous projects
Remediation Documentation/Reporting	1	ea	$ 150,000	$ 150,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Investigation/Aquifer testing/Reporting	1	ls	$ 50,000	$ 50,000	Addtnl investigations in the vicinity of expected DNAPL at the toe of the P/S Landfill and refine nature & extent
Site Preparation/Geophysical survey	1	ls	$ 50,000	$ 50,000	Include surveying location of existing collection piping runs
Reverse Osmosis, bench scale/field scale testing	1	ls	$ 100,000	$ 100,000	Bench scale/field pilot test for extraction and treatment of TDS and metals incl. rental equipment, workplan, reporting, onsite treatment,
Extraction Well Installation					Well install unit cost, $/lf $1,575
Well drilling, 8" well, steel casing	40	ea	$ 45,000	$ 1,800,000	50 feet, steel casing, sonic drilling 8-inch well
Well headworks/vaults/pumps	40	ea	$ 5,000	$ 200,000	
Consultant oversight, reporting	40	ea	$ 9,000	$ 360,000	Assume workplan, oversight during well install, logging, reporting; 3 days per well; 10 weeks to complete well install
Waste disposal, H&S, ODCs	40	ea	$ 4,000	$ 160,000	Assumed offsite disposal
GW Treatment System (Treat inorganics and organics)					Extraction rate_40 well (gpm) 2
Design flow rate = 20 gpm					PCT-C extraction (gal/year) 4,200,000
GW extraction pumps, controllers for Agg ext wells	40	ea	$ 10,000	$ 400,000	60 pumps with level controllers capable of pumping at 1 gpm
GW extraction pumps, controllers for PCT ext wells	2	ea	$ 10,000	$ 20,000	2 pumps with level controllers capable of pumping at 1 gpm
Collection piping, trenching, cabling incl offsite disch pipe	8,000	ft	$ 60	$ 480,000	Based on contractor unit cost estimate
Water storage tanks and transfer tanks: carbon steel	4	ls	$ 50,000	$ 200,000	Based on previous tank replacment costs
LPGAC vessels - 6x2,000 lb pressure vessels	6	units	$ 25,000	$ 150,000	2 trains of 3x2,000 lb LPGAC vessels, Siemens quote
Reverse Osmosis Units (Pair in series @ 20 gpm)	2	ls	$ 115,200	$ 230,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 20 gpm RO system; 2 units in series
Reject concentrator (3-module VSEP system)	1	ls	$ 282,000	$ 282,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 20 gpm RO system
Additional tankage for gw storage: carbon steel	4	ls	$ 50,000	$ 200,000	4 additional 20,000 gallon tanks to store gw that cannot be discharged due to non-compliance with stringent NPDES limits for inorganics and may need to be treated again
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 150,000	$ 150,000	Assumed based on experience
Control system	1	ls	$ 125,000	$ 125,000	PLC controls, programming, alarms, level controls in pumps
Equipment pad, secondary containment, fence	1	ls	$ 75,000	$ 75,000	Means Cost Handbook 2005; assume75'x100' at$10/SF

TABLE E-7-4
FS AREA 5W - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
PCT well redevelopment	1	ls	$ 25,000	$ 25,000	Redevelop wells in PCT-C
Electrical, Utilities Hookups	1	ls	$ 75,000	$ 75,000	Assumed lump sum based on past project experience
Equipment installation and startup	1	ls	$ 150,000	$ 150,000	Subcontractor labor for equipment hookups, startup, testing
Equipment rentals, PID/FID, misc ODCs	1	ls	$ 50,000	$ 50,000	
Refurbish PCT-C Trench					
Excavating existing gravel trench	8,000	cy	$ 35	$ 280,000	Based on 1,500 lf of trench that is 3 feet thick excavated down to an avg depth of 50 feet; unit cost from Means Handbook 2000
Overburden excavation and backfill	32,000	cy	$ 10	$ 320,000	Assume overburden in 4 times trench volume
Backfill gravel in trench	10,800	tons	$ 30	$ 324,000	Based on contractor quotes from Cal-Portland delivered; 1/2" leach rock
Backfill clay on top layer	800	cy	$ 30	$ 24,000	Based on contractor quotes
Install replacement wells	2	ea	$ 30,000	$ 60,000	80 feet deep, stainless steel casing wells
Disposal of excavated gravel	8,800	cy	$ 10	$ 88,000	Disposal of gravel/clay barrier in the PCB Landfill
Incremental cost of Larger Evap Pond	0	ls	$ 1,078,000	$ -	No evap pond because inorganics are treated for discharge
Remedial Monitoring/Sampling					
Air Monitoring/Sampling	16	samples	$ 500	$ 8,000	16 air/dust samples analyze for VOCs, PCBs, DDT, metals during drilling in DNAPL area
Soil Confirmation Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, DNAPL saturation, 6010 total metals, soluble metals Ba, CrVI, other parameters
Groundwater Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, 6010 total metals, soluble metals Ba, CrVI, other parameters
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 150,000	$ 150,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
			Direct Capital Total:	**$ 7,152,000**	
			Contingency (50%)	**$ 3,576,000**	
			Direct Capital Total:	**$ 10,728,000**	

TABLE E-7-4
FS AREA 5W - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 7,152,000	$ 358,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 7,152,000	$ 215,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$ 7,152,000	$ 715,000	
Construction Management	5%	of	$ 7,152,000	$ 358,000	
			Total PM/CM Cost:	**$ 1,646,000**	
			Total Capital Cost:	**$ 12,374,000**	
Operation and Maintenance Costs					
GW Treatment System (Treat inorganics and organics)					Extraction rate_40 well (gpm) 2
Design flow rate = 20 gpm					PCT-C extraction (gal/year) 4,200,000
GWTS Maintenance and Monitoring (Labor)	12	mths	$ 25,000	$ 300,000	1.5 FTE workers
LPGAC and VPGAC carbon vessels and replacement	12	mths	$ 3,500	$ 42,000	Based on current site O&M costs
Utilities: electricity	12	mths	$ 4,000	$ 48,000	Assume 40 kW (32HP) rated equipment power usage
Membranes, filters - waste disposal	12	mths	$ 6,000	$ 72,000	RO membranes, filters, solid waste
Groundwater sampling for compliance	12	mths	$ 4,000	$ 48,000	GWTS influent, effluent, intermediate, LPGAC sampling
Well redevelopment, annual	1	year	$ 60,000	$ 60,000	one event per year for all wells
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$ 80,000	$ 80,000	Assumed based on experience
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 60,000	$ 60,000	Same as current GWTS cost + DNAPL costs
Brine disposal	787,680	gal	$ 0.66	$ 520,000	Brine concentrate disposal quote from American Integrated (AIS); per 5,000 gal truck, $0.50/gallon + $800/load for truck/driver ($0.16/gal)
			Subtotal Annual O&M Cost:	$ 1,230,000	
			Contingency (50%):	$ 615,000	
Project Management/Technical Support	1	year	$ -	$ -	
Sitewide Groundwater Monitoring	1	year	$ 121,000	$ 121,000	Annual 1/3rd cost of current sampling program + 25%
			Total Annual O&M Cost:	**$ 1,966,000**	

TABLE E-7-4
FS AREA 5W - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace PCT-C trench	2	50-year	$ 1,500,000	$ 3,000,000	Assume entire length of PCT trenches (3000 feet) would need to be replaced based on unit cost for PCT-C Trench $1000/lf
Replace GWTS	2	50-year	$ 2,612,000	$ 5,224,000	Replace GWTS every 50 years

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$12,374		$12,374	$12,374	
Annual O&M Cost (post construction)	0 - 5	$9,855	$1,971	$9,027	$8,081	
Annual O&M Cost (post construction)	6 - 30	$49,275	$1,971	$29,606	$16,377	
Annual O&M Cost (post construction)	31 - 100	$145,844	$2,083	$24,999	$3,876	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$51,006,000**	**$36,832,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$76,005,000**	**$40,708,000**	

PRESENT VALUE ANALYSIS (2014 $)

TABLE E-7-4
FS AREA 5W - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Total Capital Cost (2014):					**$ 12,844,212**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost, Annual (2014):					**$ 2,040,708**	
Periodic Cost, 5-year (2014):					**$ 25,950**	
Periodic Cost, 50-year (2014):					**$ 4,268,256**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$12,844	$2,569	$11,422	$9,844	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$10,229	$2,046	$9,370	$8,389	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$51,147	$2,046	$30,731	$16,999	
Annual O&M Cost (post construction)	31 - 100	$151,386	$2,163	$25,949	$4,023	
Present Value of Capital				**$11,422,000**	**$9,844,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M				**$40,101,000**	**$25,388,000**	
Present Value of 100 Year O&M)				**$66,049,000**	**$29,411,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$51,522,000**	**$35,231,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)				**$77,471,000**	**$39,254,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the 20 gpm extracted flow is treated for offsite discharge under a site-specific NPDES permit.
2 The PCT-C groundwater is extracted, treated and discharged offsite to the B-Drainage.
3 The GWTS includes a LPGAC and reverse osmosis system for treatment of VOCs and inorganics for offsite discharge.

TABLE E-8-0
Sitewide Remedial Alternative Cost Summary
Casmalia Resources Superfund Site
Feasibility Study

SWR Alt #	SITEWIDE REMEDIAL ALTERNATIVE	CAPITAL COST (2014 $)	ANNUAL O&M COST (2014 $)	TIME FRAME	PRESENT WORTH CAPITAL + O&M 3% DISCOUNT RATE (2014 $)	PRESENT WORTH CAPITAL + O&M 7% DISCOUNT RATE (2014 $)
2	Larger Evaporation Pond FS Area 1 Alt 4 + FS Area 2 Alt 3[5] + FS Area 3 Alt 3 + FS Area 4 Alt 4 + FS Area 5N Alt 3 + FS Area 5S Alt 2 + FS Area 5W Alt 2	$ 53,987,000	$ 3,997,000	30-year	$115,445,000	$85,195,000
				100-year	$159,052,000	$91,956,000
3	Smaller Evaporation Pond FS Area 1 Alt 4 + FS Area 2 Alt 9 + FS Area 3 Alt 3 + FS Area 4 Alt 5 + FS Area 5N Alt 3 + FS Area 5S Alt 2 + FS Area 5W Alt 2	$ 59,967,000	$ 4,065,000	30-year	$120,224,000	$89,499,000
				100-year	$163,561,000	$96,218,000
4	No Evaporation Pond FS Area 1 Alt 4 + FS Area 2 Alt 9 + FS Area 3 Alt 3 + FS Area 4 Alt 6 + FS Area 5N Alt 4 + FS Area 5S Alt 3 + FS Area 5W Alt 3	$ 65,737,000	$ 7,772,000	30-year	$195,733,000	$138,550,000
				100-year	$282,661,000	$152,025,000
5	Evaporation Pond Plus P/S Landfill De-watering FS Area 1 Alt 4 + FS Area 2 Alt 9 + FS Area 3 Alt 4 + FS Area 4 Alt 5 + FS Area 5N Alt 6 + FS Area 5S Alt 2 + FS Area 5W Alt 2	$ 69,411,000	$ 8,464,000	30-year	$147,035,000	$113,814,000
				100-year	$191,734,000	$120,744,000
6	Aggressive Site-Wide Extraction with No Evaporation Pond FS Area 1 Alt 4 + FS Area 2 Alt 9 + FS Area 3 Alt 4 + FS Area 4 Alt 6 + FS Area 5N Alt 7 + FS Area 5S Alt 5 + FS Area 5W Alt 5	$ 93,245,000	$ 14,849,000	30-year	$291,069,000	$209,924,000
				100-year	$412,474,000	$228,744,000

NOTES

1. Present Worth Capital Costs are shown for a 3% and 7% net discount rate based on an average capital expenditure (remedy construction) for each year of the 5-year construction period.
2. Total Present Worth Capital + O&M Cost is shown for a 3% and 7% net discount rate and a 30-year and a 100-year timeframe and includes contingency on capital and O&M costs.
3. FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs.
4. Total Present Worth Cost (Capital + O&M) is assumed to be the sum of the present worth cost for individual alternative components from each FS Area that compose the sitewide remedial alternative.
5. For SWR Alternative 2, Area 2 is remediated by constructing an ET cap over the western slopes of the RCRA Canyon, instead of a RCRA mono soil cap originally specified in Area 2 Alternative 3. The original Alternative 3 cost sheet was modified to incorporate the ET cap.

TABLE E-8-1
FS AREA 1 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: RCRA Cap (PCB Landfill, BTA, CDA) + Stormwater Controls + ICs + Monitoring

Alternative Description : This remedial alternative would involve installing a RCRA cap on the PCB Landfill, Burial Trench Area (BTA) and the Central Drainage Area (CDA) as shown in Figure 11-3A. The RCRA cap would prevent direct contact with metals and organic contaminants in shallow soil and address the risk to eco-receptors. It would also prevent rainwater infiltration into groundwater. These caps would be tied into the adjacent Capped Landfills Area. The total surface area for each of these capped areas will be 4.4 acres for PCB Landfill, 5.5 acres for BTA and 18.8 acres for CDA for a total of 28.7 acres of cap. The cap cross-section is shown in Figure 11-3A. The stormwater will be directed by surface drains towards a culvert near PSCT-1 and then flow through a drainage channel to the southern portion of the site and then onto Pond 13 and offsite through or around the wetlands.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor budgetary quotes
Remediation Documentation/Reporting	1	ea	$ 125,000	$ 125,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	
Geotechnical testing/Geophysical Investigation	1	ls	$ 150,000	$ 150,000	Evaluate site stability, buried waste, geotech properties
Site Work					
Site Clearance/Grubbing	29	acre	$ 6,500	$ 189,000	Site clearance/grading prep for cap starting with the foundation layer
Existing wells protection/new aboveground well completion	30	wells	$ 5,000	$ 150,000	Protect 30 wells, raise well completion based on new cap topo surface
Dust controls	60	ls	$ 1,000	$ 60,000	Based on contractor unit costs and 3 months, 12 weeks, 60 days
RCRA Cap - PCB Landfill (4.4 ac)					
Cut/Fill Leveling Layer (grading)	20,000	cy	$ 5	$ 100,000	Based on existing slopes estimated by CAD; contractor unit cost
Foundation layer (2'), borrow and compact	16,000	cy	$ 6	$ 96,000	Soil volume based on estimated cap area, contractor unit cost quote
GCL Bento Liner (matl + labor)	4.4	acre	$ 34,500	$ 152,000	Assume $0.80/sf based on GSE Liner quote incl tax, shipping
HDPE liner (60 mil)(matl + labor)	4.4	acre	$ 34,500	$ 152,000	Assume $0.80/sf for HDPE liner per GSE Liner quote incl tax, shipping
Geocomposite 200 mil fabrinet, matl+labor	4.4	acre	$ 30,500	$ 134,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	4.4	acre	$ 21,800	$ 96,000	Assume $0.50/sf per GSE Liner quote incl tax, shipping
Vegetative cover (2'), borrow and compact	16,000	cy	$ 6	$ 96,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	4.4	acre	$ 4,000	$ 18,000	Top soil and hydroseeding

TABLE E-8-1
FS AREA 1 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
RCRA Cap - BTA (5.5 ac)					
Cut/Fill Leveling Layer (grading)	61,000	cy	$ 5	$ 305,000	Based on existing slopes estimated by CAD; Figure 11-2C
Foundation layer (2'), borrow and compact	19,000	cy	$ 6	$ 114,000	Soil volume based on estimated cap area, contractor unit cost quote
GCL Bento Liner (matl + labor)	5.5	acre	$ 34,500	$ 190,000	Assume $0.80/sf based on GSE Liner quote incl tax, shipping
HDPE liner (60 mil)(matl + labor)	5.5	acre	$ 34,500	$ 190,000	Assume $0.70/sf for HDPE liner per GSE Liner quote incl tax, shipping
Geocomposite 200 mil fabrinet, matl+labor	5.5	acre	$ 30,500	$ 168,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	5.5	acre	$ 21,800	$ 120,000	Assume $0.50/sf per GSE Liner quote incl tax, shipping
Vegetative cover (2'), borrow and compact	19,000	cy	$ 6	$ 114,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding
RCRA Cap - CDA (18.8 ac)					
Cut/Fill Leveling Layer (grading)	150,000	cy	$ 5	$ 750,000	Based on existing slopes estimated by CAD; contractor unit cost
Foundation layer (2'), borrow and compact	67,000	cy	$ 6	$ 402,000	2' clean soil cover borrowed from NW corner of site
GCL Bento Liner (matl + labor)	18.8	acre	$ 34,500	$ 649,000	Assume $0.80/sf based on GSE Liner quote incl tax, shipping
HDPE liner (60 mil)(matl + labor)	18.8	acre	$ 34,500	$ 649,000	Assume $0.70/sf for HDPE liner per GSE Liner quote incl tax, shipping
Geocomposite 200 mil fabrinet, matl+labor	18.8	acre	$ 30,500	$ 573,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	18.8	acre	$ 21,800	$ 410,000	Assume $0.50/sf per GSE Liner quote incl tax, shipping
Vegetative cover (2'), borrow and compact	67,000	cy	$ 6	$ 402,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	18.8	acre	$ 4,000	$ 75,000	Top soil and hydroseeding
Stormwater Controls					
Surface features - Stormwater ditches, Bench V-ditches	8,000	lf	$ 30	$ 240,000	Based on contractor unit cost quotes
Stormwater drain pipes	1,000	lf	$ 100	$ 100,000	Based on contractor unit cost quotes
Stormwater - culvert crossing, 3 inlet structures, riprap pads	1	ls	$ 100,000	$ 100,000	Based on contractor budgetary lump sum quote
Construct lined drainage channel for Area 1 stormwater	1,500	lf	$ 60	$ 90,000	Cost based on channel length to RCF pond; use double unit cost for V-dr
Monitoring/Sampling/Testing					
Air Monitoring/Sampling (during remedy implementation)	160	samples	$ 500	$ 80,000	160 air/dust samples analyzed for VOCs, PCBs, DDT and metals
Compaction testing: Geotech engr	80	days	$ 500	$ 40,000	80 days of testing w Geotech engr/nuclear gage at $500/day

TABLE E-8-1
FS AREA 1 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Wetlands - Upgrading for increased SW flow					Upgrade B-Drainage wetlands per the Wetlands Plan (April 2011) and add diversion drainage channels on either side of wetlands
Complete Erosion Improvements Described in Draft Wetlands Plan (April, 2011)	1	see previous cost est	$ 100,000	$ 100,000	Reference for previous cost estimate
Grading of East Slope B-Drainage hillside, gullies/rills	5	acre	$ 20,000	$ 100,000	
Erosion control - Turf reinforcement mats	3	acre	$ 54,000	$ 162,000	
Surface features - Stormwater ditches, Bench V-ditches	4,500	lf	$ 30	$ 135,000	
General NPDES Stormwater Permit - Revision	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost for entire site
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Assume 25% higher than Alt 2
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 8,548,000**	
			Contingency (35%)	**$ 2,992,000**	Lower contingency used because of prior experience with capping
			Direct Capital Total:	**$ 11,540,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 8,548,000	$ 427,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 8,548,000	$ 256,000	
EPA Oversight Costs	10%	of	$ 8,548,000	$ 855,000	
Construction Management	5%	of	$ 8,548,000	$ 427,000	
			Total PM/CM Cost:	**$ 1,965,000**	
			Total Capital Cost:	**$ 13,505,000**	Direct Capital Cost per Acre = $466,000

TABLE E-8-1
FS AREA 1 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 60,000	$ 60,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 80,000	$ 80,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
			Subtotal Annual O&M Cost:	$ 180,000	
			Contingency (50%):	$ 90,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 306,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace one half of RCRA Caps	1	100-year	$ 6,752,500	$ 6,752,500	Assume of 1/2 of cap costs for partial replacement

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$13,505		$13,505	$13,505	
Annual O&M Cost (post construction)	0 - 5	$1,555	$311	$1,424	$1,275	
Annual O&M Cost (post construction)	6 - 30	$7,775	$311	$4,671	$2,584	
Annual O&M Cost (post construction)	31 - 100	$28,173	$402	$4,829	$749	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$19,601,000**	**$17,364,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$24,430,000**	**$18,113,000**	

TABLE E-8-1
FS AREA 1 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 14,018,190**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 317,628**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 7,009,095**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$14,018	$2,803.64	$12,466	$10,743	FS Area 1 remedy is expected to be constructed during the second construction season (2017) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,614	$323	$1,478	$1,324	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$8,070	$322.82	$4,849	$2,682	
Annual O&M Cost (post construction)	31 - 100	$29,243	$417.76	$5,012	$777	
			Present Value of Capital	**$12,466,000**	**$10,743,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$6,327,000**	**$4,006,000**	
			Present Value of 100 Year O&M	**$11,340,000**	**$4,783,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$18,793,000**	**$14,749,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$23,806,000**	**$15,526,000**	

NOTES/ASSUMPTIONS

1. PCB landfill (4.4 acres), BTA (5.5 acres) and CDA (18.8 acres) cover a total area of about 29 acres. Alternative cost includes RCRA cap for all three areas and associated stormwater controls as shown in Figure 11-2A.
2. Existing wellheads will be reinstalled at new cap grade. Assumed 30 wells.
3. Assume active gas control is not required. New PCB and BTA caps will require special termination trench details.
4. RCRA cap profile - 2' foundation, GCL layer, HDPE Geomembrane, Geocomposite, and 2' vegetative layer with biotic barrier.
5. Assumed fill for foundation layer is adequate to smooth existing grades for drainage or lessen steeper slopes for potential stability issues.
6. Some of the existing V-ditches will need to be reconstructed after new capping of PCB and BTA.
7. Will need to tie existing membrane component of existing caps to the new PCB and BTA caps with a special detailed tie-in.
8. Drainage channel for Area 1 is to be a 1,500-foot concrete channel starting at the PSCT and passing through the footprint of the RCF Pond to Pond 13.
9. As discussed with EPA, agency oversight is typically assumed to be 10% of capital cost.

TABLE E-8-2
FS AREA 2 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Evapotranspirative Cap (West slope RCRA Canyon) (5') + Excavate (WCSA remedial area) (5') + Grading/BMPs (Uncapped Areas) + Stormwater Controls (Segregate Capped and Uncapped Area SW) + ICs + Monitoring

Remedial Alternative Description : This remedial alternative involves installing a Evapotranspirative cap on the west slope of the RCRA Canyon (approximately 8.4 acre) and the impacted portion of the WCSA (5.5 acres) will be excavated and the soil used as fill in Pond A-5 (Figure 11-6A). The RCRA equivalent mono soil cap is 5-foot of low permeability claylike soil with a 4-foot compacted layer to meet the 10-6 cm/s permeability criterion and a top 1-foot vegetative layer that is compacted to 85% of maximum dry density. The RCRA equivalent cap will control potential exposures to ecological receptors and will reduce surface water infiltration. The extent of the excavation is approximate and sidewall sampling will be used to confirm cleanup goals. The excavated portions of the WCSA will be backfilled to match grades. This remedial alternative assumes some grading and additional borrow soil is required to reduce the steepness of some of the sloped areas in order to install the cap. The final surfaces of the western slope of the RCRA Canyon will be sloped and include surface drains to allow drainage of storm water from the westslope of the RCRA canyon to flow into a new retention basin that will be constructed in the footprint of the former Pond A-5. This stormwater will be discharged by pipeline to the B-Drainage via the General NPDES permit. The uncapped area of the eastslope and WCSA will implement grading and BMPs as part of erosion control. The surface water runoff from the eastern slope of the RCRA Canyon (i.e. the WCSA) will be collected/managed in a new onsite evaporation pond constructed in the footprint of the A-Series Pond.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 200,000	$ 200,000	Based on contractor budgetary quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 80,000	$ 80,000	Based on contractor budgetary quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	
Prelim Geotech investigation/Geophysical Eval	1	ls	$ 100,000	$ 100,000	Geophysical to identify any buried features, prelim geotech sampling testing, physical properties
Detailed Geotechnical Evaluation/Reporting	1	ls	$ 200,000	$ 200,000	Evaluate slope stability for capping in steep slopes and erosion control measures
Site Work					
Site Preparation/Clearance/Grubbing	13.9	acre	$ 6,500	$ 90,000	Site clearance/grubbing/grading prep of north and south canyons and canyon bottoms
Existing wells protection/new well completion	20	wells	$ 5,000	$ 100,000	Protect well, raise well completion to reach new cap topo surface
Dust controls: water truck/day	50	days	$ 1,000	$ 50,000	Based on contractor unit costs and 2.5 months, 10 weeks, 50 days
Evapotranspirative Cap - Westslope (8.4 ac)					
Cut/Fill Leveling Layer (grading)	100,000	cy	$ 5	$ 500,000	Based on cap area, existing slopes to near 2:1; grading to reduce steep slopes estimated by CAD
Clay soil from borrow area, 1' foundation layer	15,000	cy	$ 14	$ 210,000	Based on assumed ET cap design of 2' bottom compacted and pre-processing of borrow soils to achieve low permeability
Place and compact, 6" lifts	15,000	cy	$ 3	$ 45,000	Moderately compacted, 90% relative compaction, 6" lifts
Clay soil from borrow area, 4' vegetative layer	60,000	cy	$ 6	$ 360,000	Based on 3' veg layer requiring addition of amendments and some preprocessing of soils
Place and compact, 12" lifts	60,000	cy	$ 2	$ 120,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh or TRM, silt fencing	8.4	acre	$ 31,500	$ 264,600	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Soil Amendments: fertilizer, gypsum, biosolids	8.4	acre	$ 20,000	$ 168,000	Based on gypsum, fertilizer, biosolids costs for 4 ft thickness
Revegetation/Hydroseeding	8.4	acre	$ 4,000	$ 33,600	Top soil and hydroseeding

TABLE E-8-2
FS AREA 2 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Excavation, 5' - WCSA; Grading (5.5 acres)					
Excavation (5 feet bgs)	44,000	cy	$ 6	$ 264,000	Based on contractor unit costs
Backfill/compact of excavation to match grades	48,000	cy	$ 4	$ 192,000	Grading of WCSA area outside of excavation to partially backfill excavation and reduce slope steepness
Erosion control - jute mesh, silt fencing	5.5	acre	$ 31,500	$ 173,250	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing; use average unit cost of 0.2/sf and 1.00/sf
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding
Grading/BMPs All Uncapped Areas (19.3 acres)					
Grading of uncapped East Slope area, gullies/rills	7	acre	$ 20,000	$ 140,000	Grading of uncapped east slope to remove gullies, rills for erosion control, assume 7 out of 19.3 acres
Erosion control - Turf reinforcement mats	3	acre	$ 54,000	$ 162,000	Turf reinforcement mats in Uncapped areas; Unit cost from CalTrans Erosion control toolbox; assume 3 out of 21 acres
Erosion control - jute mesh, silt fencing, rip rap	6	acre	$ 9,000	$ 54,000	Unit cost from CalTrans Erosion control toolbox; assume 6 out of 21 acres
Revegetation/Hydroseeding	19.3	acre	$ 4,000	$ 77,000	Top soil and hydroseeding
Stormwater and Erosion Controls					
Surface features on cap - bench roads/V-ditches	6,000	lf	$ 30	$ 180,000	Surface features for drainage - concrete V-drains, perimeter ditches
Culverts, inlet structures	1	ls	$ 150,000	$ 150,000	Based on contractor unit cost quotes
Concrete channel - Capped area stormwater flow	2,000	lf	$ 30	$ 60,000	Based on contractor unit cost quotes
Concrete channel - Uncapped area stormwater flow	2,500	lf	$ 30	$ 75,000	Based on contractor unit cost quotes
Incremental Evaporation Pond cost	3	acre	$ 206,000	$ 618,000	Incremental evaporation pond capacity needed based on unit cost for evaporation pond construction (see Area 4 cost estimate)
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	150	samples	$ 500	$ 75,000	150 air/dust samples (10/day),(VOCs, PCBs, DDT, metals)
Soil Compaction Testing: Geotech engr	40	days	$ 500	$ 20,000	40 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	400	samples	$ 200	$ 80,000	Analyze for metals including 6010 total metals, soluble metals Ba, CrVI, other parameters
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 5,313,000**	
			Contingency (35%)	**$ 1,860,000**	
			Direct Capital Total:	**$ 7,173,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 5,313,000	$ 266,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 5,313,000	$ 159,000	
EPA Oversight Costs	10%	of	$ 5,313,000	$ 531,000	
Construction Management	5%	of	$ 5,313,000	$ 266,000	
			Total PM/CM Cost:	**$ 1,222,000**	
			Total Capital Cost:	**$ 8,395,000**	Direct Capital Cost per Acre = $604,000

TABLE E-8-2
FS AREA 2 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 100,000	$ 100,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
			Subtotal Annual O&M Cost:	$ 190,000	
			Contingency (50%):	$ 95,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 321,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Cap and erosion controls	1	100-year	$ 4,197,500	$ 4,197,500	Assume 1/2 the cap and erosion controls would need to be replaced over the 100 year period
PRESENT VALUE ANALYSIS (2012 $K)					
Cost Type / **Year**	**Total Cost (2012 $K)**	**Cost/Year (2012 $K)**	**Net Present Value at 3% DF (2012 $K)**	**Net Present Value at 7% DF (2012 $K)**	
Capital Cost	$8,395		$8,395	$8,395	
Annual O&M Cost (post construction) / 0 - 5	$1,630	$326	$1,493	$1,337	
Annual O&M Cost (post construction) / 6 - 30	$8,150	$326	$4,897	$2,709	
Annual O&M Cost (post construction) / 31 - 100	$26,668	$381	$4,571	$709	
		Total Present Value of Alternative (Capital + 30 Year O&M)	**$14,785,000**	**$12,440,000**	2012 $
		Total Present Value of Alternative (Capital + 100 Year O&M)	**$19,356,000**	**$13,149,000**	

TABLE E-8-2
FS AREA 2 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 8,714,010**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 333,198**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 4,357,005**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$8,714	$1,742.80	$7,749	$6,678	FS Area 2 remedy is expected to be constructed during the first construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,692	$338.39	$1,550	$1,387	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$8,460	$338.39	$5,083	$2,812	
Annual O&M Cost (post construction)	31 - 100	$27,681	$395.44	$4,745	$736	
			Present Value of Capital	**$7,749,000**	**$6,678,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$6,633,000**	**$4,199,000**	
			Present Value of 100 Year O&M)	**$11,377,000**	**$4,935,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$14,382,000**	**$10,877,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$19,126,000**	**$11,613,000**	

NOTES/ASSUMPTIONS

1 This alternative involves RCRA-equivalent soil cap (5') for remediation areas on the West slope and excvavation (5') for the WCSA remedial area and grading to reduce and smooth out steep slopes.
2 RCRA canyon Westslope (8.4 acres) and WCSA remedial area (5.5 acres) cover a total of about 13.9 acres. Extent of excavation is approximate and could change depending on sidewall sampling to confirm cleanup goals.
3 Assumes additional site contaminant investigation is not necessary for capping and excavation areas.
4 Soil volumes for RCRA canyon are based on area of remediation derived by risk-based approach, Appendix C.
5 Clean soil is borrowed from NW corner of site and trucked down the canyon for use as soil cover.
6 Clayey soils from NW Borrow area are pre-processed with screening and pulverizing with pug mill. No supplemental bentonite or other clay include

TABLE E-8-3
FS AREA 2 - ALTERNATIVE 9
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Evapotranspirative (ET) Cap (entire RCRA Canyon, WCSA) + Stormwater Controls + ICs + Monitoring

Alternative Description : This remedial alternative involves installing a ET cap across the RCRA Canyon and WCSA as shown on Figure 11-12A. The ET cap is a monosoil cap that is 5-foot thick with a lightly compacted low permeability soil with high storage capacity and a vegetative cover designed to maximize evaporation and transpiration. The ET cap cross section assumed here is a 4-foot lightly compacted vegetative soil layer over a 1-foot well compacted foundation layer using the same low permeability onsite soils. The ET cap will control potential exposures to ecological receptors and will significantly reduce water infiltration.This remedial alternative assumes some grading and additional borrow soil is required to reduce the steepness of some of the sloped areas in order to install the cap to less than 2:1 on the east slope. The final surfaces of the cap on the RCRA Canyon and WCSA will be sloped and include surface drains to allow drainage of storm water from the RCRA canyon and WCSA to flow into a new retention basin that will be constructed in the footprint of the former Pond A-5. This stormwater will be sent by pipeline to the B-Drainage and discharged offsite via the site's General NPDES permit. The surface water runoff from the uncapped southend of WCSA will be collected in a new onsite evaporation pond where it would be managed.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 125,000	$ 125,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ -	$ -	Addtnl investigations (env., geotech, geophys); refine nature & extent, revisit risk calcs
Geotechnical testing/Geophysical Investigation	1	ls	$ 150,000	$ 150,000	Evaluate site stability, buried waste (EE/CA experience
Detailed Geotechnical Evaluation/Reporting	1	ls	$ 250,000	$ 250,000	Evaluate slope stability for capping in steep slopes and erosion control measures
Site Work					
Site Preparation/Clearance/Grubbing	33.2	acre	$ 6,500	$ 216,000	Site clearance/grubbing/grading prep of north and south canyons and canyon bottoms
Existing wells protection/new well completion	20	wells	$ 5,000	$ 100,000	Protect well, raise well completion to reach new cap topo surface
Dust controls	100	days	$ 1,000	$ 100,000	Based on contractor unit costs and 3 months, 12 weeks, 60 days
Evapotranspiration (ET) Cap - Westslope (8.4 ac)					
Cut/Fill Leveling Layer (grading)	100,000	cy	$ 5	$ 500,000	Based on cap area, existing slopes to near 2:1; grading to reduce steep slopes estimated by CAD
Clay soil from borrow area, 1' foundation layer	15,000	cy	$ 14	$ 210,000	Based on assumed ET cap design of 2' bottom compacted and pre-processing of borrow soils to achieve low permeability
Place and compact, 6" lifts	15,000	cy	$ 3	$ 45,000	Moderately compacted, 90% relative compaction, 6" lifts
Clay soil from borrow area, 4' vegetative layer	60,000	cy	$ 6	$ 360,000	Based on 3' veg layer requiring addition of amendments and some preprocessing of soils
Place and compact, 12" lifts	60,000	cy	$ 2	$ 120,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh or TRM, silt fencing	8.4	acre	$ 31,500	$ 264,600	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Revegetation/Hydroseeding	8.4	acre	$ 4,000	$ 34,000	Top soil and hydroseeding

TABLE E-8-3
FS AREA 2 - ALTERNATIVE 9
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Evapotranspiration (ET) Cap - WCSA (5.5 ac)					
Cut/Fill Leveling Layer (grading)	30,000	cy	$ 5	$ 150,000	Based on CAD estimate for WCSA
Clay soil from borrow area, 1' foundation layer	10,000	cy	$ 14	$ 140,000	Based on assumed ET cap design of 1' foundation compacted and pre-processing of borrow soils to achieve low permeability
Place and compact, 6" lifts	10,000	cy	$ 3	$ 30,000	Moderately compacted, 90% relative compaction, 6" lifts
Clay soil from borrow area, 4' vegetative layer	39,000	cy	$ 6	$ 234,000	Based on 4' veg layer requiring addition of amendments and some preprocessing of soils
Place and compact, 12" lifts	39,000	cy	$ 2	$ 78,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh or TRM, silt fencing	5.5	acre	$ 31,500	$ 173,250	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Soil Amendments: fertilizer, gypsum, biosolids	5.5	acre	$ 20,000	$ 110,000	Based on gypsum, fertilizer, biosolids costs for 4 ft thickness
Revegetation/Hydroseeding	5.5	acre	$ 4,000	$ 22,000	Top soil and hydroseeding
Incremental cost for borrow soil for Pond A-5 in Area 4	44,000	cy	$ 6	$ 264,000	Excavation of WCSA 5.5 acres provided fill for Pond A-5 but with capping of WCSA 5.5 acres, borrow soil needed for Pond A-5
Evapotranspiration (ET) Cap - Other Areas (19.3 ac)					
Cut/Fill Leveling Layer (grading)	300,000	cy	$ 5	$ 1,500,000	Cut/Fill grading of 300,000 cy to reduce slopes from 1:1 to less than 2:1 based on CAD for East slope area
Clay soil from borrow area, 1' foundation layer	34,000	cy	$ 14	$ 476,000	Based on assumed ET cap design of 1' foundation layer compacted and pre-processing of borrow soils to achieve low permeability
Place and compact, 6" lifts	34,000	cy	$ 3	$ 102,000	Moderately compacted, 90% relative compaction, 6" lifts
Clay soil from borrow area, 4' vegetative layer	137,000	cy	$ 6	$ 822,000	Based on 4' veg layer requiring addition of amendments and limited preprocessing of soils
Place and compact, 12" lifts	137,000	cy	$ 2	$ 274,000	Lightly compacted, 85% relative compaction, 12" lifts
Erosion control - jute mesh or TRM, silt fencing	19.3	acre	$ 31,500	$ 607,950	Cap erosion control on sloped areas, jute mesh, TRM, silt fencing
Soil Amendments: fertilizer, gypsum, biosolids	19.3	acre	$ 20,000	$ 386,000	Based on gypsum, fertilizer, biosolids costs for 4 ft thickness
Revegetation/Hydroseeding	19.3	acre	$ 4,000	$ 77,000	Top soil and hydroseeding
Stormwater Controls					
Surface features - SW ditches, bench roads/V-ditches	16,000	lf	$ 30	$ 480,000	Surface features for drainage - grading, swales, V-drains
Culverts, inlet structures	1	ls	$ 150,000	$ 150,000	Based on contractor budgetary estimate
Concrete channel - Capped area stormwater flow	2,500	lf	$ 30	$ 75,000	Based on contractor unit cost quotes
Concrete channel - Uncapped area stormwater flow	0	lf	$ 30	$ -	Based on contractor unit cost quotes

TABLE E-8-3
FS AREA 2 - ALTERNATIVE 9
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Incremental Evaporation Pond cost	0	acre	$ 206,000	$ -	Incremental evaporation pond capacity needed based on unit cost for evaporation pond construction
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	150	samples	$ 500	$ 75,000	150 air/dust samples (10/day),(VOCs, PCBs, DDT, metals)
Soil Compaction Testing: Geotech engr	100	days	$ 500	$ 50,000	100 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	100	samples	$ 200	$ 20,000	Analyze for metals including 6010 total metals, soluble metals Ba, CrVI, other parameters
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 300,000	$ 300,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 75,000	$ 75,000	Based on contractor quotes
			Direct Capital Total:	**$ 9,546,000**	
			Contingency (35%)	**$ 3,341,000**	
			Total Direct Capital Cost:	**$ 12,887,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 9,546,000	$ 477,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 9,546,000	$ 286,000	
EPA Oversight Costs	10%	of	$ 9,546,000	$ 955,000	
Construction Management	5%	of	$ 9,546,000	$ 477,000	
			Total PM/CM Cost:	**$ 2,195,000**	
			Total Capital Cost:	**$ 15,082,000**	Capital Cost per Acre = $454,000

TABLE E-8-3
FS AREA 2 - ALTERNATIVE 9
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 80,000	$ 80,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 140,000	$ 140,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Misc repairs, ODCs	1	year	$ 60,000	$ 60,000	Based on current site O&M costs
			Subtotal Annual O&M Cost:	$ 280,000	
			Contingency (50%):	$ 140,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Previous EE/CA and PS Landfill Cap experience
			Total Annual O&M Cost:	**$ 456,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Cap	1	100-year	$ 7,541,000	$ 7,541,000	Assume 1/2 of cap would need to be replaced

PRESENT VALUE ANALYSIS (2014 $)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$15,082		$15,082	$15,082	
Annual O&M Cost (post construction)	0 - 5	$2,305	$461	$2,111	$1,890	
Annual O&M Cost (post construction)	6 - 30	$11,525	$461	$6,925	$3,830	
Annual O&M Cost (post construction)	31 - 100	$39,461	$564	$6,764	$1,049	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$24,118,000**	**$20,803,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$30,882,000**	**$21,851,000**	

TABLE E-8-3
FS AREA 2 - ALTERNATIVE 9
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $K)						
				Total Capital Cost (2014):	**$ 15,655,116**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 473,328**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 7,827,558**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$15,655	$3,131	$13,922	$11,998	FS Area 2 remedy is expected to be constructed during the first construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$2,393	$478.52	$2,191	$1,962	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$11,963	$478.52	$7,188	$3,976	
Annual O&M Cost (post construction)	31 - 100	$40,961	$585	$7,021	$1,089	
			Present Value of Capital	**$13,922,000**	**$11,998,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$9,379,000**	**$5,938,000**	
			Present Value of 100 Year O&M	**$16,400,000**	**$7,026,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$23,301,000**	**$17,936,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$30,322,000**	**$19,024,000**	

NOTES/ASSUMPTIONS

1 This alternative involves an ET cap across the RCRA Canyon and WCSA and grading to reduce and smooth out steep slopes.
2 The ET cap cross section includes a compacted 1-foot foundation layer and 4-foot lightly compacted vegetative layer.
3 Clean soil is borrowed from the Offsite NW Borrow Area are excavated and trucked down the canyon for use as soil cover.
4 Borrow soils are claystone material that will require some pre-processing before being placed for the cap construction.
5 Claystone soils are pre-processed with screening and pulverizing with pug mill. No supplemental bentonite or other clay included.

TABLE E-8-4
FS AREA 3 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: RCRA Cap (Locations 2) + Excavate ((Location 3) (20'); (Location 4) (5')) + Excavate/New Asphalt Cap (Location 1) (5') + Groundwater Monitoring (Location 10) + Grading/BMPs (Uncapped Areas) + Stormwater Controls + ICs + Monitoring

Remedial Alternative Description : This remedial alternative involves extending the RCRA cap which is discussed for Area 1 over the Maintenance Shed Area (Location 2) and excavation of Hotspot Locations 3 and 4 south of the PSCT for disposal in the PCB Landfill (Figure 11-14A). The excavation will be backfilled with clean borrow soil. The surface of the cap would be sloped and includes surface drains to direct stormwater on the cap to flow southeast towards the drainage channel near PSCT-1. The stormwater in the drainage channel will flow under a culvert on RCF Road to Pond 13 and then offsite through or around the wetlands under the site's General NPDES permit. Hotspot Location 1 will be excavated and paved with a new 4" asphalt cap. For Hotspot Location 10 (RISBON-59), the alternative proposes 2 additional UHSU downgradient groundwater monitoring wells to ensure that there is no impact in the future to groundwater from this deep soil impacted area.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ 75,000	$ 75,000	Addtnl site investigations to define extent
Geotechnical testing/Geophysical Investigation/Surveying	1	ls	$ 75,000	$ 75,000	Evaluate site stability, buried waste, geotech soil properties
Site Work					
Demo Maintenance Shed Building	1	ls	$ 100,000	$ 100,000	Includes removal and disposal of MSA bldg and foundation
UST Removals, 2 Tanks	1	ls	$ 100,000	$ 100,000	Includes excavation, disposal, sampling, reporting and consultant costs for two USTs 5,000 gal and 2,000 gal
Existing wells protection/new aboveground well completion	15	wells	$ 5,000	$ 75,000	Protect well, raise well completion to reach new cap topo surface
Site Clearance/Grubbing for RCRA cap	6.6	acre	$ 6,500	$ 43,000	Site clearance/grading prep for cap starting with the foundation layer
Excavation/Backfill/Asphalt Cap (5') - Location 1 (1 ac)					Only a portion of the 2 acre area is excavated
Excavation (5'): Soil portion of Location 1	8,000	cy	$ 6	$ 48,000	Based on estimated remediation area, existing slopes; contractor cost
Backfill from Borrow Area and compact	8,800	cy	$ 6	$ 53,000	Borrow area transport and compact
Excavated Soil onsite Placement at PCB Landfill	8,800	cy	$ 2	$ 18,000	
4" Asphalt Pavement capping (with 4" aggregate base)	43,500	sf	$ 5	$ 218,000	Assumes asphalt paving of unpaved areas, approx 1 acre
RCRA Cap - Location 2 (MSA, N of PSCT) (2.8 ac)					Location 2 area (acres) 2.8
Cut/Fill Leveling Layer (grading)	17,000	cy	$ 5	$ 85,000	Based on estimate from CAD; contractor unit cost
Foundation layer (2'): borrow and compact	9,900	cy	$ 6	$ 59,000	Site clearance/grading prep for cap starting with the foundation layer. Soil volume based on cap area, contractor unit cost quote
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote incl. tax, shipping
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.70/sf for 60 mil HDPE liner per GSE Liner quote
Geocomposite 200 mil fabrinet, matl+labor	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote incl. tax, shipping
Vegetative cover (2')	9,900	cy	$ 6	$ 59,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding

TABLE E-8-4
FS AREA 3 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Excavation/Backfill (20') - Location 3 (2.2 ac)					Location 3 (acres) 2.2
Excavation (0-20')	71,000	cy	$ 6	$ 426,000	Based on estimated remediation area and 1:1 side slopes. Assume no shoring is necessary. Segregate unimpacted soils as fill
Segregate unimpacted soils use as fill and compact	24,000	cy	$ 3	$ 72,000	Assume unimpacted soil is 1/3rd of excavated soil
Backfill: borrow and compact	54,000	cy	$ 6	$ 324,000	Borrow from NW Borrow area; no pre-processing
Revegetation/Hydroseeding	2.2	acre	$ 4,000	$ 9,000	Top soil and hydroseeding
Excavated Soil Transport/Dispose PCB Landfill	47,000	cy	$ 2	$ 94,000	Assume PCB landfill disposal of 2/3rds of excavated soil
Excavation/Backfill (5') - Location 4 (1.6 ac)					
Excavation	13,000	cy	$ 6	$ 78,000	Based on estimated remediation area, existing slopes; contractor cost
Backfill: borrow and compact	14,300	cy	$ 6	$ 86,000	Borrow from NW Borrow area; no pre-processing
Revegetation/Hydroseeding	1.6	acre	$ 4,000	$ 6,000	Top soil and hydroseeding
Excavated Soil Transport/Dispose at PCB Landfill	13,000	cy	$ 2	$ 26,000	
GW Monitoring Wells - Location 10 (RISBON-59)					
Install 2 Upper HSU groundwater monitoring wells downgradient of RISBON-59	2	wells	$ 15,000	$ 30,000	4" Sch 80 PVC well casing, total depth 40 feet
Stormwater Controls					
Surface features - Stormwater ditches, Bench V-ditches	1,800	lf	$ 30	$ 54,000	Estimated length of surface drainage ditches
BMPs - Grading to remove rills and gullies	15	acre	$ 20,000	$ 300,000	Assumed areas that needs BMPs is 15 out of 40 acres
BMPs - Turf reinforcement mats, jute mesh, silt fence	15	acre	$ 43,500	$ 653,000	Assumed areas that needs BMPs
BMPs - hydroseeding	15	acre	$ 4,000	$ 60,000	Assumed areas that needs BMPs
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during remedy implementation)	50	samples	$ 500	$ 25,000	50 air/dust samples, analysis+labor
Soil Confirmation Sampling and Analyses	60	samples	$ 100	$ 6,000	for tank removals, Locs 1,,2,3,4,10 excavations
Compaction testing: Geotech engr	30	days	$ 500	$ 15,000	30 days of testing w Geotech engr/nuclear gage at $500/day

TABLE E-8-4
FS AREA 3 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 150,000	$ 150,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 4,073,000**	
			Contingency (35%)	**$ 1,426,000**	
			Direct Capital Total:	**$ 5,499,000**	Direct Capital Cost per Acre = $668,000
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 4,073,000	$ 204,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 4,073,000	$ 122,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$ 4,073,000	$ 407,000	
Construction Management	5%	of	$ 4,073,000	$ 204,000	
			Total PM/CM Cost:	**$ 937,000**	
			Total Capital Cost:	**$ 6,436,000**	

TABLE E-8-4
FS AREA 3 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 30,000	$ 30,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Groundwater monitoring (RISBON-59 area, Location 10)	1	year	$ -	$ -	Included in Area 5 cost estimate for sitewide gw monitoring
Misc repairs, ODCs	1	year	$ 40,000	$ 40,000	
			Subtotal Annual O&M Cost:	$ 110,000	
			Contingency (50%)	$ 55,000	
Project Management/Technical Support	1	year	$ 24,000	$ 24,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 189,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Caps	1	100-year	$ 3,218,000	$ 3,218,000	Assume 1/2 of caps would need to be replaced

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$6,436		$6,436	$6,436	
Annual O&M Cost (post construction)	0 - 5	$970	$194	$888	$795	
Annual O&M Cost (post construction)	6 - 30	$4,850	$194	$2,914	$1,612	
Annual O&M Cost (post construction)	31 - 100	$16,448	$235	$2,819	$437	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$10,238,000**	**$8,843,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$13,058,000**	**$9,280,000**	

TABLE E-8-4
FS AREA 3 - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 6,680,568**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 196,182**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 3,340,284**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$6,681	$1,336.11	$5,941	$5,120	FS Area 3 remedy is expected to be constructed during the second construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,007	$201.37	$922	$826	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$5,034	$201.37	$3,025	$1,673	
Annual O&M Cost (post construction)	31 - 100	$17,073	$243.90	$2,926	$454	
			Present Value of Capital	**$5,941,000**	**$5,120,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$3,947,000**	**$2,499,000**	
			Present Value of 100 Year O&M	**$6,873,000**	**$2,953,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$9,888,000**	**$7,619,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$12,814,000**	**$8,072,000**	

NOTES/ASSUMPTIONS

1. This alternative addresses the ten impacted soil locations identified for FS Area 3 in Figure 11-14A.
2. Location 1 is in Liquid Treatment Area and partial excavation of hot spots is assumed with asphalt replacement where needed.
3. Location 2 is to capped with a RCRA cap that will tie into the Area 1 RCRA cap.
4. Locations 3 and 4 are to be excavated down to 20' bgs and 5' bgs respectively and backfilled.
5. Locations 5-9 - No action based on ecological risk modeling and statistical analysis that confirm area-wide risk-based requirements are met.
6. Location 10, RISBON-59 assumes long term groundwater monitoring of existing and two new downgradient monitoring wells in the UHSU.
7. Capital cost for Maintenance Shed building demolition and removal of 2 USTs are included prior to remedial activities.

TABLE E-8-5
FS AREA 3 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: RCRA Cap (Location 2) + Excavate ((Location 3) (20'); (Location 4) (5'); (Location 10) (50'))/Place in PCB Landfill + Excavate/New Asphalt Cap (Location 1) (5') + Grading/BMPs (Uncapped Areas) + Stormwater Controls + ICs + Monitoring

Remedial Alternative Description : This remedial alternative involves extending the RCRA cap which is discussed for Area 1 over the Maintenance Shed Area (Location 2) and excavation of Hotspot Locations 3 and 4 south of the PSCT for disposal in the PCB Landfill (Figure 11-15A). The excavation will be backfilled with clean borrow soil. The surface of the cap would be sloped and includes surface drains to direct stormwater on the cap to flow southeast towards the drainage channel near PSCT-1. The stormwater in the drainage channel will flow under a culvert on RCF Road to Pond 13 and then offsite through or around the wetlands under the site's General NPDES permit. Hotpsot Location 1 will be excavated and paved with a new 4" asphalt cap. For Hotspot Location 10 (RISBON-59), excavation of an area about 175 feet by 175 feet with a total depth of 50 feet below RCF Road for a total impacted soil volume of 65,000 cy for onsite disposal at the PCB Landfill.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Based on previous remediation project experience
Surveying, Settlement monuments	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
Pre-Remedial Testing					
Site Investigation/Reporting	1	ls	$ 75,000	$ 75,000	Addtnl site investigations to define extent
Geotechnical testing/Geophysical Investigation/Surveying	1	ls	$ 75,000	$ 75,000	Evaluate site stability, buried waste, geotech soil properties
Site Work					
Demo Maintenance Shed Building	1	ls	$ 100,000	$ 100,000	Includes removal and disposal of MSA bldg and foundation
UST Removals, 2 Tanks	1	ls	$ 100,000	$ 100,000	Includes excavation, disposal, sampling, reporting and consultant costs for two USTs 5,000 gal and 2,000 gal
Existing wells protection/new aboveground well completion	15	wells	$ 5,000	$ 75,000	Protect well, raise well completion to reach new cap topo surface
Site Clearance/Grubbing for RCRA cap	6.6	acre	$ 6,500	$ 43,000	Site clearance/grading prep for cap starting with the foundation layer
Excavation/Backfill/Asphalt Cap (5') - Location 1 (1 ac)					Only a portion of the 2 acre area is excavated
Excavation (5'): Soil portion of Location 1	8,000	cy	$ 6	$ 48,000	Based on estimated remediation area, existing slopes; contractor cost
Backfill from Borrow Area and compact	8,800	cy	$ 6	$ 53,000	Borrow area transport and compact
Excavated Soil onsite Placement at PCB Landfill	8,800	cy	$ 2	$ 18,000	
4" Asphalt Pavement capping (with 4" aggregate base)	43,500	sf	$ 5	$ 218,000	Assumes asphalt paving of unpaved areas, approx 1 acre
RCRA Cap - Location 2 (MSA, N of PSCT) (2.8 ac)					Location 2 area (acres) 2.8
Cut/Fill Leveling Layer (grading)	17,000	cy	$ 5	$ 85,000	Based on estimate from CAD; contractor unit cost
Foundation layer (2'): borrow and compact	9,900	cy	$ 6	$ 59,000	Site clearance/grading prep for cap starting with the foundation layer. Soil volume based on cap area, contractor unit cost quote
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote incl. tax, shipping
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.70/sf for 60 mil HDPE liner per GSE Liner quote
Geocomposite 200 mil fabrinet, matl+labor	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote incl. tax, shipping
Vegetative cover (2')	9,900	cy	$ 6	$ 59,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding

TABLE E-8-5
FS AREA 3 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Excavation/Backfill (20') - Location 3 (2.2 ac)					Location 3 (acres) 2.2
Excavation (0-20')	71,000	cy	$ 6	$ 426,000	Based on estimated remediation area and 1:1 side slopes. Assume no shoring is necessary. Segregate unimpacted soils as fill.
Segregate unimpacted soils use as fill and compact	24,000	cy	$ 3	$ 72,000	Assume unimpacted soil is 1/3rd of excavated soil
Backfill: borrow and compact	54,000	cy	$ 6	$ 324,000	Borrow from NW Borrow area; no pre-processing
Revegetation/Hydroseeding	2.2	acre	$ 4,000	$ 9,000	Top soil and hydroseeding
Excavated Soil Transport/Dispose PCB Landfill	47,000	cy	$ 2	$ 94,000	Assume PCB landfill disposal of 2/3rds of excavated soil
Excavation/Backfill (5') - Location 4 (1.6 ac)					
Excavation	13,000	cy	$ 6	$ 78,000	Based on estimated remediation area, existing slopes; contractor cost
Backfill: borrow and compact	14,300	cy	$ 6	$ 86,000	Borrow from NW Borrow area; no pre-processing
Revegetation/Hydroseeding	1.6	acre	$ 4,000	$ 6,000	Top soil and hydroseeding
Excavated Soil Transport/Dispose at PCB Landfill	13,000	cy	$ 2	$ 26,000	Assume PCB Landfill disposal
Excavation/Backfill (50') - Location 10 (175'x175')					
Excavation (50 feet down to 400 ft MSL)	65,000	cy	$ 6	$ 390,000	Based on estimated remediation area, and side slopes at 1:1; contractor unit cost
Dewatering: trench based extraction	1	ls	$ 100,000	$ 100,000	Assumed lump sum cost for dewatering; disch to pond, no water treatment
Backfill: borrow and compact	71,500	cy	$ 6	$ 429,000	Based on estimated remediation area, existing slopes; contractor cost; no pre-processing
Revegetation/Hydroseeding	0.6	acre	$ 4,000	$ 2,000	Top soil and hydroseeding
Excavated Soil onsite Placement at PCB Landfill	65,000	cy	$ 2	$ 130,000	Assume disposal in PCB Landfill
Stormwater Controls					
Surface features - Stormwater ditches, Bench V-ditches	1,800	lf	$ 30	$ 54,000	Estimated length of surface drainage ditches
BMPs - Grading to remove rills and gullies	15	acre	$ 20,000	$ 300,000	Assumed areas that needs BMPs is 15 out of 40 acres
BMPs - Turf reinforcement mats, jute mesh, silt fence	15	acre	$ 43,500	$ 653,000	Assumed areas that needs BMPs
BMPs - hydroseeding	15	acre	$ 4,000	$ 60,000	Assumed areas that needs BMPs
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during remedy implementation)	50	samples	$ 500	$ 25,000	50 air/dust samples, analysis+labor
Soil Confirmation Sampling and Analyses	100	samples	$ 100	$ 10,000	for tank removals, Locs 1,,2,3,4,10 excavations
Compaction testing: Geotech engr	40	days	$ 500	$ 20,000	30 days of testing w Geotech engr/nuclear gage at $500/day

TABLE E-8-5
FS AREA 3 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 150,000	$ 150,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 5,103,000**	
			Contingency (35%)	**$ 1,786,000**	
			Direct Capital Total:	**$ 6,889,000**	Direct Capital Cost per Acre = $837,000
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 5,103,000	$ 255,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 5,103,000	$ 153,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$ 5,103,000	$ 510,000	
Construction Management	5%	of	$ 5,103,000	$ 255,000	
			Total PM/CM Cost:	**$ 1,173,000**	
			Total Capital Cost:	**$ 8,062,000**	

TABLE E-8-5
FS AREA 3 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
Cap Inspection / Maintenance					
Cap, Drainage Channel Inspection and Maintenance	1	year	$ 30,000	$ 30,000	Based on current site O&M costs
Settlement repair/Regrading/Erosion control	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Settlement survey/Reporting	1	year	$ -	$ -	
Groundwater monitoring (RISBON-59 area, Location 10)	1	year	$ -	$ -	Included in Area 5 cost estimate for sitewide gw monitoring
Misc repairs, ODCs	1	year	$ 40,000	$ 40,000	
			Subtotal Annual O&M Cost:	$ 110,000	
			Contingency (50%)	$ 55,000	
Project Management/Technical Support	1	year	$ 24,000	$ 24,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 189,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace Caps	1	100-year	$ 4,031,000	$ 4,031,000	Assume 1/2 of caps would need to be replaced

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$8,062		$8,062	$8,062	
Annual O&M Cost (post construction)	0 - 5	$970	$194	$888	$795	
Annual O&M Cost (post construction)	6 - 30	$4,850	$194	$2,914	$1,612	
Annual O&M Cost (post construction)	31 - 100	$17,261	$247	$2,959	$459	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$11,864,000**	**$10,469,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$14,823,000**	**$10,928,000**	

TABLE E-8-5
FS AREA 3 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 8,368,356**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 196,182**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 100-year (2014):	**$ 4,184,178**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$8,368	$1,673.67	$7,442	$6,413	FS Area 3 remedy is expected to be constructed during the second construction season (2016) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,007	$201.37	$922	$826	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$5,034	$201.37	$3,025	$1,673	
Annual O&M Cost (post construction)	31 - 100	$17,917	$255.96	$3,071	$476	
			Present Value of Capital	**$7,442,000**	**$6,413,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$3,947,000**	**$2,499,000**	
			Present Value of 100 Year O&M	**$7,018,000**	**$2,975,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$11,389,000**	**$8,912,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$14,460,000**	**$9,388,000**	

NOTES/ASSUMPTIONS

1. This alternative addresses the ten impacted soil locations identified for FS Area 3 in Figure 11-15A.
2. Location 1 is in Liquid Treatment Area and partial excavation of hot spots is assumed with asphalt replacement where needed.
3. Location 2 is to capped with a RCRA cap that will tie into the Area 1 RCRA cap.
4. Locations 3 and 4 are to be excavated down to 20' bgs and 5' bgs respectively and disposed in the PCB Landfill.
5. Locations 5-9 - No action based on ecological risk modeling and statistical analysis that confirm area-wide risk-based requirements are met.
6. Location 10, RISBON-59 is a SVOC impact in deep soil in an area about 175 feet by 175 feet that is excavated and placed in the PCB Landfill.
7. Capital cost for Maintenance Shed building demolition and removal of 2 USTs are included prior to remedial activities.

TABLE E-8-6
FS AREA 4 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: ALT 4 - Eco-Cap (RCF Pond) (2’) + Construct 11-acre Lined Evaporation Pond (A-Series Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring

Alternative Description: This alternative involves managing liquids in the existing stormwater ponds as discussed in detail in the FS. The RCF Pond is lined with an eco-cap after it is drained and the pond bottom is raised to 415 feet MSL with borrow soil (Figure 11-19A). The A-Series Pond bottom is raised to 425 feet MSL with fill soil from the northeast shore line (which also serves to expand the size of the new evaporation pond to 11 acres). The A-Series Pond bottom is then lined with a dual HDPE liner to convert it to the evaporation pond. Pond 18 is capped with a RCRA cap and graded to allow stormwater to sheet flow south to the A-Series Pond. The other ponds (Pond A-5 and 13) are filled to raise the pond bottom and then lined to serve as retention basins that drain storm water through or around the wetlands and discharge offsite to the B drainage under the site’s General NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Pre-Remedial Testing					
Site Investigation/Delineation/Reporting	1	ls	$ 150,000	$ 150,000	Addtnl investigations (env., geotech, geophys); refine nature & extent
Geotechnical testing/Geophysical Investigation	1	ls	$ -	$ -	
Site Work					
Pump existing pond water to new evap pond	1	ls	$ 5,000	$ 5,000	Assumed cost for transferring pond water to new evaporation pond
Dust controls	80	ls	$ 1,000	$ 80,000	Based on contractor unit cost-water truck-4 mths, 80 days
Pond A-5 - Lined Retention Basin					
Fill from WCSA excavation/transport/compact	40,000	cy	$ 6	$ 240,000	Transport and compact WCSA 5' excav soil, raise bottom and place liner to serve as retention basin; 49,000 cy - 9,000 cy = 40,000 cy
Foundation layer (2')	9,000	cy	$ 6	$ 54,000	Transport and compact 2' foundation layer soil. Use WCSA excav soil as fill
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	2.5	acre	$ 56,500	$ 141,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1'): borrow and compact	4,400	cy	$ 6	$ 26,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	2.5	acre	$ 4,000	$ 10,000	Top soil and hydroseeding
Pond 18 - RCRA Cap					
Cut/Fill (grading)	8,000	cy	$ 4	$ 32,000	Volume from CAD figure; Knockdown dike adjacent to A-Series Pond and raise pond bottom with fill and compact
Foundation layer (2'): borrow dike and compact	10,000	cy	$ 4	$ 40,000	Borrow soils from dike excavation
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote incl. tax, shipping
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf for 60 mil HDPE liner per GSE Liner quote, tax
Geocomposite 200 mil fabrinet, (matl+labor)	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl. tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote incl. tax
Vegetative cover (2')	10,000	cy	$ 6	$ 60,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding

TABLE E-8-6
FS AREA 4 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
A-Series Pond - Lined Evaporation Pond, 11-acre					A-Series large evap pond (acres) 11.00
Cut Pont NE shoreline, fill Pond bottom	48,000	cy	$ 6	$ 288,000	Cut soil from NE shoreline to expand pond and obtain fill for pond bottom
Additional Fill for Pond bottom	37,000	cy	$ 6	$ 222,000	Additional fill to raise bottom to 425' MSL based on CAD estimate including foundation layer
Construct sumps for leachate collection and leak detection	6	ls	$ 50,000	$ 300,000	Bottom sloped to sumps for leachate collection and leak detection filled with gravel and piping laid up the sideslope to a recovery tank
HDPE geomembrane, 60 mil, primary liner	14	acre	$ 34,800	$ 478,500	60 mil HDPE primary liner, 25% larger for sideslopes and anchor
Geonet 200 mil	14	acre	$ 21,750	$ 299,063	Intermediate drainage layer, 25% larger for sideslopes and anchor
HDPE geomembrane, 60 mil, secondary liner	14	acre	$ 34,800	$ 478,500	60 mil HDPE secondary liner, 25% larger for sideslopes and anchor
Foundation layer + 1' soil cover	54,000	cy	$ 6	$ 324,000	1' clean soil cover borrowed from northeast shore of A-Series Pond
Ecological Protection - Evaporation Pond					Wildlife controls including outer fencing, netting, inner fencing, hazing
Eco-protection, outer fencing	8,000	lf	$ 15	$ 120,000	Chain link fence, 6' high, get-a-quote.com
Eco-protection, hazing (radar system)	1	ls	$ 400,000	$ 400,000	Bird-Avert system, 50% higher than for 6-acre pond
Eco-protection, drift fencing	8,000	lf	$ 11	$ 88,000	tin flashing material doitbest.com ($150 per 50-foot incl. tax) + labor ($100/hr x 2 workers x 8 weeks x 50 hrs); $3+$8/foot
Eco-protection, netting	11	acre	$ 40,645	$ 447,000	Material $0.60/sf for pond netting, online price at pondbiz.com; Framing material and labor $15k per acre
Initial Biological Surveys and Vegetation clearing	1	ls	$ 80,000	$ 80,000	Initial biosurveys every 3 months for 1st year
RCF Pond - Eco Cap (2')					RCF Pond_acres 11.40
Fill to raise pond bottom: Borrow and compact	95,000	cy	$ 6	$ 570,000	Raise pond bottom well above 415 MSL minimum on east end with 1% slope; estimated by CAD; Borrow soil from NW borrow area
Soil cover (2'): Borrow and compact	40,000	cy	$ 6	$ 240,000	Based on 11 acres of eco-cap with 1' soil cover offsite NW borrow
Biotic barrier (200 mil Geonet)	0	acre	$ 21,800	$ -	Based on $0.50/sf per GSE Liner quote incl. tax, shipping
Drainage: V-drains, ditches	4,000	lf	$ 30	$ 120,000	Assume2500 lf of concrete V drains; Area 1 drainage is not included
Erosion control BMPs for sideslopes, jute mesh, TRM	5	acre	$ 8,700	$ 44,000	Assume 5 acres of steep sides of RCF Pond need erosion control
Pond 13 - Lined Retention Basin connects to Wetlands					
Fill from borrow area to raise bottom	6,000	cy	$ 6	$ 36,000	Transport and compact borrow soil, raise bottom above WT and place liner to serve as retention basin that connects to wetlands
Foundation layer (2')	7,000	cy	$ 6	$ 42,000	Transport and compact borrow soil that is 2' thick
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	1.9	acre	$ 56,500	$ 107,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1')	3,500	cy	$ 6	$ 21,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	1.9	acre	$ 4,000	$ 8,000	Top soil and hydroseeding

TABLE E-8-6
FS AREA 4 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Stormwater Controls					
Stormwater ditches, bench roads/V-ditches	3,000	lf	$ 30	$ 90,000	Surface features for drainage - grading, swales, V-drains to drain RCF Pond and Pond 18 stormwater; use 25% less drains
Stormwater drain pipes	1,200	lf	$ 100	$ 120,000	Based on contractor unit cost quote
Stormwater inlet/outlet structures, rip-rap	1	ls	$ 50,000	$ 50,000	Based on contractor budgetary estimate
Culvert under RCF Road to Pond 13	250	lf	$ 800	$ 200,000	Based on contractor unit cost quote
Drainage channel, 750 ft	750	lf	$ 60	$ 45,000	concrete channel, double unit cost for wider channel
Enhanced Evaporation System (A-Series Evap Pond)					
TurboMist System to enhance evaporation, 80 gpm	1	ea	$ 100,000	$ 100,000	Assumed cost for 1 land-based turbo mister system 80 gpm based on quote from Slimline, maker of Turbomister
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	120	samples	$ 500	$ 60,000	150 air/dust samples analyzed for VOCs, PCBs, DDT, metals
Compaction testing: Geotech engr	100	days	$ 500	$ 50,000	100 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	100	samples	$ 100	$ 10,000	Analyze for metals including 6010 total metals, Ba, Ni, Cr, Cu, soluble metals
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 7,327,000**	
Contingency - Pond Water Treatment (GAC+RO)					Contingency is relevant if ponds cannot be closed due to residual water that cannot be addressed by evaporation pond
GAC and Reverse Osmosis to treat pond water with high TDS for discharge under site specific NPDES permit	20,000,000	gal	$ 0.10	$ 2,000,000	Assume unit cost of $0.10/gallon for GAC/RO treatment based on verbal discussion with Siemens vendor
			Contingency (35%)	**$ 2,564,000**	
			Direct Capital Total:	**$ 11,891,000**	

TABLE E-8-6
FS AREA 4 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 7,327,000	$ 366,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 7,327,000	$ 220,000	
EPA Oversight Costs	10%	of	$ 7,327,000	$ 733,000	
Construction Management	5%	of	$ 7,327,000	$ 366,000	
			Total PM/CM Cost:	**$ 1,685,000**	
			Total Capital Cost:	**$ 13,576,000**	
Operation and Maintenance Costs					
Cap/Pond Inspection / Maintenance					
Pond, Storm channel, liner inspection and monitoring	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
Pond, Liner repair and maintenance/erosion control	1	year	$ 100,000	$ 100,000	Based on current site O&M costs
Evap Pond - Annual biological survey, Vegetation removal	1	year	$ 24,000	$ 24,000	Annual bio survey labor and reporting - 50% greater than 6-acre pond
Drainage, Culvert maintenance, monitoring	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
Utilities: electricity	1	year	$ 36,000	$ 36,000	Utilities for turbomister system, 40HP motor, 20HP pump, 30KW, operating 8 months per year
Misc: Equipment rentals / PID / FID / ODCs	1	year	$ 24,000	$ 24,000	
			Subtotal Annual O&M Cost:	$ 270,000	
			Contingency (50%):	$ 135,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 441,000**	

TABLE E-8-6
FS AREA 4 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace eco-protection drift fence, netting	1	5-year	$ 535,000	$ 535,000	Assumes replacement every 5 years
Replace eco-protection outer fence, radar system	1	10-year	$ 520,000	$ 520,000	Assumes replacement every 10 years
Evaporation Pond Sediment sampling (every 5 years)	6	5-year	$ 75,000	$ 450,000	Sampling sediment at 15 locations in A-Series Pond and analysis for inorganics/metals
Periodic dredging of sediment	1	20-year	$ 1,643,000	$ 1,643,000	Assume 6 acres of upper 12 inches of sediment is dredged ($50/cy) and sent to Kettleman for disposal as nonRCRA haz ($80/ton)
Replace EcoCap/Biotic barrier and Pond liners	1	50-year	$ 6,788,000	$ 6,788,000	Assume 1/2 of capital cost of pond liner and cap would need to be replaced in a 100-year period

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$13,576		$13,576	$13,576	
Annual O&M Cost (post construction)	0 - 5	$2,840	$568	$2,601	$2,329	
Annual O&M Cost (post construction)	6 - 30	$16,883	$675	$10,144	$5,611	
Annual O&M Cost (post construction)	31 - 100	$63,198	$903	$10,833	$1,679	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$26,321,000**	**$21,516,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$37,154,000**	**$23,195,000**	

TABLE E-8-6
FS AREA 4 - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 14,091,888**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 457,758**	
				Periodic Cost, 5-year (2014):	**$ 659,130**	
				Periodic Cost, 10-year (2014):	**$ 539,760**	
				Periodic Cost, 20-year (2014):	**$ 1,705,434**	
				Periodic Cost, 50-year (2014):	**$ 7,045,944**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$14,092	$2,818.38	$12,531	$10,800	FS Area 4 remedy is expected to be constructed during the third and fourth construction seasons (2018 and 2019) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$2,948	$590	$2,700	$2,417	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$17,525	$700.98	$10,529	$5,824	
Annual O&M Cost (post construction)	31 - 100	$65,600	$937.14	$11,244	$1,743	
			Present Value of Capital	**$12,531,000**	**$10,800,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$13,229,000**	**$8,242,000**	
			Present Value of 100 Year O&M	**$24,474,000**	**$9,985,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$25,761,000**	**$19,042,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$37,005,000**	**$20,785,000**	

NOTES/ASSUMPTIONS

1. This alternative involves pumping existing pond water to the new evaporation pond located on the footprint of the existing A-Series Pond.
2. The A-Series and RCF Pond will be graded and filled to raise the low lying areas of the ponds to ensure there is no groundwater intrusion.
3. Pond A-5 and Pond 13 will be lined with the following: foundation layer, geocomposite liner (HDPE membrane/geotextile), gravel and a soil cap.
4. Pond A-5 will be filled using WCSA excavation soil and lined to be used as a retention basin for capped RCRA Canyon stormwater.
5. Pond 18 will also be capped with a RCRA cap after the adjacent berm is knocked down to provide fill soil.
6. RCF Pond will be covered with an eco-cap that is sloped to drain water out of the RCF to Pond 13.
7. RCF Pond will include a drainage channel that conveys clean stormwater out of the Capped Landfills.
8. Stormwater from the capped RCRA Canyon, the Capped Landfills and the eco-capped RCF will be drained out through or around the wetlands through Pond 13.

TABLE E-8-7
FS AREA 4 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Eco-Cap (RCF Pond, portion of A-Series Pond) + Construct 6-acre Lined Evaporation Pond (A-Series Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring

Alternative Description: This alternative involves managing liquids in existing stormwater ponds as discussed in detail in the FS. The RCF Pond is lined with an eco-cap after it is drained and the bottom raised to 415 feet MSL across the entire pond (Figure 11-20A). The A-Series Pond bottom is raised to 425 feet MSL with fill soil from the northeast shore line and a portion of the A-Series Pond is then converted to a 6-acre lined evaporation pond using a dual HDPE liner with the remaining area (5 acres) covered with an eco-cap. Pond 18 is capped with a RCRA cap and graded to allow stormwater to sheet flow south to the A-Series Pond. The eco-caps on the RCF and A-Series Ponds would be sloped to direct stormwater towards Pond 13 and then to the wetlands. The other ponds (Pond A-5 and 13) are backfilled with soil and lined to serve as retention basins to drain storm water through or around the wetlands and discharge offsite to the B-Drainage under the site's General NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Pre-Remedial Testing					
Site Investigation/Delineation/Reporting	1	ls	$ 150,000	$ 150,000	Addtnl investigations (env., geotech, geophys); refine nature & extent
Geotechnical testing/Geophysical Investigation	1	ls	$ -	$ -	
Site Work					
Pump existing pond water to new evap pond	1	ls	$ 5,000	$ 5,000	Assumed cost for transferring pond water to new evaporation pond
Dust controls	80	ls	$ 1,000	$ 80,000	Based on contractor unit cost-water truck-4 mths, 80 days
Pond A-5 - Lined Retention Basin					
Fill from WCSA excavation/transport/compact	40,000	cy	$ 6	$ 240,000	Transport and compact WCSA 5' excav soil, raise bottom and place liner to serve as retention basin; 49,000 cy - 9,000 cy = 40,000 cy
Foundation layer (2')	9,000	cy	$ 6	$ 54,000	Transport and compact 2' foundation layer soil. Use WCSA excav soil as fill
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	2.5	acre	$ 56,500	$ 141,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1'): borrow and compact	4,400	cy	$ 6	$ 26,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	2.5	acre	$ 4,000	$ 10,000	Top soil and hydroseeding
Pond 18 - RCRA Cap					
Cut/Fill (grading)	8,000	cy	$ 4	$ 32,000	Volume from CAD figure; Knockdown dike adjacent to A-Series Pond and raise pond bottom with fill and compact
Foundation layer (2'): borrow dike and compact	10,000	cy	$ 4	$ 40,000	Borrow soils from dike excavation
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote incl. tax, shipping
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf for 60 mil HDPE liner per GSE Liner quote, tax
Geocomposite 200 mil fabrinet, (matl+labor)	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl. tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote incl. tax
Vegetative cover (2')	10,000	cy	$ 6	$ 60,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding

TABLE E-8-7
FS AREA 4 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
A-Series Pond - Lined Evaporation Pond, 6-acre+ecocap					A-Series small evap pond (acres) 6.00
Cut Pont NE shoreline, fill Pond bottom	48,000	cy	$ 6	$ 288,000	Cut soil from NE shoreline to expand pond and obtain fill for pond bottom
Additional Fill for Pond bottom	35,000	cy	$ 6	$ 210,000	Additional fill to raise bottom to 425' MSL based on CAD estimate
Berm construction for six 1-acre pond cells	46,000	cy	$ 6	$ 276,000	Based on CAD estimate
Construct sumps for leachate collection and leak detection	6	ls	$ 50,000	$ 300,000	Bottom sloped to sumps for leachate collection and leak detection filled with gravel and piping laid up the sideslope to a recovery tank
HDPE geomembrane, 60 mil, primary liner	9	acre	$ 34,800	$ 313,200	60 mil HDPE primary liner, 50% larger for sideslopes and anchor
Geonet 200 mil	9	acre	$ 21,750	$ 195,750	Intermediate drainage layer, 50% larger for sideslopes and anchor
HDPE geomembrane, 60 mil, secondary liner	9	acre	$ 34,800	$ 313,200	60 mil HDPE secondary liner, 50% larger for sideslopes and anchor
Foundation layer + 1' soil cover	41,400	cy	$ 6	$ 248,000	1' clean soil cover borrowed from northeast shore of A-Series Pond
Ecological Protection - Evaporation Pond					Wildlife controls including outer fencing, netting, inner fencing, hazing
Eco-protection, outer fencing	4,000	lf	$ 15	$ 60,000	Chain link fence, 6' high, get-a-quote.com
Eco-protection, hazing (radar system)	1	ls	$ 250,000	$ 250,000	Bird-Avert system
Eco-protection, drift fencing	4,000	lf	$ 11	$ 44,000	tin flashing material doitbest.com ($150 per 50-foot incl. tax) + labor ($100/hr x 2 workers x 8 weeks x 50 hrs); $3+$8/foot
Eco-protection, netting	6	acre	$ 40,645	$ 244,000	Material $0.60/sf for pond netting, online price at pondbiz.com; Framing material and labor $15k per acre
Initial Biological Surveys and Vegetation clearing	1	ls	$ 50,000	$ 50,000	Initial biosurveys every 3 months for 1st year
A-Series Pond remaining area - Eco Cap (2'), 5 acres					A-Series remaining area 5.00
Soil cover (2'): Borrow and compact	18,000	cy	$ 6	$ 108,000	Based on 11 acres of eco-cap with 1' soil cover offsite NW borrow
Biotic barrier (200 mil Geonet)	0	acre	$ 21,800	$ -	Based on $0.50/sf per GSE Liner quote incl. tax, shipping
Drainage: V-drains, ditches	1,000	lf	$ 30	$ 30,000	Assume2500 lf of concrete V drains incl. Area 1 drainage channel
Erosion control BMPs for sideslopes, jute mesh, TRM	1.0	acre	$ 8,700	$ 9,000	Assume 50% of remaining A-Series Pond need erosion control
RCF Pond - Eco Cap (2')					RCF Pond_acres 11.40
Fill to raise pond bottom: Borrow and compact	95,000	cy	$ 6	$ 570,000	Raise pond bottom well above 415 MSL minimum on east end with 1% slope; estimated by CAD; Borrow soil from NW borrow area
Soil cover (2'): Borrow and compact	40,000	cy	$ 6	$ 240,000	Based on 11 acres of eco-cap with 2' soil cover offsite NW borrow
Biotic barrier (200 mil Geonet)	0	acre	$ 21,800	$ -	Based on $0.50/sf per GSE Liner quote incl. tax, shipping
Drainage: V-drains, ditches	4,000	lf	$ 30	$ 120,000	Assume2500 lf of concrete V drains incl. Area 1 drainage channel
Erosion control BMPs for sideslopes, jute mesh, TRM	5	acre	$ 8,700	$ 44,000	Assume 5 acres of steep sides of RCF Pond need erosion control

TABLE E-8-7
FS AREA 4 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Pond 13 - Lined Retention Basin connects to Wetlands					
Fill from borrow area to raise bottom	6,000	cy	$ 6	$ 36,000	Transport and compact borrow soil, raise bottom above WT and place liner to serve as retention basin that connects to wetlands
Foundation layer (2')	7,000	cy	$ 6	$ 42,000	Transport and compact borrow soil that is 2' thick
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	1.9	acre	$ 56,500	$ 107,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1')	3,500	cy	$ 6	$ 21,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	1.9	acre	$ 4,000	$ 8,000	Top soil and hydroseeding
Stormwater Controls					
Stormwater ditches, bench roads/V-ditches	3,000	lf	$ 30	$ 90,000	Surface features for drainage - grading, swales, V-drains to drain RCF Pond and Pond 18 stormwater; use 25% less drains
Stormwater drain pipes	1,200	lf	$ 100	$ 120,000	Based on contractor unit cost quote
Stormwater inlet/outlet structures, rip-rap	1	ls	$ 50,000	$ 50,000	Based on contractor budgetary estimate
Culvert under RCF Road to Pond 13	250	lf	$ 800	$ 200,000	Based on contractor unit cost quote
Drainage channel, 750 ft, Area 1 drainage	750	lf	$ 60	$ 45,000	concrete channel, double unit cost for wider channel to Pond 13
Enhanced Evaporation System (A-Series Evap Pond)					
TurboMist System to enhance evaporation, 80 gpm	1	ea	$ 100,000	$ 100,000	Assumed cost for 1 land-based turbo mister system 80 gpm based on quote from Slimline, maker of Turbomister
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	120	samples	$ 500	$ 60,000	150 air/dust samples analyzed for VOCs, PCBs, DDT, metals
Compaction testing: Geotech engr	100	days	$ 500	$ 50,000	100 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	100	samples	$ 100	$ 10,000	Analyze for metals including 6010 total metals, Ba, Ni, Cr, Cu, soluble metals
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
Direct Capital Total:				**$ 6,741,000**	
Contingency - Pond Water Treatment (GAC+RO)					Contingency is relevant if ponds cannot be closed due to residual water that cannot be addressed by evaporation pond
GAC and Reverse Osmosis to treat pond water with high TDS for discharge under site specific NPDES permit	20,000,000	gal	$ 0.10	$ 2,000,000	Assume unit cost of $0.10/gallon for GAC/RO treatment based on verbal discussion with Siemens vendor
Contingency (35%)				**$ 2,359,000**	
Direct Capital Total:				**$ 11,100,000**	

TABLE E-8-7
FS AREA 4 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 6,741,000	$ 337,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 6,741,000	$ 202,000	
EPA Oversight Costs	10%	of	$ 6,741,000	$ 674,000	
Construction Management	5%	of	$ 6,741,000	$ 337,000	
			Total PM/CM Cost:	**$ 1,550,000**	
			Total Capital Cost:	**$ 12,650,000**	
Operation and Maintenance Costs					
Cap/Pond Inspection / Maintenance					
Pond, Storm channel, liner inspection and monitoring	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
Evap Pond, Liner repair and maintenance/erosion control	1	year	$ 60,000	$ 60,000	Based on current site O&M costs; 60% of 11-acre evap pond
Evap Pond - Annual biological survey, vegetation removal	1	year	$ 18,000	$ 18,000	Annual bio survey labor and reporting
Drainage, Culvert maintenance, monitoring	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
Utilities: electricity	1	year	$ 36,000	$ 36,000	Utilities for turbomister system, 40HP motor, 20HP pump, 30KW, operating 8 months per year
Misc: Equipment rentals / PID / FID / ODCs	1	year	$ 24,000	$ 24,000	
			Subtotal Annual O&M Cost:	$ 224,000	
			Contingency (50%):	$ 112,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 372,000**	

TABLE E-8-7
FS AREA 4 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace eco-protection drift fence, netting	1	5-year	$ 288,000	$ 288,000	Assumes replacement every 5 years
Replace eco-protection outer fence, radar system	1	10-year	$ 310,000	$ 310,000	Assumes replacement every 5 years
Evaporation Pond Sediment sampling (every 5 years)	6	5-year	$ 50,000	$ 300,000	Sampling sediment at 10 locations in A-Series Pond and analysis for inorganics/metals
Periodic dredging of sediment	1	20-year	$ 822,000	$ 822,000	Assume 3 acres of upper 12 inches of sediment is dredged ($50/cy) and sent to Kettleman for disposal as nonRCRA haz ($80/ton)
Replace EcoCap and Pond liners	1	50-year	$ 6,325,000	$ 6,325,000	Assume 1/2 of capital cost of pond liner and cap would need to be replaced in a 100-year period

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$12,650		$12,650	$12,650	
Annual O&M Cost (post construction)	0 - 5	$2,223	$445	$2,036	$1,823	
Annual O&M Cost (post construction)	6 - 30	$12,557	$502	$7,545	$4,173	
Annual O&M Cost (post construction)	31 - 100	$48,880	$698	$8,378	$1,299	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$22,231,000**	**$18,646,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$30,609,000**	**$19,945,000**	

TABLE E-8-7
FS AREA 4 - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 13,130,700**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 386,136**	
				Periodic Cost, 5-year (2014):	**$ 376,794**	
				Periodic Cost, 10-year (2014):	**$ 321,780**	
				Periodic Cost, 20-year (2014):	**$ 853,236**	
				Periodic Cost, 50-year (2014):	**$ 6,565,350**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$13,131	$2,626.14	$11,677	$10,063	FS Area 4 remedy is expected to be constructed during the third and fourth construction seasons (2018 and 2019) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$2,307	$461	$2,114	$1,892	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$13,034	$521	$7,831	$4,332	
Annual O&M Cost (post construction)	31 - 100	$50,737	$725	$8,697	$1,348	
			Present Value of Capital	**$11,677,000**	**$10,063,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$9,945,000**	**$6,224,000**	
			Present Value of 100 Year O&M	**$18,642,000**	**$7,572,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$21,621,000**	**$16,287,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$30,318,000**	**$17,636,000**	

NOTES/ASSUMPTIONS

1. This alternative involves pumping existing pond water to the new evaporation pond located on the footprint of the existing A-Series Pond.
2. The A-Series and RCF Pond will be graded and filled to raise the low lying areas of the ponds to ensure there is no groundwater intrusion.
3. Pond A-5 and Pond 13 will be lined with the following: foundation layer, geocomposite liner (HDPE membrane/geotextile), gravel and a soil cap.
4. Pond A-5 will be filled using WCSA excavation soil and lined to be used as a retention basin for capped RCRA Canyon stormwater.
5. Pond 18 will also be capped with a RCRA cap after the adjacent berm is knocked down to provide fill soil.
6. RCF Pond will be covered with an eco-cap that is sloped to drain water out of the RCF to Pond 13.
7. RCF Pond will include a drainage channel that conveys clean stormwater out of the Capped Landfills.
8. Stormwater from the capped RCRA Canyon, the Capped Landfills and the eco-capped RCF will be drained out through or around the wetlands through Pond 13.

TABLE E-8-8
FS AREA 4 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Eco-Cap (RCF Pond, A-Series Pond) (2') + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring

Alternative Description: This alternative involves managing liquids in the existing stormwater ponds as discussed in the FS. This alternative does not include an evaporation pond and complements the remedial alternatives in Area 5 groundwater where the groundwater is treated for both VOCs and inorganics. The RCF Pond is lined with an eco-cap after it is drained and the pond bottom is raised to 415 feet MSL with borrow soil (Figure 11-21A). The A-Series Pond bottom is raised to 425 feet MSL with fill soil from the northeast shore line and then covered with an eco-cap. Pond 18 is capped with a RCRA cap and graded to allow stormwater to sheet flow south to the A-Series Pond. The other ponds (Pond A-5 and 13) are filled to raise the pond bottom and then lined to serve as retention basins that drain storm water through or around the wetlands and then offsite to the B-drainage under the site's General NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 250,000	$ 250,000	Based on contractor quotes
Remediation Documentation/Reporting	1	ea	$ 100,000	$ 100,000	Based on previous remediation project experience
Pre-Remedial Testing					
Site Investigation/Delineation/Reporting	1	ls	$ 150,000	$ 150,000	Addtnl investigations (env., geotech, geophys); refine nature & extent
Geotechnical testing/Geophysical Investigation	1	ls	$ -	$ -	
Site Work					
Pump existing pond water to new evap pond	1	ls	$ 5,000	$ 5,000	Assumed cost for transferring pond water to new evaporation pond
Dust controls	120	ls	$ 1,000	$ 120,000	Based on contractor unit cost-water truck-4 mths, 80 days
Pond A-5 - Lined Retention Basin					
Fill from WCSA excavation/transport/compact	40,000	cy	$ 6	$ 240,000	Transport and compact WCSA 5' excav soil, raise bottom and place liner to serve as retention basin; 49,000 cy - 9,000 cy = 40,000 cy
Foundation layer (2')	9,000	cy	$ 6	$ 54,000	Transport and compact 2' foundation layer soil. Use WCSA excav soil as fill
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	2.5	acre	$ 56,500	$ 141,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1'): borrow and compact	4,400	cy	$ 6	$ 26,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	2.5	acre	$ 4,000	$ 10,000	Top soil and hydroseeding
Pond 18 - RCRA Cap					
Cut/Fill (grading)	8,000	cy	$ 4	$ 32,000	Volume from CAD figure; Knockdown dike adjacent to A-Series Pond and raise pond bottom with fill and compact
Foundation layer (2'): borrow dike and compact	10,000	cy	$ 4	$ 40,000	Borrow soils from dike excavation
GCL Bento Liner (matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf based on GSE Liner quote incl. tax, shipping
HDPE liner (60 mil)(matl + labor)	2.8	acre	$ 34,500	$ 97,000	Assume $0.80/sf for 60 mil HDPE liner per GSE Liner quote, tax
Geocomposite 200 mil fabrinet, (matl+labor)	2.8	acre	$ 30,500	$ 85,000	Assume $0.70/sf per GSE Liner quote incl. tax, shipping
Biotic barrier (200 mil Geonet)(matl + labor)	2.8	acre	$ 21,800	$ 61,000	Assume $0.50/sf per GSE Liner quote incl. tax
Vegetative cover (2')	10,000	cy	$ 6	$ 60,000	2' clean soil cover borrowed from NW corner of site
Revegetation/Hydroseeding	2.8	acre	$ 4,000	$ 11,000	Top soil and hydroseeding

TABLE E-8-8
FS AREA 4 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
A-Series Pond - Eco Cap (2')					
Cut Pont NE shoreline, fill Pond bottom, foundation layer	85,000	cy	$ 6	$ 510,000	Cut soil from NE shoreline to expand pond and obtain fill for pond bottom to raise to 425' MSL minimum
Soil cover (2'): Borrow and compact	39,000	cy	$ 6	$ 234,000	Based on 11 acres of eco-cap with 1' soil cover offsite NW borrow
Biotic barrier (200 mil Geonet)	0	acre	$ 21,800	$ -	Based on $0.50/sf per GSE Liner quote incl. tax, shipping
Drainage: V-drains, ditches	4,000	lf	$ 30	$ 120,000	Assume2500 lf of concrete V drains incl. Area 1 drainage channel
Erosion control BMPs for sideslopes, jute mesh, TRM	5.0	acre	$ 8,700	$ 44,000	Assume 50% of remaining A-Series Pond need erosion control
RCF Pond - Eco Cap (2')					RCF Pond_acres 11.40
Fill to raise pond bottom: Borrow and compact	95,000	cy	$ 6	$ 570,000	Raise pond bottom well above 415 MSL minimum on east end with 1% slope; estimated by CAD; Borrow soil from NW borrow area
Soil cover (2'): Borrow and compact	40,000	cy	$ 6	$ 240,000	Based on 11 acres of eco-cap with 2' soil cover offsite NW borrow
Biotic barrier (200 mil Geonet)	0	acre	$ 21,800	$ -	Based on $0.50/sf per GSE Liner quote incl. tax, shipping
Drainage: V-drains, ditches	4,000	lf	$ 30	$ 120,000	Assume2500 lf of concrete V drains incl. Area 1 drainage channel
Erosion control BMPs for sideslopes, jute mesh, TRM	5	acre	$ 8,700	$ 44,000	Assume 5 acres of steep sides of RCF Pond need erosion control
Pond 13 - Lined Retention Basin connects to Wetlands					
Fill from borrow area to raise bottom	6,000	cy	$ 6	$ 36,000	Transport and compact borrow soil, raise bottom above WT and place liner to serve as retention basin that connects to wetlands
Foundation layer (2')	7,000	cy	$ 6	$ 42,000	Transport and compact borrow soil that is 2' thick
Geocomposite Pond liner (HDPE liner 20 mil, geotextile)	1.9	acre	$ 56,500	$ 107,000	Assume $1.30/sf for GCL Bentomat pond liner per CETCO incl matl, labor, taxes, shipping
Soil cover (1')	3,500	cy	$ 6	$ 21,000	1' clean soil cover from soil borrow area
Revegetation/Hydroseeding	1.9	acre	$ 4,000	$ 8,000	Top soil and hydroseeding
Stormwater Controls					
Stormwater ditches, bench roads/V-ditches	9,000	lf	$ 30	$ 270,000	Surface features for drainage - grading, swales, V-drains to drain RCF, A-Series and Pond 18 stormwater
Stormwater drain pipes	3,600	lf	$ 100	$ 360,000	Based on contractor unit cost quote
Stormwater inlet/outlet structures, rip-rap	1	ls	$ 50,000	$ 50,000	Based on contractor budgetary estimate
Culvert under RCF Road to Pond 13	250	lf	$ 800	$ 200,000	Based on contractor unit cost quote
Drainage channel, 750 ft, Area 1 drainage	750	lf	$ 60	$ 45,000	concrete channel, double unit cost for wider channel to Pond 13
Enhanced Evaporation System (A-Series Evap Pond)					
TurboMist System to enhance evaporation, 80 gpm	0	ea	$ 100,000	$ -	

TABLE E-8-8
FS AREA 4 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	150	samples	$ 500	$ 75,000	150 air/dust samples analyzed for VOCs, PCBs, DDT, metals
Compaction testing: Geotech engr	200	days	$ 500	$ 100,000	200 days of testing w Geotech engr/nuclear gage at $500/day
Soil Confirmation Sampling and Analysis	150	samples	$ 100	$ 15,000	Analyze for metals including 6010 total metals, Ba, Ni, Cr, Cu, soluble metals
Green Remediation	1	ls	$ 50,000	$ 50,000	Assumed lump sum cost per FS Area for green remediation
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 300,000	$ 300,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 50,000	$ 50,000	Based on contractor quotes
			Direct Capital Total:	**$ 5,190,000**	
Contingency - Pond Water Treatment (GAC+RO)					Contingency is relevant if ponds cannot be closed due to residual water that cannot be addressed by evaporation pond
GAC and Reverse Osmosis to treat pond water with high TDS for discharge under site specific NPDES permit	20,000,000	gal	$ 0.10	$ 2,000,000	Assume unit cost of $0.10/gallon for GAC/RO treatment based on verbal discussion with Siemens vendor
			Contingency (35%)	**$ 1,817,000**	
			Direct Capital Total:	**$ 9,007,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 5,190,000	$ 260,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 5,190,000	$ 156,000	
EPA Oversight Costs	10%	of	$ 5,190,000	$ 519,000	
Construction Management	5%	of	$ 5,190,000	$ 260,000	
			Total PM/CM Cost:	**$ 1,195,000**	
			Total Capital Cost:	**$ 10,202,000**	

TABLE E-8-8
FS AREA 4 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
Cap/Pond Inspection / Maintenance					
Pond, Storm channel, liner inspection and monitoring	1	year	$ 50,000	$ 50,000	Based on current site O&M costs
Erosion control BMPs	1	year	$ 24,000	$ 24,000	Based on current site O&M costs; 60% of 11-acre evap pond
Drainage, Culvert maintenance, monitoring	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
Utilities: electricity	1	year	$ 6,000	$ 6,000	
Misc: Equipment rentals / PID / FID / ODCs	1	year	$ 24,000	$ 24,000	
			Subtotal Annual O&M Cost:	$ 140,000	
			Contingency (50%):	$ 70,000	
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on current site O&M costs
			Total Annual O&M Cost:	**$ 246,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace eco-protection drift fence and netting	1	5-year		$ -	No evaporation pond
Evaporation Pond Sediment sampling (every 5 years)	6	5-year		$ -	No evaporation pond
Periodic dredging of sediment	1	20-year		$ -	No evaportion pond
Replace EcoCap and Pond liners	1	50-year	$ 5,101,000	$ 5,101,000	Assume 1/2 of capital cost of cap would need to be replaced in a 100-year period

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$10,202		$10,202	$10,202	
Annual O&M Cost (post construction)	0 - 5	$1,255	$251	$1,150	$1,029	
Annual O&M Cost (post construction)	6 - 30	$6,275	$251	$3,770	$2,086	
Annual O&M Cost (post construction)	31 - 100	$27,422	$392	$4,700	$729	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$15,122,000**	**$13,317,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$19,822,000**	**$14,045,000**	

TABLE E-8-8
FS AREA 4 - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 10,589,676**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 255,348**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 50-year (2014):	**$ 5,294,838**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$10,590	$2,117.94	$9,417	$8,116	FS Area 4 remedy is expected to be constructed during the third and fourth construction seasons (2018 and 2019) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,303	$261	$1,193	$1,068	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$6,513	$261	$3,913	$2,165	
Annual O&M Cost (post construction)	31 - 100	$28,464	$407	$4,879	$756	
			Present Value of Capital	**$9,417,000**	**$8,116,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$5,107,000**	**$3,233,000**	
			Present Value of 100 Year O&M	**$9,986,000**	**$3,989,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$14,524,000**	**$11,349,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$19,403,000**	**$12,105,000**	

NOTES/ASSUMPTIONS

1. The A-Series and RCF Pond will be graded and filled to raise the low lying areas of the ponds to ensure there is no groundwater intrusion. There is no evaporation pond in this alterntive.
2. Pond A-5 and Pond 13 will be lined with the following: foundation layer, geocomposite liner (HDPE membrane/geotextile), gravel and a soil cap.
3. Pond A-5 will be filled using WCSA excavation soil and lined to be used as a retention basin for capped RCRA Canyon stormwater.
4. Pond 18 will also be capped with a RCRA cap after the adjacent berm is knocked down to provide fill soil.
5. RCF Pond will be covered with an eco-cap that is sloped to drain water out of the RCF to Pond 13.
6. RCF Pond will include a drainage channel that conveys clean stormwater out of the Capped Landfills.
7. Stormwater from the capped RCRA Canyon, the Capped Landfills and the eco-capped RCF will be drained out through or around the wetlands through Pond 13.

TABLE E-8-9
FS AREA 5N - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Fesibility Study

Remedial Alternative: Extraction (PSCT, Gallery Well) + Extraction (NAPL-only in P/S Landfill) + Extraction (NAPL-only in CDA, 4 wells) + Monitoring (12 new LHSU wells) + Treat and Discharge PSCT Groundwater to Onsite Evaporation Pond + ICs + Monitoring

Remedial Alternative Description: This alternative includes continued extraction of liquids and NAPL from the Gallery Well and PSCT trenches as discussed in Alternative 2. In addition, this alternative adds NAPL-only extraction from 16 new NAPL-only wells in the Upper HSU under the P/S Landfill. Four wells will be located on Bench 1 and four more on a new bench road between Bench 1 and Bench 2. In addition, two new bench roads south of Bench 1 will have four wells each near the toe of the P/S Landfill (Figure 11-25A). NAPL-only extraction anticipates utilizing 4-inch diameter wells which are pumped as necessary when sufficient DNAPL and LNAPL has collected in the well. Twelve new LHSU monitoring wells are proposed just upgradient of PSCT-1 and PSCT-4 to monitor any potential VOC migration under the PSCT in the LHSU. The PSCT liquids would be treated onsite for removal of organics (via an upgraded GAC system) and pumped to a new upgraded onsite treatment system designed to remove organics. The treated PSCT liquids will be pumped to a new lined evaporation pond in the A-Series Pond footprint as in Alternative 2. The extracted NAPL and leachate will be sent offsite to a permitted facility for disposal. Sitewide groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 150,000	$ 150,000	Based on contractor budgetary quotes
Remediation Documentation/Reporting	1	ea	$ 125,000	$ 125,000	Based on previous remediation project experience
Pre-Remedial Testing					
Site Investigation/Delineation/Reporting	1	ls	$ 50,000	$ 50,000	Addtnl investigations in the vicinity of expected DNAPL at the toe of the P/S Landfill and refine nature & extent
Site Preparation/Geophysical survey	1	ls	$ -	$ -	
DNAPL-Only Extraction Pilot Testing	1	ls	$ 50,000	$ 50,000	3-month long field pilot test for periodic DNAPL-only pumping incl. rentals NAPL pumps and cost estimate
Site Work					
Construct three new bench roads	3	ea	$ 200,000	$ 600,000	400 feet long bench road construction for DNAPL well installation in the southern portion of the P/S Landfill
GWTS Upgrade for PSCT Flow (Treat VOCs)					PSCT extraction rate (gal/year) 1,900,000
DNAPL stainless steel tanks: Primary, Secondary	2	ls	$ 150,000	$ 300,000	Based on TS7C tank replacement costs
Water storage tank: carbon steel	2	ls	$ 40,000	$ 80,000	Based on previous tank replacement costs
GW extraction pumps, controllers	5	ea	$ 10,000	$ 50,000	4 pumps in PSCT wells, 1 in Gallery well
6x2,000 lb LPGAC pressure vessels	6	ea	$ 25,000	$ 150,000	Means Cost Handbook 2005
Transfer pumps, bag filters, piping	1	ls	$ 35,000	$ 35,000	Assumed based on experience
Control system	1	ls	$ 75,000	$ 75,000	Estimated based on experience with other projects
Treatment system pad	1	ls	$ 30,000	$ 30,000	Means Cost Handbook 2005; assume 40x100' at$10/SF
Collection-discharge piping upgrade	3,000	ft	$ 30	$ 90,000	Assume 8,000 ft of piping to connect 12 wells
Construction, startup, shakedown	1	ls	$ 50,000	$ 50,000	Assumed based on experience

TABLE E-8-9
FS AREA 5N - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
NAPL-Only Well Installation in P/S LF					Well install unit cost, $/lf $420
NAPL well drilling, sonic drilling, casing	16	ea	$ 30,000	$ 480,000	80 ft deep, 20 ft sump, steel casing w sonic drilling; Boart Longyear quote
Well development	16	ea	$ 2,000	$ 32,000	Well development, 8 days
Consultant oversight, reporting	16	ea	$ 5,000	$ 80,000	Assume workplan, oversight during well install, logging, reporting; 3 days per well; 10 weeks to complete well install
Waste disposal, H&S, ODCs	16	ea	$ 5,000	$ 80,000	RCRA haz disposal offsite to Kettleman at $300/drum, 15 drums/boring
NAPL-Only Treatment System for P/S LF					
NAPL skimmer pumps, wellhead assemblies, controllers	16	ea	$ 5,000	$ 80,000	Xitech vendor
Collection piping, trenching, cabling to the LTA	3,000	ft	$ 60	$ 180,000	Based on contractor estimate with double containment piping
NAPL-water separator	1	ls	$ 150,000	$ 150,000	Based on Means Cost Handbook 2005
Storage tanks, instrumentation, transfer pumps	1	ls	$ 100,000	$ 100,000	Assume use of DNAPL tanks from GWTS upgrade
Equipment installation	1	ls	$ 75,000	$ 75,000	Assumed based on experience
LHSU Well Installation					
LHSU well drilling, installation, well box	12	ea	$ 20,000	$ 240,000	50 feet deep wells just south of PSCT-1 and PSCT-4; well screened in the top 20 feet of LHSU below the contact
Well development	12	ea	$ 2,000	$ 24,000	Well development, 2 days
Consultant oversight, reporting	12	ea	$ 5,000	$ 60,000	Assume workplan, oversight during well install, logging, reporting; 2 days per well; 2 weeks of drilling to complete well install
Waste disposal, H&S, ODCs	12	ea	$ 5,000	$ 60,000	RCRA haz disposal offsite to Kettleman at $300/drum, 15 drums/boring
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	16	samples	$ 500	$ 8,000	16 air/dust samples analyze for VOCs, PCBs, DDT, metals during drilling in DNAPL area
Soil Confirmation Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, DNAPL saturation, 6010 total metals, soluble metals Ba, CrVI, other parameters
Groundwater Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, 6010 total metals, soluble metals Ba, CrVI, other parameters
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 125,000	$ 125,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 75,000	$ 75,000	Based on contractor quotes
			Direct Capital Total:	**$ 3,700,000**	
			Contingency (35%)	**$ 1,295,000**	
			Direct Capital Total:	**$ 4,995,000**	

TABLE E-8-9
FS AREA 5N - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 3,700,000	$ 185,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 3,700,000	$ 111,000	
EPA Oversight Costs	10%	of	$ 3,700,000	$ 370,000	
Construction Management	5%	of	$ 3,700,000	$ 185,000	
			Total PM/CM Cost:	**$ 851,000**	
			Total Capital Cost:	**$ 5,846,000**	
Operation and Maintenance Costs					
GWTS Operation and Maintenance					
GWTS Maintenance and Monitoring (labor)	12	mths	$ 20,000	$ 240,000	Based on current site O&M costs; labor at $100/hr
GWTS water sampling for compliance	1	year	$ 15,000	$ 15,000	Based on current site O&M costs
Gallery Well liquids disposal; 450,000 gal/year	0	gal	$ 1.50	$ -	See below under Variable O&M Costs
NAPL disposal - Gallery well; 3,000 gal/year	0	gal	$ 3.50	$ -	See below under Variable O&M Costs
LPGAC and VPGAC carbon vessels and replacement	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Utilities: electricity	12	mths	$ 2,000	$ 24,000	Based on current site O&M for PSCT ext
Repair, Replacement: Pumps, motors, valves, fittings, electric	1	year	$ 35,000	$ 35,000	Based on current site O&M for PSCText
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 26,000	$ 26,000	Same as current GWTS cost + DNAPL costs
NAPL-only extraction in P/S LF O&M					NAPL exttraction for 10 years
NAPL extraction O&M	12	mths	$ 8,000	$ 96,000	80 hrs/mth O&M labor at $100/hr
NAPL disposal - 16 NAPL-only well liquids	0	gal	$ 3.50	$ -	See below under Variable O&M Costs
LPGAC and VPGAC carbon vessels and replacement	1	year	$ 8,000	$ 8,000	Vapor phase carbon replacement used with NAPL storage tanks
Utilities: electricity	1	year	$ 2,000	$ 2,000	$300/month for periodic operation of extraction pumps
Repair/Replacement: pumps, motors, valves, electrical sub	1	year	$ 6,000	$ 6,000	Based on costs from current NAPL extraction and treatment system
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 24,000	$ 24,000	Same as current GWTS cost + DNAPL costs
LHSU Groundwater Monitoring					
Annual Sampling, Analysis, Reporting for 12 wells	1	ls	$ 24,000	$ 24,000	Sampling, analysis, reporting, annual, VOCs analysis
			Subtotal Annual O&M Cost:	$ 540,000	
			Contingency (50%):	$ 270,000	

TABLE E-8-9
FS AREA 5N - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project Management/Technical Support	1	year	$ 36,000	$ 36,000	Based on experience previous GWTS construction experience
Sitewide Groundwater Monitoring	1	year	$ 242,000	$ 242,000	Based on current cost of annual sampling program
Total Annual O&M Cost (w/o Variable cost items, Years 1-10):				**$ 1,088,000**	NAPL-only and Gallery Well extraction P/S LF duration is 10 years
Total Annual O&M Cost (w/o Variable cost items, Year 11 onwards):				**$ 884,000**	Includes PSCT GWTS O&M and groundwater monitoring
Annual Variable O&M Cost Items (include 50% Contingency)					
Gallery Well liquids disposal, Year 1	450,000	gal	$ 1.50	$ 1,013,000	Assume Gallery Well liquid decreases at 5% per year initially decreasing to an average of 250,000 gallons per year for years 6 through 10, at which point approximately 3,286,000 gallons are recovered.
Gallery Well liquids disposal, Year 2	427,500	gal	$ 1.50	$ 962,000	
Gallery Well liquids disposal, Year 3	406,125	gal	$ 1.50	$ 914,000	
Gallery Well liquids disposal, Year 4	385,819	gal	$ 1.50	$ 868,000	
Gallery Well liquids disposal, Year 5	366,528	gal	$ 1.50	$ 825,000	
Gallery Well liq disposal, Year 6 - 10 (average)	250,000	gal	$ 1.50	$ 563,000	
NAPL disposal, Year 1	13,000	gal	$ 3.50	$ 68,000	Assume 10,000 gallons of NAPL recovered from extraction of P/S LF liquids and 3,000 gallons of NAPL from GW liquids for Year 1. The NAPL quantities in the P/S LF liquids decrease 20% per year. A more rapid decrease in NAPL recovered is assumed for the remaining years.
NAPL disposal, Year 2	10,400	gal	$ 3.50	$ 55,000	
NAPL disposal, Year 3	8,320	gal	$ 3.50	$ 44,000	
NAPL disposal, Year 4	6,700	gal	$ 3.50	$ 35,000	
NAPL disposal, Year 5	5,300	gal	$ 3.50	$ 28,000	
NAPL disposal, Year 6 - 10 (average)	1,500	gal	$ 3.50	$ 8,000	
Periodic Costs (No Contingency)					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace portion of PSCT trench	2	50-year	$ 1,500,000	$ 3,000,000	Assume 1,500 feet length would need to be replaced using a $1000/linear foot of trench estimate derived from PCT-C Trench
Replace GWTS	2	50-year	$ 860,000	$ 1,720,000	Replace GWTS for PSCT and NAPL-only system

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$5,846		$5,846	$5,846	
Annual O&M Cost (post construction)	0 - 5	$10,277	$2,055	$9,413	$8,428	
Annual O&M Cost (post construction)	6 - 30	$26,100	$1,044	$15,682	$8,674	
Annual O&M Cost (post construction)	31 - 100	$66,600	$951	$11,416	$1,770	

TABLE E-8-9
FS AREA 5N - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Total Present Value of Alternative (Capital + 30 Year O&M)			**$30,941,000**	**$22,948,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)			**$42,356,000**	**$24,718,000**	
PRESENT VALUE ANALYSIS (2014 $)					
Total Capital Cost (2014):				**$ 6,068,148**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost Years 1-10, Annual (2014):				**$ 1,129,344**	
Total Annual O&M Cost Years 11-onward, Annual (2014):				**$ 917,592**	
Total Variable Annual O&M Cost Years 0-5 (2014):				**$ 4,994,856**	
Total Variable Annual O&M Cost Years 6-10 (2014):				**$ 2,963,490**	
Periodic Cost, 5-year (2014):				**$ 25,950**	
Periodic Cost, 50-year (2014):				**$ 2,449,680**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$6,068	$1,214	$5,396	$4,651	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$10,668	$2,134	$9,771	$8,748	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$27,092	$1,084	$16,278	$9,004	
Annual O&M Cost (post construction)	31 - 100	$69,131	$988	$11,849	$1,837	
Present Value of Capital			**$5,396,000**	**$4,651,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M			**$26,048,000**	**$17,752,000**	
Present Value of 100 Year O&M			**$37,898,000**	**$19,589,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)			**$31,445,000**	**$22,402,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)			**$43,294,000**	**$24,240,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through PSCT wells, Gallery well continue as currently, and adds NAPL-only extraction with 16 extraction wells pumped periodically with the objective of NAPL-only removal as shown in Figure 11-25A.
2. Groundwater PSCT extraction rates are anticipated to decrease significantly from site capping and closing ponds due to reduced infiltration.
3. Groundwater treatment plant is upgraded with new treatment equipment, extraction pumps, repaired/new collection/discharge piping, etc
4. NAPL is extracted periodically by pumping DNAPL and LNAPL skimmer pumps from 16 wells for a duration of 10 years.
5. Gallery well extraction rate decreases with time as the P/S Landfill is dewatered over a period of 10 years.
6. NAPL-only wells are 4' dia steel casing wells about 80 feet deep located on Bench 1 and three other new bench roads in the southern part of the P/S landfill.
7. NAPL is separated in an oil-water separator and then sent offsite for disposal as hazardous waste similar to current onsite operations.

TABLE E-8-10
FS AREA 5N - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Fesibility Study

Remedial Alternative: Extraction (PSCT, Gallery Well) + Extraction (NAPL-only in P/S Landfill) + Extraction (NAPL-only in CDA, 4 wells) + Monitoring (12 new LHSU wells) + Treat and Discharge PSCT Groundwater Offsite (No Onsite Evaporation Pond) + ICs + Monitoring

Remedial Alternative Description: This alternative includes continued extraction of liquids and NAPL from the Gallery Well and PSCT trenches and NAPL-only extraction as discussed in Alternative 3. Also, 12 new LHSU monitoring wells are proposed just upgradient of PSCT-1 and PSCT-4 to monitor the any potential VOC migration under the PSCT in the LHSU. However, in this alternative, the PSCT liquids would be treated onsite for removal of organics and inorganics using carbon adsorption, and reverse osmosis for offsite discharge to the B-Drainage in accordance with the site-specific NPDES permit (Figure 11-26A). This alternative assumes that there is no evaporation pond onsite. The extracted NAPL and leachate will be sent offsite to a permitted facility for disposal. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 200,000	$ 200,000	Based on contractor budgetary quotes
Remediation Documentation/Reporting	1	ea	$ 125,000	$ 125,000	Based on previous remediation project experience
Pre-Remedial Testing					
Site Investigation/Delineation/Reporting	1	ls	$ 50,000	$ 50,000	Addtnl investigations in the vicinity of expected DNAPL at the toe of the P/S Landfill and refine nature & extent
Site Preparation/Geophysical survey	1	ls	$ -	$ -	
DNAPL-Only Extraction Pilot Testing	1	ls	$ 50,000	$ 50,000	3-month long field pilot test for periodic DNAPL-only pumping incl rentals NAPL pumps and cost estimate
Site Work					
Construct three new bench roads	3	ea	$ 200,000	$ 600,000	400 feet long bench road construction for DNAPL well installation in the southern portion of the P/S Landfill
NAPL Well Installation					Well install unit cost, $/lf $420
NAPL well drilling, sonic drilling, casing	16	ea	$ 30,000	$ 480,000	80 ft deep, 20 ft sump, steel casing w sonic drilling; Board Longyear quote
Well development	16	ea	$ 2,000	$ 32,000	Well development, 8 days
Consultant oversight, reporting	16	ea	$ 5,000	$ 80,000	Assume workplan, oversight during well install, logging, reporting; 3 days per well; 10 weeks to complete well instal
Waste disposal, H&S, ODCs	16	ea	$ 5,000	$ 80,000	RCRA haz disposal offsite to Kettleman at $300/drum, 15 drums/boring
NAPL-Only Treatment System					
NAPL skimmer pumps, wellhead assemblies, controllers	16	ea	$ 5,000	$ 80,000	Xitech vendor
Collection piping, trenching, cabling to the LTA	3,000	ft	$ 60	$ 180,000	Based on contractor estimate with double containment piping
NAPL-water separator	1	ls	$ 100,000	$ 100,000	Based on Means Cost Handbook 2005
Storage tanks, instrumentation	1	ls	$ 100,000	$ 100,000	Assume use of DNAPL tanks from GWTS upgrade
Equipment installation	1	ls	$ 75,000	$ 75,000	Assumed based on experience

TABLE E-8-10
FS AREA 5N - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
LHSU Well Installation					
LHSU well drilling, installation, well box	12	ea	$ 20,000	$ 240,000	50 feet deep wells just south of PSCT-1 and PSCT-4; well screened in the top 20 feet of LHSU below the contact
Well development	12	ea	$ 2,000	$ 24,000	Well development, 6 days
Consultant oversight, reporting	12	ea	$ 5,000	$ 60,000	Assume workplan, oversight during well install, logging, reporting; 2 days per well; 2 weeks of drilling to complete well instal
Waste disposal, H&S, ODCs	12	ea	$ 5,000	$ 60,000	RCRA haz disposal offsite to Kettleman at $300/drum, 15 drums/boring
GWTS for PSCT (VOCs and Inorg treatment) (10 gpm)					PSCT extraction rate (gal/year) 1,900,000
PSCT GW extraction pumps, controllers	5	ea	$ 10,000	$ 50,000	4 pumps in PSCT wells, 1 in Gallery well
Collection piping, trenching, cabling incl offsite disch pipe	5,000	ft	$ 60	$ 300,000	Contractor unit cost including double cont. piping for leachate
Gallery Well stainless steel tanks: Primary, Secondary	2	ls	$ 150,000	$ 300,000	Based on TS7C tank replacement costs, SS316 components
Water storage tanks and transfer tanks: carbon steel	4	ls	$ 50,000	$ 200,000	Based on previous tank replacment costs
LPGAC vessels - 6x2,000 lb pressure vessels	6	units	$ 25,000	$ 150,000	2 trains of 3x2,000 lb LPGAC vessels, Siemens quote
Reverse Osmosis Units (Pair in series @ 10 gpm)	2	ls	$ 70,900	$ 142,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system
Reject concentrator (3-module VSEP system)	1	ls	$ 173,600	$ 174,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 100,000	$ 100,000	Increased costs due greater filtration requirements as pre-treatment step for reverse osmosis
Control system	1	ls	$ 150,000	$ 150,000	PLC controls, programming, alarms, level controls in pumps
Equipment pad, secondary containment, fence	1	ls	$ 75,000	$ 75,000	Means Cost Handbook 2005; assume75'x100' at$10/SF
Electrical, Utilities Hookups	1	ls	$ 50,000	$ 50,000	Assumed lump sum based on past project experience
Equipment installation and startup	1	ls	$ 150,000	$ 150,000	Subcontractor labor for equipment hookups, startup, testing
Equipment rentals, PID/FID, misc ODCs	1	ls	$ 50,000	$ 50,000	
Additional tankage for gw storage	1	ls	$ 150,000	$ 150,000	3 additional 20,000 gallon tanks for temporary storage of groundwater that cannot be discharged due to non-compliance with stringent NPDES limits for inorganics and needs re-treatment
PSCT well redevelopment	1	ls	$ 25,000	$ 25,000	Redevelop PSCT-1 through PSCT-4

TABLE E-8-10
FS AREA 5N - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Remedial Monitoring/Sampling					
Air Monitoring/Sampling (during implementation)	16	samples	$ 500	$ 8,000	16 air/dust samples analyze for VOCs, PCBs, DDT, metals during drilling in DNAPL area
Soil Confirmation Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, DNAPL saturation, 6010 total metals, soluble metals Ba, CrVI, other parameters
Groundwater Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, 6010 total metals, soluble metals Ba, CrVI, other parameters
NPDES Permit - Basin Plan Exception Application					
Basin Plan Exception Application, Support	1	ls	$ 150,000	$ 150,000	Assumed based on level of effort
RWQCB Application Cost	1	ls	$ 100,000	$ 100,000	Based on feedback from RWQCB rec'd through EPA
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 150,000	$ 150,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
			Direct Capital Total:	**$ 5,206,000**	Assume higher 50% contingency for challenges with RO technology, # reverse osmosis units needed, and level of pre-treatment and filtration needed, e.g. additional iron pre-treatment may be required
			Contingency (50%)	**$ 2,603,000**	
			Direct Capital Total:	**$ 7,809,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 5,206,000	$ 260,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 5,206,000	$ 156,000	
EPA Oversight Costs	10%	of	$ 5,206,000	$ 521,000	
Construction Management	5%	of	$ 5,206,000	$ 260,000	
			Total PM/CM Cost:	**$ 1,197,000**	
			Total Capital Cost:	**$ 9,006,000**	

TABLE E-8-10
FS AREA 5N - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
GWTS for PSCT - Treat Org and Inorg (10 gpm)					O&M for GAC and RO system for disch offsite; indefinite duration
GWTS Maintenance and Monitoring (Labor)	12	mths	$ 30,000	$ 360,000	1.5 FTE workers
GWTS water sampling for compliance	1	year	$ 24,000	$ 24,000	Based on current site O&M costs
Gallery Well liquids disposal; 450,000 gal/year	0	gal	$ 1.50	$ -	See below under Variable O&M Costs
NAPL disposal - Gallery well; 3,000 gal/year	0	gal	$ 3.50	$ -	See below under Variable O&M Costs
LPGAC and VPGAC carbon vessels and replacement	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Utilities: electricity	12	mths	$ 5,000	$ 60,000	Assume 50 kW (35HP) rated equipment power usage
RO Membranes replacement, filters - waste disposal	12	mths	$ 3,000	$ 36,000	Reverse osmosis membranes, filters, solid waste
Groundwater sampling for compliance	12	mths	$ 4,000	$ 48,000	GWTS influent, effluent, intermediate, LPGAC sampling
Well redevelopment, annual	1	year	$ 40,000	$ 40,000	one event per year for all wells
Evaporation Pond maintenance	12	mths	$ 5,000	$ 60,000	Periodic monthly/quarterly maintenance of eco-protection,etc
Repair/Replacement: pumps, motors, valves, electrical sub	1	year	$ 100,000	$ 100,000	Assumed based on experience
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 75,000	$ 50,000	Same as current GWTS cost + DNAPL costs
Brine disposal	285,000	gal	$ 0.66	$ 188,000	Brine concentrate disposal quote from American Integrated (AIS); per 5,000 gal truck, \$0.50/gallon + \$800/load for truck/driver (\$0.16/gal)
NAPL-only extraction O&M					NAPL extraction duration is assumed to be 10 years
NAPL extraction O&M	12	mths	$ 8,000	$ 96,000	80 hrs/mth O&M labor at \$100/hr
NAPL disposal - 16 NAPL well liquids	0	gal	$ 3.50	$ -	See below under Periodic Costs
LPGAC and VPGAC carbon vessels and replacement	1	year	$ 8,000	$ 8,000	Vapor phase carbon replacement used with NAPL storage tanks
Utilities: electricity	1	year	$ 2,000	$ 2,000	\$300/month for periodic operation of extraction pumps
Repair/Replacement: pumps, motors, valves, electrical sub	1	year	$ 6,000	$ 6,000	Based on costs from current NAPL extraction and treatment system
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 24,000	$ 24,000	Same as current GWTS cost + DNAPL costs
LHSU Groundwater Monitoring					
Annual Sampling, Analysis, Reporting for 12 wells	1	ls	$ 24,000	$ 24,000	Sampling, analysis, reporting, annual, VOCs analysis
			Subtotal Annual O&M Cost:	$ 1,166,000	
			Contingency (50%):	$ 583,000	

TABLE E-8-10
FS AREA 5N - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs (continued)					
Project Management/Technical Support	1	year	$ 50,000	$ 50,000	Based on experience previous GWTS construction experience
Sitewide Groundwater Monitoring	1	year	$ 242,000	$ 242,000	Based on current cost of annual sampling program
Total Annual O&M Cost (w/o Variable cost items, Years 1-10):				**$ 2,041,000**	NAPL-only extraction P/S LF duration is 10 years
Total Annual O&M Cost (w/o Variable cost items, Year 11 onwards):				**$ 1,837,000**	Includes PSCT GWTS O&M and groundwater monitoring
Annual Variable O&M Cost Items (include 50% Contingency)					
Gallery Well liquids disposal, Year 1	450,000	gal	$ 1.50	$ 1,013,000	Assume Gallery Well liquid decreases at 5% per year initially decreasing to an average of 250,000 gallons per year for years 6 through 10, at which point approximately 3,286,000 gallons are recovered.
Gallery Well liquids disposal, Year 2	427,500	gal	$ 1.50	$ 962,000	
Gallery Well liquids disposal, Year 3	406,125	gal	$ 1.50	$ 914,000	
Gallery Well liquids disposal, Year 4	385,819	gal	$ 1.50	$ 868,000	
Gallery Well liquids disposal, Year 5	366,528	gal	$ 1.50	$ 825,000	
Gallery Well liq disposal, Year 6 - 10 (average)	250,000	gal	$ 1.50	$ 563,000	
NAPL disposal, Year 1	13,000	gal	$ 3.50	$ 68,000	Assume 10,000 gallons of NAPL recovered from extraction of P/S LF liquids and 3,000 gallons of NAPL from GW liquids for Year 1. The NAPL quantities in the P/S LF liquids decrease 20% per year. A more rapid decrease in NAPL recovered is assumed for the remaining years.
NAPL disposal, Year 2	10,400	gal	$ 3.50	$ 55,000	
NAPL disposal, Year 3	8,320	gal	$ 3.50	$ 44,000	
NAPL disposal, Year 4	6,700	gal	$ 3.50	$ 35,000	
NAPL disposal, Year 5	5,300	gal	$ 3.50	$ 28,000	
NAPL disposal, Year 6 - 10 (average)	1,500	gal	$ 3.50	$ 8,000	
Periodic Costs (No Contingency)					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace portion of PSCT trench	2	50-year	$ 1,500,000	$ 3,000,000	Assume 1,500 feet length would need to be replaced using a $1000/linear foot of trench estimate derived from PCT-C Trench
Replace GWTS	2	50-year	$ 2,066,000	$ 4,132,000	Replace GWTS for PSCT and NAPL-only system

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$9,006		$9,006	$9,006	
Annual O&M Cost (post construction)	0 - 5	$15,042	$3,008	$13,778	$12,335	
Annual O&M Cost (post construction)	6 - 30	$49,925	$1,997	$29,996	$16,593	
Annual O&M Cost (post construction)	31 - 100	$135,722	$1,939	$23,264	$3,607	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$52,780,000**	**$37,934,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$76,044,000**	**$41,541,000**	

TABLE E-8-10
FS AREA 5N - ALTERNATIVE 4
Casmalia Resources Superfund Site
Final Fesibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
Total Capital Cost (2014):					**$ 9,348,228**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost Years 1-10, Annual (2014):					**$ 2,118,558**	
Total Annual O&M Cost Years 11-onward, Annual (2014):					**$ 1,906,806**	
Total Variable Annual O&M Cost Years 0-5 (2014):					**$ 4,994,856**	
Total Variable Annual O&M Cost Years 6-10 (2014):					**$ 2,963,490**	
Periodic Cost, 5-year (2014):					**$ 25,950**	
Periodic Cost, 50-year (2014):					**$ 3,701,508**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$9,348	$1,870	$8,313	$7,164	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$15,614	$3,123	$14,301	$12,804	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$51,822	$2,073	$31,136	$17,223	
Annual O&M Cost (post construction)	31 - 100	$140,879	$2,013	$24,148	$3,744	
Present Value of Capital				**$8,313,000**	**$7,164,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M				**$45,437,000**	**$30,027,000**	
Present Value of 100 Year O&M				**$69,585,000**	**$33,771,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$53,750,000**	**$37,191,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)				**$77,898,000**	**$40,935,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through PSCT wells, Gallery well continue as currently, and adds NAPL-only extraction with 16 extraction well pumped periodically with the objective of NAPL-only removal as shown in Figure 11-26A.
2. Groundwater treatment plant is designed to treat organics and inorganics for offsite discharge through or around the wetlands to the B-Drainage.
3. Groundwater PSCT extraction rates are anticipated to decrease significantly from site capping and closing ponds due to reduced infiltration.
4. NAPL is extracted periodically by pumping DNAPL and LNAPL skimmer pumps from 16 wells for a duration of 10 years.
5. Gallery well extraction rate decreases with time as the P/S Landfill is dewatered over a period of 10 years.
6. NAPL-only wells are 4' dia steel casing wells about 80 feet deep located on Bench 1 and three other new bench roads in the southern part of the P/S landfill.
7. NAPL is separated in an oil-water separator and then sent offsite for disposal as hazardous waste similar to current onsite operations.

TABLE E-8-11
FS AREA 5N - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Extraction (PSCT, Gallery Well) + Dewater P/S Landfill (5 Horizontal Wells) + Extraction (NAPL-only in CDA, 4 wells) + Monitoring (12 new LHSU wells) + Treat and Discharge to Onsite Evaporation Pond + ICs + Monitoring

Alternative Description : This alternative includes extraction from the PSCT and Gallery Well and adds 5 horizontal wells under the P/S Landfill to dewater it (Figure 11-28A). The horizontal well extraction of total fluids is expected to produce a total groundwater flow rate of up to 10 gpm of landfill leachate initially and decreasing in subsequent years and these liquids would be sent offsite for disposal. The duration of the P/S LF dewatering is assumed to be 5 years. The PSCT groundwater would be treated in a new Liquids Treatment Plant (LTP) for VOCs and discharged to the onsite evaporation pond and this would have an indefinite duration. Also, as in Alternative 5, four existing monitoring wells in the CDA would be converted to LNAPL skimmer wells to recover floating product and 12 new LHSU monitoring wells are proposed just upgradient of PSCT-1 and PSCT-4 to monitor the any potential VOC migration under the PSCT in the LHSU. The extracted NAPL that is not treated will be sent offsite to a permitted facility for disposal. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan, March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
			Capital Costs		
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 300,000	$ 300,000	Based on Contractor quotes from previous projects
Remediation Documentation/Reporting	1	ea	$ 150,000	$ 150,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Investigation/Aquifer testing/Reporting	1	ls	$ 50,000	$ 50,000	Addtnl investigations in the vicinity of expected DNAPL at the toe of th P/S Landfill and refine nature & exten
Site Preparation/Geophysical survey	1	ls	$ 50,000	$ 50,000	Include surveying location of existing collection piping runs
Hydraulic Extraction Pilot Testing in NAPL area	1	ls	$ 250,000	$ 250,000	6-month long field pilot test for aggressive hydraulic extraction incl. renta equipment, workplan, reporting, onsite treatment, disposal
Site Work					
Construct three new bench roads	0	ea	$ 200,000	$ -	No new bench roads required for horizontal wells
Horizontal Well Installation, P/S Landfill					Well install unit cost, $/lf $500
Horizontal well drilling, 8" well	5	ea	$ 240,000	$ 1,200,000	600 feet long, $400/lf, on average 300-foot stainless steel wirewrapped screen, 8-inch well;
Consultant oversight, reporting	5	ea	$ 18,000	$ 90,000	Assume workplan, oversight during well install, logging, reporting; 10 day per well; 20 weeks to complete well instal
Waste disposal, H&S, ODCs	5	ea	$ 42,000	$ 210,000	RCRA haz disposal of drilling mud by incineration to Utah at $1,400/ton, 30 tons/boring
Dewater P/S LF, Offsite Liquids Disposal					Dewatering liquids extraction rate (2 gpm per well) is 10 gpm (5.2M gal/yr) for Year 1, decreases to 2.5 gpm for Years 2 and 3 and 0.5 gpm for Years 4 and 5.
Extraction pumps, well head assemblies, controllers	5	ea	$ 10,000	$ 50,000	Pumps in 5 horizontal wells
NAPL separator, tanks, instrumentation	2	ls	$ 250,000	$ 500,000	Based on TS7C tank replacement costs
Stainless steel tanks: Leachate liquids, 10 tanks	10	ls	$ 150,000	$ 1,500,000	Based on TS7C tank costs; 2-week storage, 200,000 gal
Water storage tank: carbon steel	2	ls	$ 40,000	$ 80,000	Based on previous tank replacement costs
VPGAC carbon drums	20	ls	$ 1,500	$ 30,000	2 carbon drums per tank
Transfer pumps, bag filters, piping, manifold	1	ls	$ 50,000	$ 50,000	Assumed based on experience
Collection piping, trenching, incl. offsite discharge pipe	3,000	ft	$ 60	$ 180,000	Double containment HDPE pipe
Control system, Instrumentation	1	ls	$ 75,000	$ 75,000	High level shutoffs on each tank
Treatment system pad	1	ls	$ 50,000	$ 50,000	Means Cost Handbook 2005; assume 50x100' at$10/SF
Construction, startup, shakedown	1	ls	$ 100,000	$ 100,000	Assumed based on experience

TABLE E-8-11
FS AREA 5N - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
GWTS Upgrade for PSCT, Gallery Well (Treat VOCs)					PSCT extraction rate (gal/year) 1,900,000
DNAPL stainless steel tanks: Primary, Secondary	2	ls	$ 150,000	$ 300,000	Based on TS7C tank replacement costs
Water storage tank: carbon steel	2	ls	$ 40,000	$ 80,000	Based on previous tank replacement costs
GW extraction pumps, controllers	5	ea	$ 10,000	$ 50,000	4 pumps in PSCT wells, 1 in Gallery well
6x2,000 lb LPGAC pressure vessels	6	ea	$ 25,000	$ 150,000	Means Cost Handbook 2005
Transfer pumps, bag filters, piping	1	ls	$ 35,000	$ 35,000	Assumed based on experience
Control system	1	ls	$ 75,000	$ 75,000	Estimated based on experience with other projects
Treatment system pad	1	ls	$ 30,000	$ 30,000	Means Cost Handbook 2005; assume 40x100' at$10/SF
Collection-discharge piping upgrade	3,000	ft	$ 30	$ 90,000	Assume 8,000 ft of piping to connect 12 wells
Construction, startup, shakedown	1	ls	$ 50,000	$ 50,000	Assumed based on experience
Incremental cost of Larger Evap Pond treated gw	1	ls	$ 1,078,000	$ 1,078,000	This alt would need a larger evap pond \; incremental capital cost of pond i listed for 6 acres
LHSU Well Installation					12 new LHSU wells (six clusters of two wells each) are installed north o PSCT-1 and PSCT-4
LHSU well drilling, installation, well box	12	ea	$ 20,000	$ 240,000	50 feet deep wells just north of PSCT-1 and PSCT-4; well screened in the upper and lower portions of the LHSU
Well development	12	ea	$ 2,000	$ 24,000	Well development, 2 days
Consultant oversight, reporting	12	ea	$ 5,000	$ 60,000	Assume workplan, oversight during well install, logging, reporting; 2 day per well; 2 weeks of drilling to complete well insta
Waste disposal, H&S, ODCs	12	ea	$ 5,000	$ 60,000	RCRA haz disposal offsite to Kettleman at $300/drum, 15 drums/boring
LNAPL Skimmers in CDA					4 existing wells are converted to LNAPL skimming wells
Active solar driven LNAPL skimmer	4	ea	$ 5,750	$ 23,000	Assume use of Xitech Solar Skimmer 2500ES remote control station incl tax+shipping, one per well that pumps to dedicated drum that is perioodically pumped/transferred to the LTA for storage
Wellhead modification, new well box	4	ea	$ 2,000	$ 8,000	Modify well head and install larger well box to run hoses to drum
Misc: Equipment, Drums, Tubing, fittings, shutoffs	4	ea	$ 3,000	$ 12,000	Miscellaneous equipment incl. drums, tubing, tank high level shutoffs
Equipment installation	4	ea	$ 4,000	$ 16,000	Assume 1 FTE for 1 week per well
Remedial Monitoring/Sampling (well install/startup)					
Air Monitoring/Sampling	16	samples	$ 500	$ 8,000	16 air/dust samples analyze for VOCs, PCBs, DDT, metals during drilling in DNAPL area
Soil Confirmation Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, DNAPL saturation, 6010 total metals, soluble metals Ba, CrVI, other parameters
Groundwater Sampling and Analysis	32	samples	$ 500	$ 16,000	Analyze for VOCs, 6010 total metals, soluble metals Ba, CrVI, other parameters
Treatment System Sampling at Startup	40	samples	$ 500	$ 20,000	40 samples influent, effluent over 3 week startup period

TABLE E-8-11
FS AREA 5N - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 200,000	$ 200,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 150,000	$ 150,000	Use higher estimate for hazardous NAPL wells, high conc gw
			Direct Capital Total:	**$ 7,698,000**	
			Contingency (50%)	**$ 3,849,000**	
			Direct Capital Total:	**$ 11,547,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 7,698,000	$ 385,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 7,698,000	$ 231,000	Engineering and management costs based on industry standards and experience.
EPA Oversight Costs	10%	of	$ 7,698,000	$ 770,000	
Construction Management	5%	of	$ 7,698,000	$ 385,000	
			Total PM/CM Cost:	**$ 1,771,000**	
			Total Capital Cost:	**$ 13,318,000**	
Operation and Maintenance Costs					
Dewater P/S LF O&M					
O&M Labor, Maintenance	12	mths	$ 16,000	$ 192,000	1 FTE 40 hr/week on average; initial labor costs maybe higher
NAPL disposal - 5 hor ext wells - see below under Variable O&M cost items below	0	gal	$ 3.50	$ -	NAPL from phase separator is sent offsite for disposal.
Dewater Liquids Disposal - see below under Variable O&M cost items below	0	gal	$ 1.50	$ -	Sent offsite for disposal - see cost below
VPGAC carbon vessels and replacement	40	drums	$ 1,000	$ 40,000	Assume 4 drums replaced per tank per year
Utilities: electricity	12	mths	$ 2,000	$ 24,000	Average electricity usage; initial usage higher due to higher flow
Repair, Replacement: pumps, motors, valves, fittings, electric subs	1	year	$ 50,000	$ 50,000	Assume transfer pumps, hoses, valves replaced every year
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 40,000	$ 40,000	
PSCT and Gallery Well - GWTS O&M					PSCT extraction system operates indefinitely in the future
GWTS Maintenance and Monitoring (labor)	12	mths	$ 20,000	$ 240,000	Based on current site O&M costs; labor at $100/hr
GWTS water sampling for compliance	1	year	$ 15,000	$ 15,000	Based on current site O&M costs
Groundwater disposal; 450,000 gal/year - see under Variable O&M cost items below	0	gal	$ 1.50	$ -	See below under Variable O&M Costs
NAPL disposal - Gallery well; 3,000 gal for Year 1 - see below	0	gal	$ 3.50	$ -	See below under Variable O&M Costs
LPGAC and VPGAC carbon vessels and replacement	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Utilities: electricity	12	mths	$ 2,000	$ 24,000	Based on current site O&M for PSCT ext
Repair, Replacement: Pumps, motors, valves, fittings, electric subs	1	year	$ 35,000	$ 35,000	Based on current site O&M for PSCText
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 26,000	$ 26,000	Same as current GWTS cost + DNAPL costs

TABLE E-8-11
FS AREA 5N - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs (continued)					
LHSU Groundwater Monitoring					Assume monitoring of 12 LHSU wells indefinitely
Annual Sampling, Analysis, Reporting for 12 wells	1	ls	$ 24,000	$ 24,000	Sampling, analysis, reporting, annual, VOCs analysis
LNAPL skimming in CDA O&M					Assume LNAPL skimming from 4 existing wells for 5 years
NAPL skimming O&M	12	mths	$ 1,000	$ 12,000	80 hrs/mth O&M labor at $100/hr
NAPL disposal - 4 NAPL well liquids; 500 gal/year	500	gal	$ 3.50	$ 1,750	Assume at most 500 gal NAPL extracted per year
VPGAC carbon drums replacement	1	year	$ 4,000	$ 4,000	Vapor phase carbon replacement used with NAPL storage tanks
Utilities: electricity	1	year	$ -	$ -	solar cell operated skimmers assumed
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$ 4,000	$ 4,000	Based on costs from current NAPL extraction and treatment system
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 4,000	$ 4,000	Same as current GWTS cost + DNAPL costs
Subtotal Annual O&M Cost:				$ 775,750	
Contingency (50%):				$ 387,875	Use higher contingency due to greater uncertainty with hor wells
Project Management/Technical Support	1	year	$ 80,000	$ 80,000	Based on experience previous GWTS construction experience
Sitewide Groundwater Monitoring	1	year	$ 242,000	$ 242,000	Annual cost of current sampling program
Total Annual O&M Cost (w/o Variable cost items, Years 1-5):				**$ 1,486,000**	Dewatering P/S LF and NAPL skimming is completed in 5 years
Total Annual O&M Cost (w/o Variable cost items, Year 6 onwards):				**$ 928,000**	Includes PSCT GWTS O&M and groundwater monitoring
Annual Variable O&M Cost Items (include 75% Contingency)					
Dewater P/S LF Liquids disposal, Year 1	5,250,000	gal	$ 1.50	$ 13,781,000	2 gpm/well, 10 gpm, 5.2M gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 2	1,300,000	gal	$ 1.50	$ 3,413,000	0.5 gpm/well, 2.5 gpm, 1.3 M gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 3	1,300,000	gal	$ 1.50	$ 3,413,000	0.5 gpm/well, 2.5 gpm, 1.3 M gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 4	263,000	gal	$ 1.50	$ 690,000	0.1 gpm/well, 0.5 gpm, 263,000 gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 5	263,000	gal	$ 1.50	$ 690,000	0.1 gpm/well, 0.5 gpm, 263,000 gallons disposal @ $1.50
Annual Variable O&M Cost Items (include 50% Contingency)					
Gallery Well liquids disposal, Year 1	450,000	gal	$ 1.50	$ 1,013,000	Assume GW liquids decreases rapidly similar to the dewater liquids rates.
Gallery Well liquids disposal, Year 2	112,500	gal	$ 1.50	$ 253,000	
Gallery Well liquids disposal, Year 3	112,500	gal	$ 1.50	$ 253,000	
Gallery Well liquids disposal, Year 4	56,000	gal	$ 1.50	$ 126,000	
Gallery Well liquids disposal, Year 5	56,000	gal	$ 1.50	$ 126,000	
Total P/S LF liquids for Years 1-5	9,163,000				

TABLE E-8-11
FS AREA 5N - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
NAPL disposal, Year 1	13,000	gal	$ 3.50	$ 68,000	Assume 10,000 gal recovered from Dewater P/S LF liquids extraction and 3,000 gallons of NAPL from GW liquids for Year 1. The NAPL quantities decrease rapidly and add up to approximately 48,000 gallons over 5 years.
NAPL disposal, Year 2	11,000	gal	$ 3.50	$ 58,000	
NAPL disposal, Year 3	9,000	gal	$ 3.50	$ 47,000	
NAPL disposal, Year 4	8,000	gal	$ 3.50	$ 42,000	
NAPL disposal, Year 5	7,000	gal	$ 3.50	$ 37,000	
Total NAPL liquids for Years 1-5	48,000				
Periodic Costs (No Contingency)					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace portion of PSCT trench	2	50-year	$ 2,300,000	$ 4,600,000	Assume 1,500 feet length would need to be replaced using a $1000/linea foot of trench estimate derived from PCT-C Trencl
Replace evaporation pond	2	50-year	$ 1,078,000	$ 2,156,000	Assume evap pond liner is replaced every 50 years
Replace GWTS	2	50-year	$ 860,000	$ 1,720,000	Assume GWTS is replaced every 50 years

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$13,318		$13,318	$13,318	
Annual O&M Cost (post construction)	0 - 5	$31,465	$6,293	$28,820	$25,803	
Annual O&M Cost (post construction)	6 - 30	$23,325	$933	$14,014	$7,752	
Annual O&M Cost (post construction)	31 - 100	$73,436	$1,049	$12,587	$1,952	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$56,152,000**	**$46,873,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$68,740,000**	**$48,824,000**	

TABLE E-8-11
FS AREA 5N - ALTERNATIVE 6
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
Total Capital Cost (2014):					**$ 13,824,084**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost Years 1-5, Annual (2014):					**$ 1,542,468**	
Total Annual O&M Cost Years 6-onward, Annual (2014):					**$ 963,264**	
Total Variable Annual O&M Cost Years 0-5 (2014):					**$ 24,922,380**	
Periodic Cost, 5-year (2014):					**$ 25,950**	
Periodic Cost, 50-year (2014):					**$ 4,399,044**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$13,824	$2,765	$12,293	$10,595	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$32,661	$6,532	$29,915	$26,783	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$24,211	$968	$14,547	$8,047	
Annual O&M Cost (post construction)	31 - 100	$76,227	$1,089	$13,066	$2,026	
Present Value of Capital				**$12,293,000**	**$10,595,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M				**$44,462,000**	**$34,830,000**	
Present Value of 100 Year O&M				**$57,528,000**	**$36,855,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$56,755,000**	**$45,424,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)				**$69,821,000**	**$47,450,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction PSCT wells, Gallery well continue as currently, and adds horizontal dewatering extraction wells in the P/S Landfill.
2 Groundwater from PSCT is treated onsite for organics with carbon in a GWTS and discharged to an onsite evaporation pon
3 P/S Landfill liquids are dewatered from the 5 horizontal extraction wells which yield on average about 2 gpm/well (5.2M gal/year) initially then drops to 0.5 gpm/well and 0.1 gpm/well.
4 P/S Landfill liquids are separated in an oil-water separator to separate NAPL and liquids which are both trucked offsite for disposal.
5 Gallery Well liquids are separated in an oil-water separator and then sent offsite for disposal as hazardous waste similar to current onsite operation
6 The total NAPL removed from P/S Landfill decreases with time over a 5-year period yielding a total of approximately 48,000 gallons of NAPL liquids.
7 The LNAPL skimmers in the CDA are assumed to operate for 5 years.

TABLE E-8-12
FS AREA 5N - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative: Extraction (PSCT, Gallery Well) + Dewater P/S Landfill (5 Horizontal Wells) + Extraction (NAPL-only in CDA, 12 new wells) + Extraction (4 new LHSU wells) + Monitoring (8 new LHSU wells) + Treat and Discharge Offsite + ICs + Monitoring

Alternative Description : This alternative includes extraction from the PSCT and Gallery Well and adds 5 horizontal wells under the P/S Landfill to dewater it (Figure 11-29A). The horizontal well extraction of total fluids is expected to produce a total groundwater flow rate of up to 10 gpm of landfill leachate initially and decreasing in subsequent years and these liquids would be sent offsite for disposal. The duration of the Dewatering P/S LF is assumed to be 5 years. The PSCT groundwater would be treated in a new Liquids Treatment Plant (LTP) for VOCs and dissolved solids and discharged to the offsite B-Drainage. The duration of the PSCT operation is indefinite. Also, active LNAPL extraction includes 12 new extraction wells in the CDA to recover floating product, groundwater extraction from 4 new LHSU wells, and 8 new LHSU monitoring wells are proposed just upgradient of PSCT-1 and PSCT-4 to monitor the any potential VOC migration under the PSCT in the LHSU. The extracted NAPL and concentrated leachate will be sent offsite to a permitted facility for disposal. Brine wastes generated from the onsite LTP with dissolved solids treatment will be trucked offsite for disposal to a permitted facility. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 350,000	$ 350,000	Based on Contractor quotes from previous projects
Remediation Documentation/Reporting	1	ea	$ 150,000	$ 150,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Investigation/Aquifer testing/Reporting	1	ls	$ 50,000	$ 50,000	Addtnl investigations in the vicinity of expected DNAPL at the toe of the P/S Landfill and refine nature & extent
Site Preparation/Geophysical survey	1	ls	$ 50,000	$ 50,000	Include surveying location of existing collection piping runs
Hydraulic Extraction Pilot Testing in DNAPL area	1	ls	$ 250,000	$ 250,000	6-month long field pilot test for aggressive hydraulic extraction incl. rental equipment, workplan, reporting, onsite treatment, disposal
Reverse Osmosis, bench scale/field scale testing	1	ls	$ 250,000	$ 250,000	Bench scale/field pilot test for extraction and treatment of TDS and metals incl. rental equipment, workplan, reporting, onsite treatment, disposal
Site Work					
Construct three new bench roads	0	ea	$ 200,000	$ -	No new bench roads required for horizontal wells
Horizontal Well Installation, P/S Landfill					Well install unit cost, $/lf $938
Horizontal well drilling, 8" well	5	ea	$ 240,000	$ 1,200,000	600 feet long, $400/lf, 300-foot stainless steel wirewrapped screen, 8-inch well;
Consultant oversight, reporting	5	ea	$ 18,000	$ 90,000	Assume workplan, oversight during well install, logging, reporting; 1C days per well; 20 weeks to complete well instal
Waste disposal, H&S, ODCs	5	ea	$ 42,000	$ 210,000	RCRA haz disposal of drilling mud by incineration to Utah at $1,400/ton, 30 tons/boring
Dewater P/S LF, Offsite Liquids Disposal					Dewatering liquids extraction rate (2 gpm per well) is 10 gpm (5.2M gal/yr) for Year 1, decreases to 2.5 gpm for Years 2 and 3 and 0.5 gpm for Years 4 and 5
Extraction pumps, well head assemblies, controllers	5	ea	$ 10,000	$ 50,000	Pumps in 5 horizontal wells
NAPL separator, tanks, instrumentation	2	ls	$ 250,000	$ 500,000	Based on TS7C tank replacement costs
Stainless steel tanks: Leachate liquids, 10 tanks	10	ls	$ 150,000	$ 1,500,000	Based on TS7C tank costs; 2-week storage, 200,000 gal
Water storage tank: carbon steel	2	ls	$ 40,000	$ 80,000	Based on previous tank replacement costs
VPGAC carbon drums	20	ls	$ 1,500	$ 30,000	2 carbon drums per tank
Transfer pumps, bag filters, piping, manifold	1	ls	$ 50,000	$ 50,000	Assumed based on experience
Collection piping, trenching, incl. offsite discharge pipe	3,000	ft	$ 60	$ 180,000	Double containment HDPE pipe
Control system, Instrumentation	1	ls	$ 75,000	$ 75,000	High level shutoffs on each tank
Treatment system pad, secondary containment	1	ls	$ 100,000	$ 100,000	Means Cost Handbook 2005; assume 50x100' at$20/SF
Construction, startup, shakedown	1	ls	$ 100,000	$ 100,000	Assumed based on experience

TABLE E-8-12
FS AREA 5N - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
GWTS for PSCT (VOCs and Inorg treatment) (10 gpm)					PSCT extraction rate (gal/year) 1,900,000
PSCT GW extraction pumps, controllers	5	ea	$ 10,000	$ 50,000	4 pumps in PSCT wells, 1 in Gallery well
Collection piping, trenching, cabling incl offsite disch pipe	5,000	ft	$ 60	$ 300,000	Contractor unit cost including double cont. piping for leachate
Gallery Well stainless steel tanks: Primary, Secondary	2	ls	$ 150,000	$ 300,000	Based on TS7C tank replacement costs, SS316 components
Water storage tanks and transfer tanks: carbon steel	4	ls	$ 50,000	$ 200,000	Based on previous tank replacment costs
LPGAC vessels - 6x2,000 lb pressure vessels	6	units	$ 25,000	$ 150,000	2 trains of 3x2,000 lb LPGAC vessels, Siemens quote
Reverse Osmosis Units (Pair in series @ 10 gpm)	2	ls	$ 70,900	$ 142,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system
Reject concentrator (3-module VSEP system)	1	ls	$ 173,600	$ 174,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 125,000	$ 125,000	Increased costs due greater filtration requirements as pre-treatment step for reverse osmosis
Control system	1	ls	$ 100,000	$ 100,000	PLC controls, programming, alarms, level controls in pumps
Equipment pad, secondary containment, fence	1	ls	$ 75,000	$ 75,000	Means Cost Handbook 2005; assume75'x100' at$10/SF
Electrical, Utilities Hookups	1	ls	$ 50,000	$ 50,000	Assumed lump sum based on past project experience
Equipment installation and startup	1	ls	$ 150,000	$ 150,000	Subcontractor labor for equipment hookups, startup, testing
Equipment rentals, PID/FID, misc ODCs	1	ls	$ 50,000	$ 50,000	
Additional tankage for gw storage	1	ls	$ 150,000	$ 150,000	3 additional 20,000 gallon tanks to store gw that cannot be discharged due to non-compliance with stringent NPDES limits for inorganics and may need to be treated again
PSCT well redevelopment	1	ls	$ 25,000	$ 25,000	Redevelop PSCT-1 through PSCT-4
Incremental cost of Larger Evap Pond	0	ls	$ 1,078,000	$ -	This alternative would not need an additional evaporation pond because the treated water is discharged offsite
LHSU Well and Extraction Sys Installation					Two wells next to PSCT-1 pump to one tank while two wells near PSCT-4 pump to another tank
LHSU well drilling, installation, well box	12	ea	$ 20,000	$ 240,000	50 feet deep wells just north of PSCT-1 and PSCT-4; well screened in upper and lower sections of LHSU below the contact; 8 monitoring wells and 4 extraction wells.
Well development	12	ea	$ 2,000	$ 24,000	Well development, 2 days
Consultant oversight, reporting	12	ea	$ 5,000	$ 60,000	Assume workplan, oversight during well install, logging, reporting; 2 days per well; 2 weeks of drilling to complete well instal
Waste disposal, H&S, ODCs	12	ea	$ 5,000	$ 60,000	RCRA haz disposal offsite to Kettleman at $300/drum, 15 drums/boring
Extraction pumps, well head assemblies, controllers	4	ea	$ 5,000	$ 20,000	4 extraction pumps rated for 1 gpm and controllers
Storage tank, pumps, control equipment	2	ls	$ 25,000	$ 50,000	Two 500 gal HDPE tanks
Piping/Trenching/Product piping/Air piping	500	ft	$ 30	$ 15,000	Piping below grade to 2 tanks with 250 feet of pipe for each
Electrical power hookup	1	ls	$ 25,000	$ 25,000	Bring power to treatment pad location
Misc: Equipment, Drums, Tubing, fittings, shutoffs	1	ls	$ 3,000	$ 3,000	Miscellaneous equipment incl. drums, tubing, tank high level shutoffs
Equipment installation	1	ls	$ 75,000	$ 75,000	1 month duration

TABLE E-8-12
FS AREA 5N - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
LNAPL Skimmers in CDA, 12 new wells					12 LNAPL skimmers in 12 wells across CDA, connected by piping to central tank and treatment pad. Compressor supplies air to drive skimmers and product pumped back to tank
Well Installation, 12 wells in CDA	12	ea	$ 16,000	$ 192,000	Well installation avg depth 40 feet,4" PVC wells, screened across water table.
Active LNAPL skimmer	12	ea	$ 5,000	$ 60,000	Assume use of Xitech Skimmer incl tax+shipping, one per well that pumps to dedicated drum that is perioodically pumped/transferred to the LTA for storage
Wellhead modification, new well box	12	ea	$ 2,000	$ 24,000	Modify well head and install larger well box to run hoses to drum
Steel tanks for NAPL storage	1	ls	$ 75,000	$ 75,000	1,000 gallons steel for NAPL storage with high level shutoff
Compressor, Control Equipment	1	ls	$ 50,000	$ 50,000	Include compressor, PLC controller, high level shut off, solenoids
Piping/Trenching/Product piping/Air piping	1,000	ft	$ 60	$ 60,000	Product piping below grade and hoses
Electrical power hookup	1	ls	$ 50,000	$ 50,000	Bring power to treatment pad location
Misc: Equipment, Drums, Tubing, fittings, shutoffs	1	ls	$ 3,000	$ 3,000	Miscellaneous equipment incl. drums, tubing, tank high level shutoffs
Equipment installation	1	ls	$ 100,000	$ 100,000	Assume 1 FTE for 1 week per well
Remedial Monitoring/Sampling (well install/startup)					
Air Monitoring/Sampling	16	samples	$ 500	$ 8,000	16 air/dust samples analyze for VOCs, PCBs, DDT, metals during drilling in DNAPL area
Soil Confirmation Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, DNAPL saturation, 6010 total metals, soluble metals Ba, CrVI, other parameters
Groundwater Sampling and Analysis	32	samples	$ 500	$ 16,000	Analyze for VOCs, 6010 total metals, soluble metals Ba, CrVI, other parameters
Treatment System Sampling at Startup	40	samples	$ 500	$ 20,000	System samples influent, effluent over 3 week startup period
NPDES Permit - Basin Plan Exception Application					
Basin Plan Exception Application, Support	1	ls	$ 150,000	$ 150,000	Assumed
RWQCB Application Cost	1	ls	$ 100,000	$ 100,000	Based on EPA comments
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 250,000	$ 300,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 150,000	$ 150,000	Based on contractor quotes
			Direct Capital Total:	**$ 9,244,000**	
			Contingency (60%)	**$ 5,546,000**	
			Direct Capital Total:	**$ 14,790,000**	

TABLE E-8-12
FS AREA 5N - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 9,244,000	$ 462,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 9,244,000	$ 277,000	
EPA Oversight Costs	10%	of	$ 9,244,000	$ 924,000	
Construction Management	5%	of	$ 9,244,000	$ 462,000	
			Total PM/CM Cost:	**$ 2,125,000**	
			Total Capital Cost:	**$ 16,915,000**	
Operation and Maintenance Costs					
Dewater P/S LF O&M					
O&M Labor, Maintenance	12	mths	$ 16,000	$ 192,000	1 FTE 40 hr/week on average; initial labor costs may be higher
NAPL disposal - 5 horz ext wells-see below Variable O&M cost items below	0	gal	$ 3.50	$ -	NAPL from phase separator is sent offsite for disposal.
Dewater Liquids Disposal - see below Variable O&M cost items below	0	gal	$ 1.50	$ -	Sent offsite for disposal - see cost below
VPGAC carbon vessels and replacement	40	drums	$ 1,000	$ 40,000	Assume 4 drums replaced per tank per year
Utilities: electricity	12	mths	$ 2,000	$ 24,000	Average electricity usage; initial usage higher due to higher flow
Repair, Replacement: pumps, motors, valves, fittings, electric subs	1	year	$ 50,000	$ 50,000	Assume transfer pumps, hoses, valves replaced every year
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 40,000	$ 40,000	
GWTS for PSCT - O&M, Treat Org and Inorg, offsite					PSCT extraction system operates indefinitely in the future
GWTS Maintenance and Monitoring (Labor)	12	mths	$ 30,000	$ 360,000	1.5 FTE workers
Groundwater disposal; 450,000 gal/year - see under Variable O&M cost items b	0	gal	$ 1.50	$ -	See below under Variable O&M Costs
NAPL disposal - Gallery well; 3,000 gal for Year 1 - see below	0	gal	$ 3.50	$ -	See below under Variable O&M Costs
LPGAC and VPGAC carbon vessels and replacement	1	year	$ 40,000	$ 40,000	Based on current site O&M costs
Utilities: electricity	12	mths	$ 5,000	$ 60,000	Assume 50 kW (35HP) rated equipment power usage
RO Membranes replacement, filters - waste disposal	12	mths	$ 3,000	$ 36,000	Reverse osmosis membranes, filters, solid waste
Groundwater sampling for compliance	12	mths	$ 4,000	$ 48,000	GWTS influent, effluent, intermediate, LPGAC sampling
Well redevelopment, annual	1	year	$ 40,000	$ 40,000	one event per year for all wells
Evaporation Pond maintenance	12	mths	$ 5,000	$ 60,000	Periodic monthly/quarterly maintenance of eco-protection,etc
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$ 100,000	$ 100,000	Assumed based on experience
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 75,000	$ 50,000	Same as current GWTS cost + DNAPL costs
Brine disposal	285,000	gal	$ 0.66	$ 188,000	Brine concentrate disposal quote from American Integrated (AIS); per 5,000 gal truck, $0.50/gallon + $800/load for truck/driver ($0.16/gal)

TABLE E-8-12
FS AREA 5N - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
O&M Costs (continued)					
LHSU Groundwater Extraction					
O&M Labor, Maintenance	1	ls	$ 12,000	$ 12,000	Assume 10 hours per month O&M labor
Utilities: electricity	1	ls	$ 6,000	$ 6,000	Based on experience/judgement
Repair/Replacement: Pumps, motors, valves, electrical sub	1	ls	$ 4,000	$ 4,000	Based on experience/judgement
Misc: Equipment rentals /Generator/Forklift/ODCs	1	ls	$ 4,000	$ 4,000	Based on experience/judgement
LHSU Groundwater Monitoring					
Annual Sampling, Analysis, Reporting for 8 wells	1	ls	$ 16,000	$ 16,000	Sampling, analysis, reporting, annual, VOCs analysis
LNAPL skimming in CDA O&M					
NAPL skimming O&M	12	mths	$ 1,000	$ 12,000	80 hrs/mth O&M labor at $100/hr
NAPL disposal - 12 NAPL well liquids; 1000 gal/year	1,000	gal	$ 3.50	$ 3,500	Assume at most 1,000 gal NAPL extracted per year
VPGAC carbon drums replacement	1	year	$ 4,000	$ 4,000	Vapor phase carbon replacement used with NAPL storage tanks
Utilities: electricity	1	year	$ -	$ -	solar cell operated skimmers assumed
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$ 4,000	$ 4,000	Based on costs from current NAPL extraction and treatment system
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 4,000	$ 4,000	Same as current GWTS cost + DNAPL costs
			Subtotal Annual O&M Cost:	$ 1,397,500	
			Contingency (50%):	$ 698,750	
Project Management/Technical Support	1	year	$ 120,000	$ 120,000	Based on experience previous GWTS construction experience
Sitewide Groundwater Monitoring	1	year	$ 242,000	$ 242,000	Annual cost of current sampling program
			Total Annual O&M Cost (w/o Variable cost items, Years 1-5):	**$ 2,458,000**	Dewatering P/S LF and NAPL skimming is completed in 5 years
			Total Annual O&M Cost (w/o Variable cost items, Year 6 onwards):	**$ 1,898,000**	Includes PSCT GWTS O&M and groundwater monitoring
Annual Variable O&M Cost Items (include 75% Contingency)					
Dewater P/S LF Liquids disposal, Year 1	5,250,000	gal	$ 1.50	$ 13,781,000	2 gpm/well, 10 gpm, 5.2M gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 2	1,300,000	gal	$ 1.50	$ 3,413,000	0.5 gpm/well, 2.5 gpm, 1.3 M gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 3	1,300,000	gal	$ 1.50	$ 3,413,000	0.5 gpm/well, 2.5 gpm, 1.3 M gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 4	263,000	gal	$ 1.50	$ 690,000	0.1 gpm/well, 0.5 gpm, 263,000 gallons disposal @ $1.50
Dewater P/S LF Liquids disposal, Year 5	263,000	gal	$ 1.50	$ 690,000	0.1 gpm/well, 0.5 gpm, 263,000 gallons disposal @ $1.50
Annual Variable O&M Cost Items (include 50% Contingency)					
Gallery Well liquids disposal, Year 1	450,000	gal	$ 1.50	$ 1,013,000	Assume GW liquids decreases rapidly similar to the dewater liquids rates.
Gallery Well liquids disposal, Year 2	112,500	gal	$ 1.50	$ 253,000	
Gallery Well liquids disposal, Year 3	112,500	gal	$ 1.50	$ 253,000	
Gallery Well liquids disposal, Year 4	56,000	gal	$ 1.50	$ 126,000	
Gallery Well liquids disposal, Year 5	56,000	gal	$ 1.50	$ 126,000	
Total P/S LF liquids for Years 1-5	9,163,000				

TABLE E-8-12
FS AREA 5N - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
NAPL disposal, Year 1	13,000	gal	$ 3.50	$ 68,000	Assume 10,000 gal recovered from Dewater P/S LF liquids extraction and 3,000 gallons of NAPL from GW liquids for Year 1. The NAPL quantities decrease rapidly and add up to approximately 48,000 gallons over 5 years.
NAPL disposal, Year 2	11,000	gal	$ 3.50	$ 58,000	
NAPL disposal, Year 3	9,000	gal	$ 3.50	$ 47,000	
NAPL disposal, Year 4	8,000	gal	$ 3.50	$ 42,000	
NAPL disposal, Year 5	7,000	gal	$ 3.50	$ 37,000	
Total NAPL liquids for Years 1-5	48,000				
Periodic Costs (No Contingency)					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace portion of PSCT trench	2	50-year	$ 2,300,000	$ 4,600,000	Assume 1,500 feet length would need to be replaced using a $1000/linear foot of trench estimate derived from PCT-C Trench
Replace evaporation pond	2	50-year	$ -	$ -	Assume evap pond liner is replaced every 50 years
Replace GWTS	2	50-year	$ 2,665,000	$ 5,330,000	Assume GWTS is replaced every 50 years

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$16,915		$16,915	$16,915	
Annual O&M Cost (post construction)	0 - 5	$36,325	$7,265	$33,272	$29,788	
Annual O&M Cost (post construction)	6 - 30	$47,575	$1,903	$28,584	$15,812	
Annual O&M Cost (post construction)	31 - 100	$142,790	$2,040	$24,475	$3,795	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$78,771,000**	**$62,515,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$103,246,000**	**$66,309,000**	

TABLE E-8-12
FS AREA 5N - ALTERNATIVE 7
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)					
Total Capital Cost (2014):				**$ 17,557,770**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost Years 1-5, Annual (2014):				**$ 2,551,404**	
Total Annual O&M Cost Years 6-onward, Annual (2014):				**$ 1,970,124**	
Total Variable Annual O&M Cost Years 0-5 (2014):				**$ 24,922,380**	
Periodic Cost, 5-year (2014):				**$ 25,950**	
Periodic Cost, 50-year (2014):				**$ 5,153,670**	

Cost Type	Year	Total Cost (2014 $K)	Cost/Year (2014 $K)	Net Present Value at 3% DF (2014 $K)	Net Present Value at 7% DF (2014 $K)	Notes / Assumptions
Capital Cost		$17,558	$3,512	$15,613	$13,456	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$37,705	$7,541	$34,536	$30,920	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$49,383	$1,975	$29,671	$16,413	
Annual O&M Cost (post construction)	31 - 100	$148,216	$2,117	$25,405	$3,939	
Present Value of Capital				**$15,613,000**	**$13,456,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M				**$64,207,000**	**$47,332,000**	
Present Value of 100 Year O&M				**$89,612,000**	**$51,271,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$79,820,000**	**$60,789,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)				**$105,225,000**	**$64,727,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction PSCT wells, Gallery well continue as currently, and adds horizontal dewatering extraction wells in the P/S Landfill.
2 PSCT groundwater is treated onsite for organics and inorg with carbon and reverse osmosis in a GWTS and discharged offsite. There is no evap pond.
3 P/S Landfill liquids are extracted from the 5 horizontal extraction wells which yield on average about 2 gpm/well (5.2M gal/year) initially then drops to 0.5 gpm/well and 0.1 gpm/well.
4 P/S Landfill liquids are separated in an oil-water separator to separate NAPL and liquids which are both trucked offsite for disposal.
5 Gallery Well liquids are separated in an oil-water separator and sent offsite for disposal as hazardous waste similar to current onsite operations.
6 The total NAPL removed from P/S Landfill decreases with time over a 5-year period yielding a total of approximately 48,000 gallons of NAPL liquids.
7 The LNAPL skimmers in the CDA are assumed to operate for 5 years.

TABLE E-8-13
FS AREA 5S - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Rremedial Alternative Extraction (PCT-A, PCT-B) + Treat/Discharge to Onsite Evaporation Pond + MNA + ICs + Monitoring

Alternative Description: This remedial alternative includes continued extraction of liquids from PCT-A and PCT-B as is required to meet current action levels to ensure no offsite migration. The extracted PCT-A and PCT-B liquids will be pumped to a new lined evaporation pond which we are proposing to be located in the footprint of the A-Series Pond (Figure 11-30A). Note that anticipated capping remedies for the FS Areas and 1 and 3 would minimize leaching to groundwater. This combined with natural attenuation of organics would reduce contaminant concentrations over the long term. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Preparation/Geophysical survey	1	ls	$ 20,000	$ 20,000	Include surveying location of existing collection piping runs
Refurbish PCT-B Trench					
Excavate existing trench, gravel/clay barrier	3,000	cy	$ 35	$ 105,000	Based on excavation of trench 500 feet long, 3 feet thick, 50 feet deep
Overburden excavation and backfill	12,000	cy	$ 10	$ 120,000	Assume overburden in 4 times trench volume
Backfill gravel/sand in trench	3,750	tons	$ 30	$ 113,000	Based on contractor quotes from Cal-Portland delivered; 1/2" leach rock
Backfill clay on top layer	500	cy	$ 30	$ 15,000	Based on contractor unit cost quotes
Install replacement wells	2	ea	$ 30,000	$ 60,000	80 feet deep, stainless steel casing wells
Transport and place in PCB Landfill	3,300	cy	$ 10	$ 33,000	Disposal of gravel barrier in the PCB Landfill
PCT-A, PCT-B Extraction					
GW extraction pumps, controllers	6	ea	$ 10,000	$ 60,000	6 pumps in RAP wells,
Collection-discharge piping upgrade	2,000	ft	$ 30	$ 60,000	Assume 2,000 ft of piping to connect 6 wells to GWTS/evap pond
GWTS for PCT (VOCs treatment)					PCT-A,B extraction (gal/year) 1,750,000
Water storage tanks and transfer tanks: carbon steel	4	ls	$ 50,000	$ 200,000	Based on previous tank replacment costs
LPGAC vessels - 4x2,000 lb pressure vessels	4	units	$ 25,000	$ 100,000	2 trains of 2x2,000 lb LPGAC vessels, Siemens quote
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 25,000	$ 25,000	Assumed based on experience
Health and Safety / Quality Control					PCT-C length (linear feet) = 1500
Construction QA/QC Program	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Health and Safety Program, ODCs	1	ls	$ 25,000	$ 25,000	Based on contractor quotes
			Direct Capital Total:	**$ 1,086,000**	
			Contingency (35%)	**$ 380,000**	Assume lower 35% contingency for conventional extraction technology
			Direct Capital Total:	**$ 1,466,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 1,086,000	$ 54,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 1,086,000	$ 33,000	
EPA Oversight Costs	10%	of	$ 1,086,000	$ 109,000	
Construction Management	5%	of	$ 1,086,000	$ 54,000	
			Total PM/CM Cost:	**$ 250,000**	
			Total Capital Cost:	**$ 1,716,000**	

TABLE E-8-13
FS AREA 5S - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Operation and Maintenance Costs					
GWTS Operation and Maintenance					
GWTS Maintenance and Monitoring (labor)	12	mths	$ 2,000	$ 24,000	Based on current site O&M. 20 hrs/week O&M labor at $100/hr
LPGAC carbon vessels and replacement	12	mths	$ 3,000	$ 36,000	Assume 1-2000 lb vessel changed out per month
GWTS water sampling for compliance	1	year	$ 5,000	$ 5,000	Based on current site O&M
Utilities: electricity	12	mths	$ 500	$ 6,000	Based on current site O&M
Well redevelopment, annual	1	year	$ 30,000	$ 30,000	one event per year for all wells
Repair, Replacement: Pumps, motors, valves, fittings, electric sub	1	year	$ 5,000	$ 5,000	Based on current site O&M
Misc: Equip rentals/PID/FID/Generator/Forklift/ODCs	1	year	$ 4,000	$ 4,000	Based on current site O&M
			Subtotal Annual O&M Cost:	$ 110,000	
			Contingency (50%):	$ 55,000	
Project Management/Technical Support	1	year	$ 8,000	$ 8,000	Assume 1/3 rd of PM cost for Alt 2 Area 5N
Sitewide Groundwater Monitoring	1	year	$ 121,000	$ 121,000	Annual 1/3rd cost of current sampling program + 25%
			Total Annual O&M Cost:	**$ 294,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace PCT-A and -B trenches/wells	2	50-year	$ 1,500,000	$ 3,000,000	Assume entire length of PCT trenches (3000 feet) would need to be replaced based on unit cost for PCT-C Trench $1000/lf

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$1,716		$1,716	$1,716	
Annual O&M Cost (post construction)	0 - 5	$1,495	$299	$1,369	$1,226	
Annual O&M Cost (post construction)	6 - 30	$7,475	$299	$4,491	$2,484	
Annual O&M Cost (post construction)	31 - 100	$23,580	$337	$4,042	$627	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$7,577,000**	**$5,426,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$11,618,000**	**$6,053,000**	

TABLE E-8-13
FS AREA 5S - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)					
Total Capital Cost (2014):				**$ 1,781,208**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
Total Annual O&M Cost, Annual (2014):				**$ 305,172**	
Periodic Cost, 5-year (2014):				**$ 25,950**	
Periodic Cost, 50-year (2014):				**$ 1,557,000**	

Cost Type	Year	Total Cost (2014 $K)	Cost/Year (2014 $K)	Net Present Value at 3% DF (2014 $K)	Net Present Value at 7% DF (2014 $K)	Notes / Assumptions
Capital Cost		$1,781	$356.24	$1,584	$1,365	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,552	$310.36	$1,421	$1,273	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$7,759	$310.36	$4,662	$2,579	
Annual O&M Cost (post construction)	31 - 100	$24,476	$349.66	$4,195	$650	
Present Value of Capital				**$1,584,000**	**$1,365,000**	2014 $ = 2012 $ adjusted by 3.8%
Present Value of 30 Year O&M				**$6,083,000**	**$3,851,000**	
Present Value of 100 Year O&M				**$10,279,000**	**$4,502,000**	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$7,667,000**	**$5,216,000**	
Total Present Value of Alternative (Capital + 100 Year O&M)				**$11,863,000**	**$5,867,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through the RAP wells continue as currently.
2. Groundwater RAP extraction rates at PCT-A and B are assumed to decrease due to site capping and closing ponds that will reduce infiltration.
3. Groundwater treatment plant is upgraded with new treatment equipment, extraction pumps, repaired/new collection/discharge piping, etc

TABLE E-8-14
FS AREA 5S - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Rremedial Alternative Extraction (PCT-A, PCT-B) + Treat and Discharge Offsite + MNA + ICs + Monitoring

Alternative Description: This remedial alternative includes continued extraction of liquids from PCT-A and PCT-B as in Alternative 2. The extracted PCT-A and PCT-B liquids will be treated for organics and inorganics and discharged offsite in accordance with the site-specific NPDES permit (Figure 11-31A). Note that anticipated capping remedies for the FS Areas and 1 and 3 would minimize leaching to groundwater. This combined with natural attenuation of organics would reduce contaminant concentrations over the long term. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
			Capital Costs		
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 150,000	$ 150,000	Based on Contractor quotes
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Preparation/Geophysical survey	1	ls	$ 20,000	$ 20,000	Include surveying location of existing collection piping runs
Refurbish PCT-B Trench					
Excavate existing trench, gravel/clay barrier	3,000	cy	$ 35	$ 105,000	Based on excavation of trench 500 feet long, 3 feet thick, 50 feet deep
Overburden excavation and backfill	12,000	cy	$ 10	$ 120,000	Assume overburden in 4 times trench volume
Backfill gravel/sand in trench	3,750	tons	$ 30	$ 113,000	Based on contractor quotes from Cal-Portland delivered; 1/2" leach rock
Backfill clay on top layer	500	cy	$ 30	$ 15,000	Based on contractor unit cost quotes
Install replacement wells	2	ea	$ 30,000	$ 60,000	80 feet deep, stainless steel casing wells
Transport and place in PCB Landfill	3,300	cy	$ 10	$ 33,000	Disposal of gravel barrier in the PCB Landfill
PCT-A, PCT-B Extraction					
GW extraction pumps, controllers	4	ea	$ 10,000	$ 40,000	5 pumps, level controllers in RAP wells in PCT-A, PCT-B
Collection-discharge piping upgrade	5,000	ft	$ 60	$ 300,000	Assume 5,000 ft of piping to connect 4 wells to GWTS/evap pond
GWTS for PCT (VOCs, Inorganics treatment)					PCT-A,B extraction (gal/year) 5,600,000
Water storage tanks and transfer tanks: carbon steel	4	ls	$ 50,000	$ 200,000	Based on previous tank replacment costs
LPGAC vessels - 4x2,000 lb pressure vessels	4	units	$ 25,000	$ 100,000	2 trains of 2x2,000 lb LPGAC vessels, Siemens quote
Reverse Osmosis Units (Pair in series @ 10 gpm)	2	ls	$ 70,900	$ 142,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system; 2 units in series
Reject concentrator (3-module VSEP system)	1	ls	$ 173,600	$ 174,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 75,000	$ 75,000	Assumed based on experience
Control system	1	ls	$ 75,000	$ 75,000	PLC controls, programming, alarms, level controls in pumps
Equipment pad, secondary containment, fence	1	ls	$ 75,000	$ 75,000	Means Cost Handbook 2005; assume75'x100' at$10/SF
Electrical, Utilities Hookups	1	ls	$ 50,000	$ 50,000	Assumed lump sum based on past project experience
Equipment installation and startup	1	ls	$ 125,000	$ 125,000	Subcontractor labor for equipment hookups, startup, testing

TABLE E-8-14
FS AREA 5S - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (Cont'd)					
Equipment rentals, PID/FID, misc ODCs	1	ls	$ 50,000	$ 50,000	
Additional tankage for groundwater and brine storage	6	ls	$ 50,000	$ 300,000	6 additional 20,000 gallon tanks to store gw that cannot be discharged due to non-compliance with stringent NPDES limits for inorganics and may need to be treated again
PCT well redevelopment	1	ls	$ 25,000	$ 25,000	Redevelop wells in PCT-A and PCT-B
Health and Safety / Quality Control					PCT-C length (linear feet) = 1500
Construction QA/QC Program	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Health and Safety Program, ODCs	1	ls	$ 25,000	$ 25,000	Based on contractor quotes
			Direct Capital Total:	**$ 2,472,000**	Assume higher 50% contingency for challenges with # reverse osmosis units needed, level of pre-treatment and filtration needed; e.g. iron filtration units may be required due to elevated dissolved iorn
			Contingency (50%)	**$ 1,236,000**	
			Direct Capital Total:	**$ 3,708,000**	
Project / Construction Management					Engineering and management costs based on industry standards and experience.
Remedial Design/Engineering	5%	of	$ 2,472,000	$ 124,000	
Project Management, Agency Reporting and Coordination	3%	of	$ 2,472,000	$ 74,000	
EPA Oversight Costs	10%	of	$ 2,472,000	$ 247,000	
Construction Management	5%	of	$ 2,472,000	$ 124,000	
			Total PM/CM Cost:	**$ 569,000**	
			Total Capital Cost:	**$ 4,277,000**	
Operation and Maintenance Costs					
GWTS for PCT - Operation and Maintenance					PCT-A,B extraction (gal/year) 5,600,000 Design flow rate (gpm) 10
GWTS Maintenance and Monitoring (Labor)	12	mths	$ 15,000	$ 180,000	1 FTE worker
GWTS water sampling for compliance	12	mths	$ 2,000	$ 24,000	Assume $2000 sampling cost per month
LPGAC carbon vessels and replacement	12	mths	$ 3,000	$ 36,000	Assume 1-2000 lb vessel changed out per month
Utilities: electricity	12	mths	$ 2,000	$ 24,000	Assume 20 kW (14HP) rated equipment power usage
Membranes, filters - waste disposal	12	mths	$ 4,000	$ 48,000	RO membranes, filters, solid waste
Well redevelopment, annual	1	year	$ 30,000	$ 30,000	one event per year for all wells
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$ 50,000	$ 50,000	Assumed based on experience
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 50,000	$ 50,000	Same as current GWTS cost
Brine disposal	840,000	gal	$ 0.66	$ 554,000	Brine concentrate disposal quote from American Integrated (AIS); per 5,000 gal truck, $0.50/gallon + $800/load for truck/driver ($0.16/gal)

TABLE E-8-14
FS AREA 5S - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
			Subtotal Annual O&M Cost:	$ 996,000	
			Contingency (50%):	$ 498,000	
Project Management/Technical Support	1	year	$ 16,000	$ 16,000	Assume double PM cost for Alt 2 Area 5S
Sitewide Groundwater Monitoring	1	year	$ 121,000	$ 121,000	Annual 1/3rd cost of current sampling program + 25%
			Total Annual O&M Cost:	**$ 1,631,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace PCT-A and -B trenches/wells	2	50-year	$ 1,500,000	$ 3,000,000	Assume entire length of PCT trenches (3000 feet) would need to be replaced based on unit cost for PCT-C Trench $1000/lf
Replace GWTS	2	50-year	$ 1,391,000	$ 2,782,000	Assume entire GWTS is replaced every 50 years

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$4,277		$4,277	$4,277	
Annual O&M Cost (post construction)	0 - 5	$8,180	$1,636	$7,492	$6,708	
Annual O&M Cost (post construction)	6 - 30	$40,900	$1,636	$24,574	$13,593	
Annual O&M Cost (post construction)	31 - 100	$119,952	$1,714	$20,561	$3,188	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$36,343,000**	**$24,578,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$56,904,000**	**$27,766,000**	

TABLE E-8-14
FS AREA 5S - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 4,439,526**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 1,692,978**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 50-year (2014):	**$ 3,000,858**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$4,440	$887.91	$3,948	$3,402	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$8,491	$1,698.17	$7,777	$6,963	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$42,454	$1,698.17	$25,508	$14,110	
Annual O&M Cost (post construction)	31 - 100	$124,510	$1,778.72	$21,342	$3,309	
			Present Value of Capital	**$3,948,000**	**$3,402,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$33,285,000**	**$21,073,000**	
			Present Value of 100 Year O&M	**$54,627,000**	**$24,381,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$37,233,000**	**$24,475,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$58,575,000**	**$27,784,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through the RAP wells continue as currently.
2. Groundwater RAP extraction rates at PCT-A and B are assumed to decrease due to site capping and closing ponds that will reduce infiltration.
3. Groundwater treatment plant is upgraded with new treatment equipment, extraction pumps, repaired/new collection/discharge piping, et

TABLE E-8-15
FS AREA 5S - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative Aggressive Extraction (40 New Large Diameter Wells) + Extraction (PCT-A, PCT-B) + Treat and Discharge Offsite + MNA + ICs + Monitoring

Alternative Description : This alternative is an aggressive hydraulic extraction that would require a high density of groundwater extraction wells be installed as an attempt to achieve MCLs in groundwater throughout the site. The alternative would be required since a Technical Impracticability waiver is not included for this groundwater area. It involves installation of 40 new large diameter extraction wells distributed across Area 5 South at approximately 150-foot spacing (Figure 11-33A). Extraction from these wells would be continuous and is assumed to produce about 0.5 gpm per well and including PCT-A and PCT-B flow for a total of about 30 gpm of low VOCs and metals-impacted groundwater being treated aboveground in a dedicated treatment system for discharge offsite in accordance with a site-specific NPDES permit. Extraction at the PCT-A and PCT-B is also included to provide capture at the perimeter. Note that anticipated capping remedies for the FS Areas and 1 and 3 upgradient of PCT-A and PCT-B would minimize leaching to groundwater. This combined with natural attenuation of organics would reduce contaminant concentrations over the long term.The extracted groundwater is treated at a centralized treatment system at the LTA. The treatment system is assumed to include Reverse Osmosis and LPGAC. The treated groundwater is discharged offsite under a site-specific NPDES permit.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 300,000	$ 300,000	Based on Contractor quotes from previous projects
Remediation Documentation/Reporting	1	ea	$ 150,000	$ 150,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Investigation/Aquifer testing/Reporting	1	ls	$ 50,000	$ 50,000	Addtnl investigations in the vicinity of expected DNAPL at the toe of the P/S Landfill and refine nature & extent
Site Preparation/Geophysical survey	1	ls	$ 50,000	$ 50,000	Include surveying location of existing collection piping runs
Reverse Osmosis, bench scale/field scale testing	1	ls	$ 100,000	$ 100,000	Bench scale/field pilot test for extraction and treatment of TDS and metals incl. rental equipment, workplan, reporting, onsite treatment,
Extraction Well Installation					Well install unit cost, $/lf $1,575
Well drilling, 8" well, steel casing	40	ea	$ 45,000	$ 1,800,000	50 feet deep, steel casing, sonic drilling 8-inch well
Well headworks/vaults/pumps	40	ea	$ 5,000	$ 200,000	Based on experience with other wells
Consultant oversight, reporting	40	ea	$ 9,000	$ 360,000	Assume workplan, oversight during well install, logging, reporting; 3 days per well; 10 weeks to complete well install
Waste disposal, H&S, ODCs	40	ea	$ 4,000	$ 160,000	Assumed offsite disposal
GW Treatment System (Treat VOCs, Inorganics)					Extraction rate_40 well (gpm) 20
Design flow rate 30 gpm					PCT-A,B extraction (gal/yr) 5,600,000
GW extraction pumps, controllers for Agg ext wells	40	ea	$ 10,000	$ 400,000	40 pumps with level controllers capable of pumping at 1 gpm
GW extraction pumps, controllers for PCT ext wells	5	ea	$ 10,000	$ 50,000	5 pumps with level controllers capable of pumping at 1 gpm
Collection piping, trenching, cabling incl offsite disch pipe	10,000	ft	$ 60	$ 600,000	Based on contractor unit cost estimate
Water storage tanks and transfer tanks: carbon steel	6	ls	$ 50,000	$ 300,000	Based on previous tank replacment costs
LPGAC vessels - 6x2,000 lb pressure vessels	6	units	$ 25,000	$ 150,000	2 trains of 3x2,000 lb LPGAC vessels, Siemens quote
Reverse Osmosis Units (Pair in series @ 30 gpm)	2	ls	$ 153,000	$ 306,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 30 gpm RO system
Reject concentrator (3-module VSEP system)	1	ls	$ 374,500	$ 375,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 30 gpm RO system

TABLE E-8-15
FS AREA 5S - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Additional tankage for gw and brine storage: carbon steel	10	ls	$ 50,000	$ 500,000	10 additional 20,000 gallon tanks to store gw or brine - for gw cannot be discharged due to non-compliance with stringent NPDES limits for inorganics and may need to be treated again
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 150,000	$ 150,000	Assumed based on experience
Control system	1	ls	$ 125,000	$ 125,000	PLC controls, programming, alarms, level controls in pumps
Equipment pad, secondary containment, fence	1	ls	$ 75,000	$ 75,000	Means Cost Handbook 2005; assume75'x100' at$10/SF
PCT well redevelopment	1	ls	$ 25,000	$ 25,000	Redevelop wells in PCT-A and PCT-B
Electrical, Utilities Hookups	1	ls	$ 75,000	$ 75,000	Assumed lump sum based on past project experience
Equipment installation and startup	1	ls	$ 150,000	$ 150,000	Subcontractor labor for equipment hookups, startup, testing
Equipment rentals, PID/FID, misc ODCs	1	ls	$ 50,000	$ 50,000	
Refurbish PCT-C Trench					
Excavating existing gravel trench	8,000	cy	$ 35	$ 280,000	Based on 1,500 lf of trench that is 3 feet thick excavated down to an avg depth of 50 feet; unit cost from Means Handbook 2000
Overburden excavation and backfill	32,000	cy	$ 10	$ 320,000	Assume overburden in 4 times trench volume
Backfill gravel in trench	10,800	tons	$ 30	$ 324,000	Based on contractor quotes from Cal-Portland delivered; 1/2" leach rock
Backfill clay on top layer	800	cy	$ 30	$ 24,000	Based on contractor quotes
Install replacement wells	2	ea	$ 30,000	$ 60,000	80 feet deep, stainless steel casing wells
Disposal of excavated gravel	8,800	cy	$ 10	$ 88,000	Disposal of gravel/clay barrier in the PCB Landfill
Incremental cost of Larger Evap Pond	0	ls	$ 1,078,000	$ -	No evap pond because inorganics are treated for offsite disch
Remedial Monitoring/Sampling					
Air Monitoring/Sampling	16	samples	$ 250	$ 4,000	16 air/dust samples analyze for VOCs, metals
Soil Confirmation Sampling and Analysis	16	samples	$ 250	$ 4,000	Analyze for VOCs, 6010 total metals
Groundwater Sampling and Analysis	16	samples	$ 250	$ 4,000	Analyze for VOCs, 6010 total metals
Treatment System Vapor Sampling at Startup	20	samples	$ 250	$ 5,000	20 samples influent, effluent over 3 week startup period
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 200,000	$ 200,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
			Direct Capital Total:	**$ 7,914,000**	
			Contingency (50%)	**$ 3,957,000**	
			Direct Capital Total:	**$ 11,871,000**	

TABLE E-8-15
FS AREA 5S - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost		Estimated Cost		Notes / Assumptions
Project / Construction Management							
Remedial Design/Engineering	5%	of	$	7,914,000	$	396,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$	7,914,000	$	237,000	
EPA Oversight Costs	10%	of	$	7,914,000	$	791,000	
Construction Management	5%	of	$	7,914,000	$	396,000	
Total PM/CM Cost:					**$**	**1,820,000**	
Total Capital Cost:					**$**	**13,691,000**	
Operation and Maintenance Costs							
GWTS Operation and Maintenance, Treat Organics & Inorganics, Design flow rate = 30 gpm							Extraction rate_40 well (gpm) 20
							PCT-A,B extraction (gal/yr) 5,600,000
GWTS Maintenance and Monitoring (Labor)	12	mths	$	30,000	$	360,000	2 FTE workers
LPGAC carbon vessels and replacement	12	mths	$	6,000	$	72,000	Based on 2 carbon changeouts per month; $2/lb
Utilities: electricity	12	mths	$	5,000	$	60,000	Assume 50 kW (35HP) rated equipment power usage
Membranes, filters - waste disposal	12	mths	$	8,000	$	96,000	RO membranes, filters, solid waste
Groundwater sampling for compliance	12	mths	$	4,000	$	48,000	GWTS influent, effluent, intermediate, LPGAC sampling
Well redevelopment, annual	1	year	$	80,000	$	80,000	one event per year for all impacted wells
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$	100,000	$	100,000	Assumed based on experience
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$	75,000	$	75,000	
Brine disposal	2,416,800	gal	$	0.66	$	1,595,000	Brine concentrate disposal quote from American Integrated (AIS); per 5,000 gal truck, $0.50/gallon + $800/load for truck/driver ($0.16/gal)
Subtotal Annual O&M Cost:					$	2,486,000	
Contingency (50%):					$	1,243,000	
Project Management/Technical Support	1	year	$	32,000	$	32,000	Assume twice the PM cost of Alt 3
Sitewide Groundwater Monitoring	1	year	$	121,000	$	121,000	Annual 1/3rd cost of current sampling program + 25%
Total Annual O&M Cost:					**$**	**3,882,000**	

TABLE E-8-15
FS AREA 5S - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace PCT-A and -B trenches	2	50-year	$ 1,500,000	$ 3,000,000	Assume entire length of PCT-A and PCT-B trenches (1500 feet) would need to be replaced based on unit cost for PCT-C Trench $1000/lf
Replace GWTS	2	50-year	$ 3,331,000	$ 6,662,000	Assume GWTS is replaced every 50 years

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$13,691		$13,691	$13,691	
Annual O&M Cost (post construction)	0 - 5	$19,435	$3,887	$17,801	$15,937	
Annual O&M Cost (post construction)	6 - 30	$97,175	$3,887	$58,386	$32,296	
Annual O&M Cost (post construction)	31 - 100	$281,402	$4,020	$48,234	$7,478	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$89,878,000**	**$61,925,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$138,112,000**	**$69,403,000**	

TABLE E-8-15
FS AREA 5S - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 14,211,258**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 4,029,516**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 50-year (2014):	**$ 5,014,578**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$14,211	$2,842.25	$12,638	$10,891	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$20,174	$4,034.71	$18,478	$16,543	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$100,868	$4,034.71	$60,604	$33,524	
Annual O&M Cost (post construction)	31 - 100	$292,095	$4,172.79	$50,067	$7,762	
			Present Value of Capital	**$12,638,000**	**$10,891,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$79,082,000**	**$50,067,000**	
			Present Value of 100 Year O&M)	**$129,149,000**	**$57,829,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$91,720,000**	**$60,958,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$141,787,000**	**$68,720,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the 30 gpm extracted flow is treated for offsite discharge under a site-specific NPDES permit.
2. The PCT-A and PCT-B groundwater is extracted, treated and discharged offsite to the B-Drainage.
3. The GWTS includes a LPGAC and reverse osmosis system for treatment of VOCs and inorganics for offsite discharge.

TABLE E-8-16
FS AREA 5W - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Rremedial Alternative Extraction (PCT-C) + Treat/Discharge to Onsite Evap Pond + MNA + ICs + Monitoring

Alternative Description: This remedial alternative includes continued extraction of liquids from PCT-C as is required to meet current action levels and prevent offsite migration. The extracted PCT-C liquids will be pumped to the new lined 11-acre evaporation pond which we are proposing be located in the footprint of the A-Series Pond (Figure 11-34A). Note that anticipated capping remedies for the RCRA Canyon/WCSA (FS Area 2) and Pond A-5 and A-Series Pond (FS Area 4) that are upgradient would minimize leaching to groundwater and this would attenuate inorganic concentrations over the long term. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Preparation/Geophysical survey	1	ls	$ 20,000	$ 20,000	Include surveying location of existing collection piping runs
Refurbish PCT-C Trench					Unit cost for trench per lf $ 1,000
Excavating existing gravel trench	8,000	cy	$ 35	$ 280,000	Based on 1,500 lf of trench that is 3 feet thick excavated down to an avg depth of 50 feet; unit cost from Means Handbook 2000
Overburden excavation and backfill	32,000	cy	$ 10	$ 320,000	Assume overburden in 4 times trench volume
Backfill gravel/sand in trench	10,800	tons	$ 30	$ 324,000	Based on contractor quotes from Cal-Portland delivered; 1/2" leach rock
Backfill clay on top layer	800	cy	$ 30	$ 24,000	Based on contractor quotes
Install replacement wells	2	ea	$ 30,000	$ 60,000	80 feet deep, stainless steel casing wells
Disposal of excavated gravel	8,800	cy	$ 10	$ 88,000	Disposal of gravel/clay barrier in the PCB Landfill
PCT-C Extraction					
GW extraction pumps, controllers	6	ea	$ 10,000	$ 60,000	6 pumps in RAP wells,
Collection-discharge piping upgrade	1,000	ft	$ 30	$ 30,000	Assume 1,000 ft of piping to connect 11 wells
GWTS for PCT (VOCs treatment)					PCT-C extraction (gal/year) 4,200,000
Water storage tanks and transfer tanks: carbon steel	2	ls	$ 50,000	$ 100,000	Based on previous tank replacment costs
LPGAC vessels - 4x2,000 lb pressure vessels	4	units	$ 25,000	$ 100,000	2 trains of 2x2,000 lb LPGAC vessels, Siemens quote
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 25,000	$ 25,000	Assumed based on experience
Health and Safety / Quality Control					PCT-C length (linear feet) = 1500
Construction QA/QC Program	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Health and Safety Program, ODCs	1	ls	$ 25,000	$ 25,000	Based on contractor quotes
			Direct Capital Total:	**$ 1,606,000**	
			Contingency (35%)	**$ 562,000**	Assume lower 35% contingency for conventional extraction technology
			Direct Capital Total:	**$ 2,168,000**	

TABLE E-8-16
FS AREA 5W - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 1,606,000	$ 80,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 1,606,000	$ 48,000	
EPA Oversight Costs	10%	of	$ 1,606,000	$ 161,000	
Construction Management	5%	of	$ 1,606,000	$ 80,000	
			Total PM/CM Cost:	**$ 369,000**	
			Total Capital Cost:	**$ 2,537,000**	
Operation and Maintenance Costs					
GWTS Operation and Maintenance					
GWTS Maintenance and Monitoring (labor)	12	mths	$ 2,000	$ 24,000	Based on current site O&M. 20 hrs/week O&M labor at $100/hr
LPGAC carbon vessels and replacement	12	mths	$ 3,000	$ 36,000	Assume 1-2000 lb vessel changed out per month
GWTS water sampling for compliance	1	year	$ 5,000	$ 5,000	Based on current site O&M
Utilities: electricity	12	mths	$ 500	$ 6,000	Based on current site O&M
Repair, Replacement: Pumps, motors, valves, fittings, electric su	1	year	$ 5,000	$ 5,000	Based on current site O&M
Misc: Equip rentals/PID/FID/Generator/Forklift/ODCs	1	year	$ 4,000	$ 4,000	Based on current site O&M
			Subtotal Annual O&M Cost:	$ 80,000	
			Contingency (50%):	$ 40,000	
Project Management/Technical Support	1	year	$ 8,000	$ 8,000	Assume 1/3 rd of PM cost for Alt 2 Area 5NS
Sitewide Groundwater Monitoring	1	year	$ 121,000	$ 121,000	Annual 1/3rd cost of current sampling program + 25%
			Total Annual O&M Cost:	**$ 249,000**	

TABLE E-8-16
FS AREA 5W - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace PCT-C trench	2	50-year	$ 1,500,000	$ 3,000,000	Assume entire length of PCT trenches (3000 feet) would need to be replaced based on unit cost for PCT-C Trench $1000/lf

PRESENT VALUE ANALYSIS (2012 $K)						
Cost Type	**Year**	**Total Cost (2012 $K)**	**Cost/Year (2012 $K)**	**Net Present Value at 3% DF (2012 $K)**	**Net Present Value at 7% DF (2012 $K)**	
Capital Cost		$2,537		$2,537	$2,537	
Annual O&M Cost (post construction)	0 - 5	$1,270	$254	$1,163	$1,041	
Annual O&M Cost (post construction)	6 - 30	$6,350	$254	$3,815	$2,110	
Annual O&M Cost (post construction)	31 - 100	$20,430	$292	$3,502	$543	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$7,516,000**	**$5,689,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$11,017,000**	**$6,232,000**	

TABLE E-8-16
FS AREA 5W - ALTERNATIVE 2
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 2,633,406**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 258,462**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 50-year (2014):	**$ 1,557,000**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$2,633	$526.68	$2,342	$2,018	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$1,318	$263.65	$1,207	$1,081	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$6,591	$263.65	$3,960	$2,191	
Annual O&M Cost (post construction)	31 - 100	$21,206	$302.95	$3,635	$564	
			Present Value of Capital	**$2,342,000**	**$2,018,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$5,168,000**	**$3,272,000**	
			Present Value of 100 Year O&M)	**$8,803,000**	**$3,835,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$7,509,000**	**$5,290,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$11,144,000**	**$5,853,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through RAP wells at PCT-C.
2. Groundwater RAP extraction rates are assumed to be decreased due to site capping and closing ponds.
3. Groundwater treatment plant is upgraded with new treatment equipment, extraction pumps, repaired/new collection/discharge piping, etc

TABLE E-8-17
FS AREA 5W - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Rremedial Alternative Extraction (PCT-C) + Treat/Discharge Offsite + MNA + ICs + Monitoring

Alternative Description: This remedial alternative includes continued extraction of liquids from PCT-C as is required to meet current action levels and prevent offsite migration. The extracted PCT-C liquids will be pumped to the new lined 11-acre evaporation pond which we are proposing be located in the footprint of the A-Series Pond (Figure 11-35A). Note that anticipated capping remedies for the RCRA Canyon/WCSA (FS Area 2) and Pond A-5 and A-Series Pond (FS Area 4) that are upgradient would minimize leaching to groundwater and this would attenuate inorganic concentrations over the long term. Groundwater monitoring is included as currently implemented and described in the RGMEW workplan dated March 2009. The waste brine from inorganics treatment is sent offsite for disposal.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Remediation Documentation/Reporting	1	ea	$ 50,000	$ 50,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Preparation/Geophysical survey	1	ls	$ 20,000	$ 20,000	Include surveying location of existing collection piping runs
Refurbish PCT-C Trench					Unit cost for trench per lf $ 1,000
Excavating existing gravel trench	8,000	cy	$ 35	$ 280,000	Based on 1,500 lf of trench that is 3 feet thick excavated down to an avg depth of 50 feet; unit cost from Means Handbook 2000
Overburden excavation and backfill	32,000	cy	$ 10	$ 320,000	Assume overburden in 4 times trench volume
Backfill gravel/sand in trench	10,800	tons	$ 30	$ 324,000	Based on contractor quotes from Cal-Portland delivered; 1/2" leach rock
Backfill clay on top layer	800	cy	$ 30	$ 24,000	Based on contractor quotes
Install replacement wells	2	ea	$ 30,000	$ 60,000	80 feet deep, stainless steel casing wells
Disposal of excavated gravel	8,800	cy	$ 10	$ 88,000	Disposal of gravel/clay barrier in the PCB Landfill
PCT-C Extraction					
GW extraction pumps, controllers	2	ea	$ 10,000	$ 20,000	2 pumps in RAP wells
Collection-discharge piping upgrade	4,000	ft	$ 60	$ 240,000	Assume 4,000 ft of piping to connect wells to system and discharge offsite
GWTS for PCT (VOCs and Inorganics treatment)					PCT-C extraction (gal/year) 4,200,000
					Design flow rate (gpm) 10
Water storage tanks and transfer tanks: carbon steel	4	ls	$ 50,000	$ 200,000	Based on previous tank replacment costs
LPGAC vessels - 4x2,000 lb pressure vessels	4	units	$ 25,000	$ 100,000	2 trains of 2x2,000 lb LPGAC vessels, Siemens quote
Reverse Osmosis Units (Pair in series @ 10 gpm)	2	ls	$ 70,900	$ 142,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system; 2 units in series
Reject concentrator (3-module VSEP system)	1	ls	$ 173,600	$ 174,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 10 gpm RO system
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 75,000	$ 75,000	Assumed based on experience
Control system	1	ls	$ 75,000	$ 75,000	PLC controls, programming, alarms, level controls in pumps
Equipment pad, secondary containment, fence	1	ls	$ 75,000	$ 75,000	Means Cost Handbook 2005; assume75'x100' at$10/SF
Electrical, Utilities Hookups	1	ls	$ 50,000	$ 50,000	Assumed lump sum based on past project experience
Equipment installation and startup	1	ls	$ 125,000	$ 125,000	Subcontractor labor for equipment hookups, startup, testing

TABLE E-8-17
FS AREA 5W - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
Equipment rentals, PID/FID, misc ODCs	1	ls	$ 50,000	$ 50,000	
Additional tankage for gw storage	3	ls	$ 50,000	$ 150,000	3 additional 20,000 gallon tanks to store gw that cannot be discharged due to non-compliance with stringent NPDES limits for inorganics and may need to be treated again
PCT well redevelopment	1	ls	$ 20,000	$ 20,000	Redevelop wells in PCT-A and PCT-B
Health and Safety / Quality Control					PCT-C length (linear feet) = 1500
Construction QA/QC Program	1	ls	$ 50,000	$ 50,000	Based on Contractor quotes
Health and Safety Program, ODCs	1	ls	$ 25,000	$ 25,000	Based on contractor quotes
Direct Capital Total:				**$ 2,787,000**	Assume higher 50% contingency for challenges with RO technology, # reverse osmosis units needed, and level of pre-treatment and filtration needed, e.g. additional iron pre-treatment may be required
Contingency (50%)				**$ 1,394,000**	
Direct Capital Total:				**$ 4,181,000**	
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 2,787,000	$ 139,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 2,787,000	$ 84,000	
EPA Oversight Costs	10%	of	$ 2,787,000	$ 279,000	
Construction Management	5%	of	$ 2,787,000	$ 139,000	
Total PM/CM Cost:				**$ 641,000**	
Total Capital Cost:				**$ 4,822,000**	
Operation and Maintenance Costs					
GWTS for PCT (VOCs and Inorganics treatment)					PCT-C extraction (gal/year) 4,200,000
					Design flow rate (gpm) 10
GWTS Maintenance and Monitoring (Labor)	12	mths	$ 20,000	$ 240,000	1.2 FTE workers
GWTS water sampling for compliance	12	mths	$ 2,000	$ 24,000	Assume $2000 sampling cost per month
LPGAC vessels and replacement	12	mths	$ 3,000	$ 36,000	Based on current site O&M costs
Utilities: electricity	12	mths	$ 5,000	$ 60,000	Assume 50 kW (35HP) rated equipment power usage
Membranes, filters - waste disposal	12	mths	$ 6,000	$ 72,000	RO membranes, filters, solid waste
Well redevelopment, annual	1	year	$ 20,000	$ 20,000	one event per year for all wells
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$ 100,000	$ 100,000	Assumed based on experience
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 75,000	$ 50,000	Same as current GWTS cost + DNAPL costs
Brine disposal	630,000	gal	$ 0.66	$ 416,000	Brine concentrate disposal quote from American Integrated (AIS); per 5,000 gal truck, $0.50/gallon + $800/load for truck/driver ($0.16/gal)

TABLE E-8-17
FS AREA 5W - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
			Subtotal Annual O&M Cost:	$ 1,018,000	
			Contingency (50%):	$ 509,000	
Project Management/Technical Support	1	year	$ 8,000	$ 8,000	Assume 1/3 rd of PM cost for Alt 2 Area 5NS
Sitewide Groundwater Monitoring	1	year	$ 121,000	$ 121,000	Annual 1/3rd cost of current sampling program + 25%
			Total Annual O&M Cost:	**$ 1,656,000**	
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace PCT-C trench	2	50-year	$ 1,500,000	$ 3,000,000	Assume entire length of PCT trenches (3000 feet) would need to be replaced based on unit cost for PCT-C Trench $1000/lf
Replace GWTS	2	50-year	$ 1,236,000	$ 2,472,000	Assume entire GWTS is replaced every 50 years

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$4,822		$4,822	$4,822	
Annual O&M Cost (post construction)	0 - 5	$8,305	$1,661	$7,607	$6,810	
Annual O&M Cost (post construction)	6 - 30	$41,525	$1,661	$24,949	$13,801	
Annual O&M Cost (post construction)	31 - 100	$121,392	$1,734	$20,807	$3,226	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$37,378,000**	**$25,433,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$58,186,000**	**$28,659,000**	

TABLE E-8-17
FS AREA 5W - ALTERNATIVE 3
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 5,005,236**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 1,718,928**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 50-year (2014):	**$ 2,839,968**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$5,005	$1,001.05	$4,451	$3,836	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$8,621	$1,724.12	$7,896	$7,069	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$43,103	$1,724.12	$25,898	$14,325	
Annual O&M Cost (post construction)	31 - 100	$126,005	$1,800.07	$21,598	$3,349	
			Present Value of Capital	**$4,451,000**	**$3,836,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$33,793,000**	**$21,395,000**	
			Present Value of 100 Year O&M)	**$55,392,000**	**$24,743,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$38,244,000**	**$25,231,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$59,843,000**	**$28,579,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the existing extraction through RAP wells at PCT-C.
2. Groundwater RAP extraction rates are assumed to be decreased due to site capping and closing ponds.
3. Groundwater treatment plant is upgraded with new treatment equipment, extraction pumps, repaired/new collection/discharge piping, etc

TABLE E-8-18
FS AREA 5W - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Remedial Alternative Aggressive Extraction (40 New Large Diameter Wells) + Extraction (PCT-C) + Treat and Discharge Offsite + MNA + ICs + Monitoring

Alternative Description : This alternative includes aggressive hydraulic extraction from 40 new 8" diameter wells in large boreholes extracting about on average 0.05 gpm each for a total of 2 gpm extraction and includes the perimeter extraction at the PCT-C. The extracted groundwater is treated at a centralized treatment system at the LTA. The treatment system is assumed to include a Reverse Osmosis and LPGAC units. The treated groundwater is discharged offsite under a site-specific NPDES permit. The Reverse Osmosis treatment creates a large volume brine wastewater that is assumed to be sent offsite for disposal.

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs					
Mobilization / Demobilization					
Site Setup, Equipment Mobilization/Demobilization	1	ls	$ 300,000	$ 300,000	Based on Contractor quotes from previous projects
Remediation Documentation/Reporting	1	ea	$ 150,000	$ 150,000	Projected based on experience with other remediation projects
Pre-Remedial Testing					
Site Investigation/Aquifer testing/Reporting	1	ls	$ 50,000	$ 50,000	Addtnl investigations in the vicinity of expected DNAPL at the toe of the P/S Landfill and refine nature & extent
Site Preparation/Geophysical survey	1	ls	$ 50,000	$ 50,000	Include surveying location of existing collection piping runs
Reverse Osmosis, bench scale/field scale testing	1	ls	$ 100,000	$ 100,000	Bench scale/field pilot test for extraction and treatment of TDS and metals incl. rental equipment, workplan, reporting, onsite treatment,
Extraction Well Installation					Well install unit cost, $/lf $1,575
Well drilling, 8" well, steel casing	40	ea	$ 45,000	$ 1,800,000	50 feet, steel casing, sonic drilling 8-inch well
Well headworks/vaults/pumps	40	ea	$ 5,000	$ 200,000	
Consultant oversight, reporting	40	ea	$ 9,000	$ 360,000	Assume workplan, oversight during well install, logging, reporting; 3 days per well; 10 weeks to complete well install
Waste disposal, H&S, ODCs	40	ea	$ 4,000	$ 160,000	Assumed offsite disposal
GW Treatment System (Treat inorganics and organics)					Extraction rate_40 well (gpm) 2
Design flow rate = 20 gpm					PCT-C extraction (gal/year) 4,200,000
GW extraction pumps, controllers for Agg ext wells	40	ea	$ 10,000	$ 400,000	60 pumps with level controllers capable of pumping at 1 gpm
GW extraction pumps, controllers for PCT ext wells	2	ea	$ 10,000	$ 20,000	2 pumps with level controllers capable of pumping at 1 gpm
Collection piping, trenching, cabling incl offsite disch pipe	8,000	ft	$ 60	$ 480,000	Based on contractor unit cost estimate
Water storage tanks and transfer tanks: carbon steel	4	ls	$ 50,000	$ 200,000	Based on previous tank replacment costs
LPGAC vessels - 6x2,000 lb pressure vessels	6	units	$ 25,000	$ 150,000	2 trains of 3x2,000 lb LPGAC vessels, Siemens quote
Reverse Osmosis Units (Pair in series @ 20 gpm)	2	ls	$ 115,200	$ 230,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 20 gpm RO system; 2 units in series
Reject concentrator (3-module VSEP system)	1	ls	$ 282,000	$ 282,000	Based on scaling with cost exponent factor using costs obtained for GWTS in Appendix A for this 20 gpm RO system
Additional tankage for gw storage: carbon steel	4	ls	$ 50,000	$ 200,000	4 additional 20,000 gallon tanks to store gw that cannot be discharged due to non-compliance with stringent NPDES limits for inorganics and may need to be treated again
Transfer pumps, bag filters, piping, instrumentation	1	ls	$ 150,000	$ 150,000	Assumed based on experience
Control system	1	ls	$ 125,000	$ 125,000	PLC controls, programming, alarms, level controls in pumps
Equipment pad, secondary containment, fence	1	ls	$ 75,000	$ 75,000	Means Cost Handbook 2005; assume75'x100' at$10/SF

TABLE E-8-18
FS AREA 5W - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Capital Costs (continued)					
PCT well redevelopment	1	ls	$ 25,000	$ 25,000	Redevelop wells in PCT-C
Electrical, Utilities Hookups	1	ls	$ 75,000	$ 75,000	Assumed lump sum based on past project experience
Equipment installation and startup	1	ls	$ 150,000	$ 150,000	Subcontractor labor for equipment hookups, startup, testing
Equipment rentals, PID/FID, misc ODCs	1	ls	$ 50,000	$ 50,000	
Refurbish PCT-C Trench					
Excavating existing gravel trench	8,000	cy	$ 35	$ 280,000	Based on 1,500 lf of trench that is 3 feet thick excavated down to an avg depth of 50 feet; unit cost from Means Handbook 2000
Overburden excavation and backfill	32,000	cy	$ 10	$ 320,000	Assume overburden in 4 times trench volume
Backfill gravel in trench	10,800	tons	$ 30	$ 324,000	Based on contractor quotes from Cal-Portland delivered; 1/2" leach rock
Backfill clay on top layer	800	cy	$ 30	$ 24,000	Based on contractor quotes
Install replacement wells	2	ea	$ 30,000	$ 60,000	80 feet deep, stainless steel casing wells
Disposal of excavated gravel	8,800	cy	$ 10	$ 88,000	Disposal of gravel/clay barrier in the PCB Landfill
Incremental cost of Larger Evap Pond	0	ls	$ 1,078,000	$ -	No evap pond because inorganics are treated for discharge
Remedial Monitoring/Sampling					
Air Monitoring/Sampling	16	samples	$ 500	$ 8,000	16 air/dust samples analyze for VOCs, PCBs, DDT, metals during drilling in DNAPL area
Soil Confirmation Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, DNAPL saturation, 6010 total metals, soluble metals Ba, CrVI, other parameters
Groundwater Sampling and Analysis	16	samples	$ 500	$ 8,000	Analyze for VOCs, 6010 total metals, soluble metals Ba, CrVI, other parameters
Health and Safety / Quality Control					
Construction QA/QC Program	1	ls	$ 150,000	$ 150,000	Based on contractor quotes
Health and Safety Program, ODCs	1	ls	$ 100,000	$ 100,000	Based on contractor quotes
			Direct Capital Total:	**$ 7,152,000**	
			Contingency (50%)	**$ 3,576,000**	
			Direct Capital Total:	**$ 10,728,000**	

TABLE E-8-18
FS AREA 5W - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Project / Construction Management					
Remedial Design/Engineering	5%	of	$ 7,152,000	$ 358,000	Engineering and management costs based on industry standards and experience.
Project Management, Agency Reporting and Coordination	3%	of	$ 7,152,000	$ 215,000	
EPA Oversight Costs	10%	of	$ 7,152,000	$ 715,000	
Construction Management	5%	of	$ 7,152,000	$ 358,000	
			Total PM/CM Cost:	**$ 1,646,000**	
			Total Capital Cost:	**$ 12,374,000**	
Operation and Maintenance Costs					
GW Treatment System (Treat inorganics and organics)					Extraction rate_40 well (gpm) 2
Design flow rate = 20 gpm					PCT-C extraction (gal/year) 4,200,000
GWTS Maintenance and Monitoring (Labor)	12	mths	$ 25,000	$ 300,000	1.5 FTE workers
LPGAC and VPGAC carbon vessels and replacement	12	mths	$ 3,500	$ 42,000	Based on current site O&M costs
Utilities: electricity	12	mths	$ 4,000	$ 48,000	Assume 40 kW (32HP) rated equipment power usage
Membranes, filters - waste disposal	12	mths	$ 6,000	$ 72,000	RO membranes, filters, solid waste
Groundwater sampling for compliance	12	mths	$ 4,000	$ 48,000	GWTS influent, effluent, intermediate, LPGAC sampling
Well redevelopment, annual	1	year	$ 60,000	$ 60,000	one event per year for all wells
Repair/Replacement: Pumps, motors, valves, electrical sub	1	year	$ 80,000	$ 80,000	Assumed based on experience
Misc: Equipment rentals /Generator/Forklift/ODCs	1	year	$ 60,000	$ 60,000	Same as current GWTS cost + DNAPL costs
Brine disposal	787,680	gal	$ 0.66	$ 520,000	Brine concentrate disposal quote from American Integrated (AIS); per 5,000 gal truck, $0.50/gallon + $800/load for truck/driver ($0.16/gal)
			Subtotal Annual O&M Cost:	$ 1,230,000	
			Contingency (50%):	$ 615,000	
Project Management/Technical Support	1	year	$ -	$ -	
Sitewide Groundwater Monitoring	1	year	$ 121,000	$ 121,000	Annual 1/3rd cost of current sampling program + 25%
			Total Annual O&M Cost:	**$ 1,966,000**	

TABLE E-8-18
FS AREA 5W - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
Periodic Costs					
US EPA Five-year Review (5,10,15,20,25 and 30 years)	6	5-year	$ 25,000	$ 150,000	Based on previous experience with other sites; cost is divided by 5 and assigned to each FS Area
Replace PCT-C trench	2	50-year	$ 1,500,000	$ 3,000,000	Assume entire length of PCT trenches (3000 feet) would need to be replaced based on unit cost for PCT-C Trench $1000/lf
Replace GWTS	2	50-year	$ 2,612,000	$ 5,224,000	Replace GWTS every 50 years

PRESENT VALUE ANALYSIS (2012 $K)

Cost Type	Year	Total Cost (2012 $K)	Cost/Year (2012 $K)	Net Present Value at 3% DF (2012 $K)	Net Present Value at 7% DF (2012 $K)	
Capital Cost		$12,374		$12,374	$12,374	
Annual O&M Cost (post construction)	0 - 5	$9,855	$1,971	$9,027	$8,081	
Annual O&M Cost (post construction)	6 - 30	$49,275	$1,971	$29,606	$16,377	
Annual O&M Cost (post construction)	31 - 100	$145,844	$2,083	$24,999	$3,876	
Total Present Value of Alternative (Capital + 30 Year O&M)				**$51,006,000**	**$36,832,000**	2012 $
Total Present Value of Alternative (Capital + 100 Year O&M)				**$76,005,000**	**$40,708,000**	

TABLE E-8-18
FS AREA 5W - ALTERNATIVE 5
Casmalia Resources Superfund Site
Final Feasibility Study

Task Description		Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes / Assumptions
PRESENT VALUE ANALYSIS (2014 $)						
				Total Capital Cost (2014):	**$ 12,844,212**	2014 $ = 2012 $ adjusted by 3.8% construction cost inflation rate. (Reference: California Construction Cost Index Table, Engineering News Record, May 2014)
				Total Annual O&M Cost, Annual (2014):	**$ 2,040,708**	
				Periodic Cost, 5-year (2014):	**$ 25,950**	
				Periodic Cost, 50-year (2014):	**$ 4,268,256**	
Cost Type	**Year**	**Total Cost (2014 $K)**	**Cost/Year (2014 $K)**	**Net Present Value at 3% DF (2014 $K)**	**Net Present Value at 7% DF (2014 $K)**	
Capital Cost		$12,844	$2,569	$11,422	$9,844	FS Area 5 remedy is expected to be constructed during the fifth construction season (2020) but PV of Capital Cost is assumed to be based based on average capital cost for each year of the 5 year construction period.
Annual O&M Cost (post construction)	0 - 5	$10,229	$2,046	$9,370	$8,389	FS Remedy construction will take 5 years (projected to occur from 2016 to 2020). Annual O&M Costs post construction begin in 2021. Please note prior to and during construction the site will continue to incur O&M and EPA oversight costs
Annual O&M Cost (post construction)	6 - 30	$51,147	$2,046	$30,731	$16,999	
Annual O&M Cost (post construction)	31 - 100	$151,386	$2,163	$25,949	$4,023	
			Present Value of Capital	**$11,422,000**	**$9,844,000**	2014 $ = 2012 $ adjusted by 3.8%
			Present Value of 30 Year O&M	**$40,101,000**	**$25,388,000**	
			Present Value of 100 Year O&M)	**$66,049,000**	**$29,411,000**	
			Total Present Value of Alternative (Capital + 30 Year O&M)	**$51,522,000**	**$35,231,000**	
			Total Present Value of Alternative (Capital + 100 Year O&M)	**$77,471,000**	**$39,254,000**	

NOTES/ASSUMPTIONS

1. This alternative assumes that the 20 gpm extracted flow is treated for offsite discharge under a site-specific NPDES permit.
2 The PCT-C groundwater is extracted, treated and discharged offsite to the B-Drainage.
3 The GWTS includes a LPGAC and reverse osmosis system for treatment of VOCs and inorganics for offsite discharge.

TABLE E-9-0
CONTINGENCY FACTORS USED FOR COST ESTIMATES
Casmalia Resources Superfund Site
Feasibility Study

Screening-Level Evaluation Alternative	Detailed Evaluation Cost Estimate Contingency (%)			Site-Wide Remedial Alternative					
	Alt	Construction	O&M	1	2	3 [1]	4 [1]	5 [1]	6 [1]
Area 1 - Capped Landfills, PCB Landfill, BTA, and CDA Capped Landfills Area									
1. No Action	1			●					
2. RCRA-Equivalent Mono Soil Cap (BTA, CDA) (5') + RCRA Prescriptive Cap (PCB Landfill) + Stormwater Controls + ICs + Monitoring	2	35	50						
3. Evapotranspirative (ET) Cap (BTA, CDA) (5') + RCRA Cap (PCB Landfill) + Stormwater Controls + ICs + Monitoring	3	35	50						
4. RCRA Cap (PCB Landfill, BTA, CDA) + Stormwater Controls + ICs + Monitoring	4	35	50		●	●	●	●	●
5. Excavate (BTA, CDA remedial areas) (5')/Offsite Disposal + RCRA-Equivalent Mono Soil Cap (BTA, CDA) (5') + RCRA Cap (PCB Landfill) + Stormwater Controls + Ics + Monitoring									
6. Excavate (Entire BTA (20') + CDA remedial area (5'))/Offsite Disposal + RCRA-Equivalent Mono Soil Cap (BTA, CDA) + RCRA Cap (PCB Landfill) + Stormwater Controls + ICs + Monitoring	5	50	50						
Area 2 - RCRA Canyon/WCSA									
1. No Action	1			●					
2. Eco-Cap (Westslope RCRA Canyon, WCSA remedial area) (2') + Grading/BMPs (Uncapped areas) + Stormwater Controls + ICs + Monitoring	2	35	50						
3. RCRA-Equivalent Mono Soil Cap (Westslope RCRA Canyon) (5') + Excavation (WCSA remedial area) (5') + Grading/BMPs (Uncapped Areas) + Stormwater Controls (Segregate Capped and Uncapped Area SW) + ICs + Monitoring	3	35	50		●				
4. RCRA-Equivalent Mono Soil Cap (Westslope RCRA Canyon, WCSA remedial area) (5') + Grading/BMPs (Uncapped areas) + Stormwater Controls + ICs + Monitoring	4	35	50						
5. RCRA-Equivalent Mono Soil Cap (Westslope RCRA Canyon) (5') + Excavation (WCSA remedial area) (5') + Clean Soil Cover (Uncapped Areas) (2') + Stormwater Controls (Segregate Capped and Uncapped Area SW) + ICs + Monitoring	5	35	50						
6. RCRA-equivalent Hybrid Cap (West slope RCRA Canyon)(5') + Excavation (WCSA remedial area) + Clean Soil Cover (Uncapped Areas)(2') + Stormwater Controls + ICs + Monitoring	6	35	50						
7. Evapotranspirative (ET) Cap (West slope RCRA Canyon)(5') + Excavation (WCSA remedial area) + Clean Soil Cover (Uncapped Areas)(2') + Stormwater Controls + ICs + Monitoring	7	35	50						
8. RCRA Equivalent Hybrid Cap (Entire RCRA Canyon, WCSA) + Stormwater Controls + ICs + Monitoring	8	35	50			●	●	●	●
9. Evapotranspirative (ET) Cap (entire RCRA Canyon, WCSA) + Stormwater Controls + ICs + Monitoring	9	35	50			●	●	●	●
10. RCRA Prescriptive Cap (Entire RCRA Canyon, WCSA) + Stormwater Controls + ICs + Monitoring									
Area 3 - Former Ponds/Pads, Roadways, Remaining Oniste Areas, MSA, LTA									
1. No Action	1			●					
2. Eco-Cap (Locations 2, 3, 4) (2') + Asphalt Cap (Location 1) + GW Monitoring (Location 10) + Grading/BMPs (Uncapped Areas) + Stormwater Controls + ICs + Monitoring									
3. RCRA Cap (Locations 2, 3, 4)[2] + Excavate/New Asphalt Cap (Location 1)(5') + GW Monitoring (Location 10) + Grading/BMPs (Uncapped Areas) + Stormwater Controls + ICs + Monitoring	2	35	50						
4. RCRA Cap (Locations 2)[2] + Excavate ((Location 3) (20'); (Location 4)(5')) + Excavate/New Asphalt Cap (Location 1)(5') + Groundwater Monitoring (Location 10) + Grading/BMPs (Uncapped Areas) + Stormwater Controls + ICs + Monitoring	3	35	50		●	●	●		
5. RCRA Cap (Location 2) + Excavate ((Location 3)(20'); (Location 4)(5'); (Location 10)(50'))/Place in PCB Landfill + Excavate/New Asphalt Cap (Location 1)(5') + Grading/BMPs (Uncapped Areas) + Stormwater Controls + ICs + Monitoring	4	35	50					●	●
6. Excavate (Locations 2, 4) (5')/Place in PCB Landfill + Excavate (Location 3)(20')/Offsite Disposal + Excavate/Asphalt Cap (Location 1)(5') + In-situ Thermal Desorption (Location 10) (5'-50' bgs) + Backfill/Clean soil cap + Grading/BMPs (Uncapped Areas) + Stormwater Controls + ICs + Monitoring									
7. Excavate (Locations 2, 4) (5'), Location 3 (20'), and (Location 10) (50')/Offsite Disposal + Excavate/Asphalt Cap (Location 1)(5') + Grading/BMPs (Uncapped Areas) + Stormwater Controls + ICs + Monitoring	5	50	50						

TABLE E-9-0
CONTINGENCY FACTORS USED FOR COST ESTIMATES
Casmalia Resources Superfund Site
Feasibility Study

Screening-Level Evaluation Alternative	Detailed Evaluation Cost Estimate Contingency (%)			Site-Wide Remedial Alternative					
	Alt	Construction	O&M	1	2	3 [1]	4 [1]	5 [1]	6 [1]
Area 4 - Ponds									
1. No Action	1			●					
2. Eco-Cap (RCF, A-Series Pond) (2') + Construct New 11-Acre Evaporation Pond + RCRA Prescriptive Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring	2	35	50						
3. Eco-Cap (RCF Pond, Segregate East RCF)(2') + Construct Lined Evaporation Pond (A-Series Pond) + RCRA Prescriptive Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring	3	35	50						
4. Eco-Cap (RCF Pond)(2') + Construct 11-acre Lined Evaporation Pond (A-Series Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls[3, 4] + ICs + Monitoring	4	35	50		●				
5. Eco-Cap (RCF Pond, portion of A-Series Pond) + Construct 6-acre Lined Evaporation Pond (A-Series Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring	5	35	50			●		●	
6. Eco-Cap (RCF Pond, A-Series Pond)(2') + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls[3, 4] + ICs + Monitoring	6	35	50				●		●
7. ET Cap (RCF Pond, portion of A-Series Pond) + Construct 6-acre Lined Evaporation Pond (A-Series Pond) + RCRA Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring	7	35	50						
8. Excavate (RCF Pond, A-Series Pond) (5') + Construct New 11-Acre Lined Evaporation Pond (North of RCF Pond) + RCRA Prescriptive Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring	8	50	50						
9. RCRA Prescriptive Cap (RCF Pond) + Construct New 11-Acre Lined Evaporation Pond (A-Series Pond) + RCRA Prescriptive Cap (Pond 18) + Lined Retention Basin (Pond A-5, Pond 13) + Stormwater Controls + ICs + Monitoring									
Area 5N - Groundwater North									
1. No Action	1			●					
2. Extraction (PSCT, Gallery Well) + Treat and Discharge PSCT Groundwater to Onsite Evaporation Pond + ICs + Monitoring	2	35	50						
3. Extraction (PSCT, Gallery Well) + Extraction (NAPL-only in P/S Landfill) + Extraction (NAPL-only in CDA, 4 wells) + Monitoring (12 new LHSU wells) + Treat and Discharge PSCT Groundwater to Onsite Evaporation Pond + ICs + Monitoring	3	35	50		●	●			
4. Extraction (PSCT, Gallery Well) + Extraction (NAPL-only in P/S Landfill) + Extraction (NAPL-only in CDA, 4 wells) + Monitoring (12 new LHSU wells) + Treat and Discharge PSCT Groundwater Offsite (No Evap Pond) + ICs + Monitoring	4	50	50				●		
5. Extraction (PSCT, Gallery Well) + Extraction (Aggressive, 16 large NAPL wells) + Extraction (NAPL-only in CDA, 4 wells) + Monitoring (12 new LHSU wells) + Treat and Discharge to Onsite Evaporation Pond + ICs + Monitoring	5	50	50						
6. Extraction (PSCT, Gallery Well) + Dewater P/S Landfill (5 Horizontal Wells) + Extraction (NAPL-only in CDA, 4 wells) + Monitoring (12 new LHSU wells) + Treat and Discharge to Onsite Evaporation Pond + ICs + Monitoring	6	50	75[2]					●	
7. Extraction (PSCT, Gallery Well) + Dewater P/S Landfill (5 Horizontal Wells) + Extraction (NAPL-only in CDA, 12 new wells) + Extraction (4 new LHSU wells) + Monitoring (8 new LHSU wells) + Treat and Discharge Offsite + ICs + Monitoring	7	60	75[2]						●
8. Aggressive Extraction (50 New Extraction Wells, Area 5 North) + Extraction (Aggressive, 16 Large NAPL Wells in P/S Landfill)+ Extraction (PSCT, Gallery Well) + Treat and Discharge Offsite + ICs + Monitoring									
Area 5S - Groundwater South									
1. No Action	1			●					
2. Extraction (PCT-A, PCT-B)[5] + Treat/Discharge to Onsite Evaporation Pond + MNA + ICs + Monitoring	2	35	50		●	●		●	
3. Extraction (PCT-A, PCT-B)[5] + Treat and Discharge Offsite + MNA + ICs + Monitoring	3	50	50				●		
4. Extraction (PCT-A) + In-situ Reactive Wall (PCT-B) + MNA + ICs + Monitoring	4	50	50						

TABLE E-9-0
CONTINGENCY FACTORS USED FOR COST ESTIMATES
Casmalia Resources Superfund Site
Feasibility Study

Screening-Level Evaluation Alternative	Detailed Evaluation Cost Estimate Contingency (%)			Site-Wide Remedial Alternative					
	Alt	Construction	O&M	1	2	3 [1]	4 [1]	5 [1]	6 [1]
5. Extraction (PSCT Westside Extension) + Extraction (PCT-A, PCT-B) + MNA + ICs + Monitoring									
6. Aggressive Extraction (40 new extraction wells, Area 5 South) + Extraction (PCT-A, PCT-B) + Treat and Discharge Offsite + MNA + ICs + Monitoring	5	50	50						●
Area 5W - Groundwater West									
1. No Action	1			●					
2. Monitored Natural Attenuation + ICs									
3. Extraction (PCT-C) + Treat and Discharge to Onsite Evaporation Pond MNA + ICs + Monitoring	2	35	50		●	●		●	
4. Extraction (PCT-C) + Treat and Discharge Offsite + MNA + ICs + Monitoring	3	50	50				●		
5. In-Situ Reactive Wall (PCT-C) + MNA + ICs + Monitoring	4	50	50						
6. Aggressive Extraction (40 new extraction wells) + Extraction (PCT-C) + Treat and Discharge Offsite + MNA + ICs + Monitoring	5	50	50						●

1. Remedial alternative assumes ET cap for FS Area 2, but cap type will be determined during remedial design.
2. The O&M cost estimate contingency is 75% for annual variable O&M costs associated with dewatering the P/S LF liquids. The O&M cost estimate contingency is 50% for remaining O&M and annual variable O&M costs.

Table E-10-0
Alternative 2
Flow Rates of Extraction Wells
Casmalia Resources Superfund Site
Casmalia, CA

Extraction Well	TOC Elevation	Model Pumping Level		2004 Model Flow Rate		2001 Model Flow Rate	
	(ft msl)	Elevation (ft msl)	Depth BTOC (ft)	(ft^3/day)	(gpm)	(ft^3/day)	(gpm)
PSCT Trench							
PSCT-1	454.51	409.51	45.00	592.200	3.076	721.953	3.750
PSCT-2	503.51	451.51	52.00	222.005	1.153	401.040	2.083
PSCT-3	561.34	506.34	55.00	Dry	Dry	Dry	Dry
PSCT-4	593.18	542.18	51.00	Dry	Dry	Dry	Dry
PCT-A Trench							
RAP-1A	449.40	420.40	29.00	128.524	0.668	278.533	1.447
RAP-2A	447.10	402.10	45.00	438.240	2.277	577.310	2.999
RAP-3A	423.05	379.05	44.00	310.738	1.614	362.165	1.881
PCT-B Trench							
RAP-1B	416.07	355.07	61.00	1229.255	6.386	1420.326	7.378
PCT-C Trench							
RAP-1C	450.67	395.67	55.00	580.139	3.014	729.577	3.790
C-5	452.38	375.38	77.00	1028.960	5.345	1187.223	6.167
Gallery Well	487.29	467.29	20.00	Dry	Dry	54.981	0.286
Sump 9B	561.20	472.74	88.46	Off	Off	Off	Off

Table E-10-1
Alternative 3
Flow Rates of Extraction Wells
Casmalia Resources Superfund Site
Casmalia, CA

Extraction Well	TOC Elevation	Model Pumping Level		2004 Model Flow Rate		2001 Model Flow Rate	
		Elevation	Depth BTOC				
	(ft msl)	(ft msl)	(ft)	(ft^3/day)	(gpm)	(ft^3/day)	(gpm)
PSCT Trench							
PSCT-1	454.51	409.51	45.00	556.334	2.890	539.027	2.800
PSCT-2	503.51	451.51	52.00	167.159	0.868	171.995	0.893
PSCT-3	561.34	506.34	55.00	Dry	Dry	Dry	Dry
PSCT-4	593.18	542.18	51.00	Dry	Dry	Dry	Dry
PCT-A Trench							
RAP-1A	449.40	420.40	29.00	113.053	0.587	284.659	1.479
RAP-2A	447.10	402.10	45.00	418.101	2.172	644.925	3.350
RAP-3A	423.05	379.05	44.00	302.583	1.572	409.501	2.127
PCT-B Trench							
RAP-1B	416.07	355.07	61.00	1206.271	6.266	1520.378	7.898
PCT-C Trench							
RAP-1C	450.67	395.67	55.00	547.999	2.847	668.467	3.473
C-5	452.38	375.38	77.00	1026.785	5.334	1158.664	6.019
Gallery Well	487.29	467.29	20.00	Dry	Dry	Dry	Dry
Sump 9B	561.20	472.74	88.46	Off	Off	Off	Off

Table E-10-2
Alternative 4
Flow Rates of Extraction Wells
Casmalia Resources Superfund Site
Casmalia, CA

Extraction Well	TOC Elevation (ft msl)	Model Pumping Level Elevation (ft msl)	Model Pumping Level Depth BTOC (ft)	2004 Model Flow Rate (ft^3/day)	2004 Model Flow Rate (gpm)	2001 Model Flow Rate (ft^3/day)	2001 Model Flow Rate (gpm)
PSCT Trench							
PSCT-1	454.51	409.51	45.00	563.934	2.930	690.964	3.589
PSCT-2	503.51	451.51	52.00	177.275	0.921	351.197	1.824
PSCT-3	561.34	506.34	55.00	Dry	Dry	Dry	Dry
PSCT-4	593.18	542.18	51.00	Dry	Dry	Dry	Dry
PCT-A Trench							
RAP-1A	449.40	420.40	29.00	120.033	0.624	269.412	1.400
RAP-2A	447.10	402.10	45.00	427.957	2.223	566.272	2.942
RAP-3A	423.05	379.05	44.00	307.061	1.595	358.244	1.861
PCT-B Trench							
RAP-1B	416.07	355.07	61.00	1223.402	6.355	1414.417	7.348
PCT-C Trench							
RAP-1C	450.67	395.67	55.00	619.975	3.221	773.442	4.018
C-5	452.38	375.38	77.00	1118.918	5.813	1291.293	6.708
Gallery Well	487.29	467.29	20.00	Dry	Dry	25.824	0.134
Sump 9B	561.20	472.74	88.46	Off	Off	Off	Off

Table E-10-3
Alternative 5
Flow Rates of Extraction Wells
Casmalia Resources Superfund Site
Casmalia, CA

Extraction Well		TOC Elevation (ft msl)	Model Pumping Level Elevation (ft msl)	Model Pumping Level Depth BTOC (ft)	2004 Model Flow Rate (ft^3/day)	2004 Model Flow Rate (gpm)	2001 Model Flow Rate (ft^3/day)	2001 Model Flow Rate (gpm)
PSCT Trench								
	PSCT-1	454.51	409.51	45.00	553.738	2.877	680.801	3.537
	PSCT-2	503.51	451.51	52.00	163.636	0.850	337.636	1.754
	PSCT-3	561.34	506.34	55.00	Dry	Dry	Dry	Dry
	PSCT-4	593.18	542.18	51.00	Dry	Dry	Dry	Dry
PCT-A Trench								
	RAP-1A	449.40	420.40	29.00	111.920	0.581	260.765	1.355
	RAP-2A	447.10	402.10	45.00	416.643	2.164	554.131	2.879
	RAP-3A	423.05	379.05	44.00	301.995	1.569	352.768	1.833
PCT-B Trench								
	RAP-1B	416.07	355.07	61.00	1204.606	6.258	1393.783	7.240
PCT-C Trench								
	RAP-1C	450.67	395.67	55.00	547.304	2.843	690.193	3.585
	C-5	452.38	375.38	77.00	1025.953	5.330	1184.713	6.154
Gallery Well		487.29	467.29	20.00	Dry	Dry	18.726	0.097
Sump 9B		561.20	472.74	88.46	Off	Off	Off	Off
Horizontal Wells		--	--	--	19.250	0.100	19.250	0.100

Table E-10-4
Alternative 6
Flow Rates of Extraction Wells
Casmalia Resources Superfund Site
Casmalia, CA

Extraction Well		TOC Elevation (ft msl)	Model Pumping Level Elevation (ft msl)	Model Pumping Level Depth BTOC (ft)	2004 Model Flow Rate (ft^3/day)	2004 Model Flow Rate (gpm)	2001 Model Flow Rate (ft^3/day)	2001 Model Flow Rate (gpm)
PSCT Trench								
	PSCT-1	454.51	409.51	45.00	180.199	0.936	361.956	1.880
	PSCT-2	503.51	451.51	52.00	Dry	Dry	Dry	Dry
	PSCT-3	561.34	506.34	55.00	Dry	Dry	Dry	Dry
	PSCT-4	593.18	542.18	51.00	Dry	Dry	Dry	Dry
PCT-A Trench								
	RAP-1A	449.40	420.40	29.00	Dry	Dry	Dry	Dry
	RAP-2A	447.10	402.10	45.00	Dry	Dry	159.039	0.826
	RAP-3A	423.05	379.05	44.00	121.225	0.630	194.030	1.008
PCT-B Trench								
	RAP-1B	416.07	355.07	61.00	675.906	3.511	920.973	4.784
PCT-C Trench								
	RAP-1C	450.67	395.67	55.00	322.781	1.677	481.087	2.499
	C-5	452.38	375.38	77.00	752.737	3.910	930.287	4.833
Gallery Well		487.29	467.29	20.00	Dry	Dry	Dry	Dry
Sump 9B		561.20	472.74	88.46	Off	Off	Off	Off
Area 5 West Wells (40)		--	--	--	439.863	2.285	439.863	2.285
Area 5 South Wells (40)		--	--	--	3234.962	16.805	3074.627	15.972
Lower HSU Wells (7)		--	--	--	26.950	0.140	26.950	0.140
Horizontal Wells		--	--	--	19.250	0.100	19.250	0.100

TABLE E-11-0
UNIT COST BACKUP
Casmalia Resources Superfund Site
Final Feasibility Study

Unit Costs and References Used					
	Description	Unit Cost		Units	Source
1	Site Clearance and Grubbing	$	6,500	/acre	ICS contractor estimate
2	Biotic barrier 200 mil Geonet, matl+labor+tax+shipping	$	0.50	/sf	GSE Liner vendor estimate
3	Biotic barrier 200 mil Geonet, matl+labor+tax+shipping	$	21,750	/acre	GSE Liner vendor estimate
4	HDPE membrane 60 mil, matl+labor+tax+shipping	$	0.8	/sf	GSE Liner vendor estimate
5	HDPE membrane 60 mil, matl+labor+tax+shipping	$	34,800	/acre	GSE Liner vendor estimate
6	GCL Bentoliner membrane, matl+labor+tax+shipping	$	0.8	/sf	GSE Liner vendor estimate
7	GCL Bentoliner membrane, matl+labor+tax+shipping	$	34,800	/acre	GSE Liner vendor estimate
8	Geocomposite 200 mil fabrinet, matl+labor+tax+shipping	$	0.7	/sf	GSE Liner vendor estimate
9	Geocomposite 200 mil fabrinet, matl+labor+tax+shipping	$	30,500	/acre	GSE Liner vendor estimate
10	Geosynthetic Clay Liner (GCL)/Pondliner, matl+lab+tax+ship	$	1.3	/sf	CETCO GCL Bentomat product (alternate product: Akwaseal)
11	Geosynthetic Clay Liner (GCL)/Pondliner, matl+lab+tax+ship	$	56,550	/acre	CETCO GCL Bentomat product (alternate product: Akwaseal)
12	Super Gripnet HDPE Liner: matl + install + tax	$	0.9	/sf	Agru America vendor estimate
13	Super Gripnet HDPE Liner: matl + install + tax	$	39,200	/acre	Agru America vendor estimate
14	Borrow soil transport/backfill/compact, foundation layer	$	6	/cy	ICS contractor estimate based on borrow onsite source NW corner
15	Onsite borrow/light pre-processing, vegetative layer, low ground pressure equipment	$	6	/cy	Ford Construction contractor estimate
16	Offsite borrow/multi-step pre-processing, low permeability clay layer - include screening, pug mill pulverizer	$	14	/cy	Ford Construction contractor estimate
17	Place soil/Compact, 6" lifts	$	3	/cy	ICS contractor estimate
18	Place soil/Compact, 12" lifts	$	2	/cy	ICS contractor estimate
19	Cut/Fill Leveling/Grading and compacting within FS Area	$	5	/cy	Ford Construction contractor estimate
20	Onsite borrow/place, compact	$	4	/cy	Ford Construction contractor estimate
21	Soil Amendments: Fertilizer, Gypsum, Amendments (1' layer)	$	5,000	/acre	Ford Construction contractor estimate
22	Soil Amendments: Fertilizer, Gypsum, Amendments (4' layer)	$	20,000	/acre	Ford Construction contractor estimate
23	Revegetation/Hydroseeding	$	0.09	/sf	Ford Construction contractor estimate
24	Revegetation/Hydroseeding	$	4,000	/acre	Ford Construction contractor estimate
25	Asphalt cap 4" thick with 4" gravel base	$	5.00	sf	ICS contractor estimate
26	Excavation, flat areas	$	6	/cy	ICS contractor estimate
27	Transport and place excav soil in PCB Landfill for disposal	$	2	/cy	ICS contractor estimate
28	Soil disposal non haz Buttonwillow	$	40	/ton	ICS contractor unit cost estimate
29	Soil disposal nonRCRA haz Buttonwillow	$	80	/ton	ICS contractor estimate
30	Soil disposal RCRA haz Kettleman	$	160	/ton	ICS contractor estimate
31	Turf Reinforcement Mats/steep slopes	$	1.3	/sf	EPA BMP presentation - stormwater erosion control; www.ectc.org
32	Turf Reinforcement Mats/steep slopes	$	54,000	/acre	EPA BMP presentation - stormwater erosion control; www.ectc.org
33	Jute mesh, slopes	$	0.2	/sf	EPA BMP presentation - stormwater erosion control; www.ectc.org
34	Jute mesh, slopes	$	9,000	/acre	EPA BMP presentation - stormwater erosion control; www.ectc.org
35	Erosion controls: TRM, jute mesh for slopes	$	31,500	/acre	Average of TRM and Jute mesh costs
36	Stormwater concrete ditches	$	30	/lf	Entact unit cost
37	Stormwater concrete drainage channel	$	60	/lf	Entact unit cost
38	Stormwater drain pipes	$	100	/lf	Entact unit cost
39	Stormwater ditch crossings	$	25,000	ls	Entact unit cost
40	Culverts - inlet structures	$	150,000	ls	Entact unit cost
41	Import fill offsite: clay	$	30	/cy	ICS contractor estimate
42	Import fill offsite: silty sand	$	20	/cy	ICS contractor estimate
43	Import fill offsite: unclassified fill	$	15	/cy	ICS contractor estimate
44	Compaction testing: Geotech engineer	$	500	/day	Geotechnical engineer with nuclear gauge
45	Dust controls:Water truck and driver	$	1,000	/day	ICS contractor estimate
46	Air/dust samples	$	500	/sample	VOCs, metals, soluble metals air and dust analysis
47	Soil confirmation samples	$	200	/sample	Metals, PCBs, SVOCs, soluble metals analysis
48	Ecoprotection for ponds: drift fence	$	11	/lf	tin flashing material doitbest.com ($150 per 50-foot incl. tax) + labor ($100/hr x 2 workers x 8 weeks x 50 hrs); $3+$8/foot
49	Ecoprotection for ponds: pond netting	$	40,645	/acre	Material $0.60/sf for pond netting, online price at pondbiz.com; Framing material and labor $15k per acre
50	Ecoprotection for ponds: outfer fence	$	15	/lf	Chain link fence, 6' high, get-a-quote.com
51	Fertilizer (average price)	$	500	/ton	Agricultural website, www.agfax.com, price range $400 - $600/ton
52	Gypsum	$	102	/ton	$85 per ton, add tax+shipping (20%); 2 tons per lift (12") per acre

TABLE E-11-0
UNIT COST BACKUP
Casmalia Resources Superfund Site
Final Feasibility Study

			GROUNDWATER		
53	Horizontal well installation	$	400	/lf	Directional Technologies, Inc. estimate
54	Vertical well installation	$	300	/lf	Boart Longyear quote, sonic drilling, steel casing
55	2,000-lb LPGAC vessel	$	25,000	/vessel	Siemens quote for existing system
56	3,000-lb LPGAC vessel	$	40,000	/vessel	Siemens quote for existing system
57	200-lb VPGAC drum	$	1,500	/drum	Siemens quote for existing system
58	DNAPL storage tank, stainless steel	$	150,000	/vessel	Based on experience with existing system
59	Water storage tank, carbon steel	$	40,000	/vessel	Siemens quote for existing system
60	Groundwater extraction pumps, controllers	$	10,000	/pump	Based on experience with existing system
61	Low flow, LHSU Groundwater extraction pumps, controllers	$	5,000	/pump	Based on QED Env estimate, 1 gpm
62	NAPL skimmer pumps, controllers	$	5,000	/vessel	Based on Xitech verbal quote
63	Solar NAPL skimmer pumps, controllers	$	5,750	/vessel	Based on Xitech verbal quote
64	Trenching/Piping	$	30	/lf	ICS estimate
65	Trenching/Piping with double containment piping	$	60	/lf	ICS estimate
66	Carbon changeout, LPGAC or VPGAC	$	2	/lb	Based on experience with Siemens vendor at other sites
67	Leachate disposal	$	1.50	/gal	Based on current disposal costs
68	NAPL disposal	$	3.50	/gal	Based on current disposal costs
69	Drill cuttings, RCRA haz drum disposal	$	300	/drum	American Integrated estimate
70	Drilling mud disposal, RCRA haz incineration	$	1,400	/ton	American Integrated estimate
71	Brine disposal, trucked to SoCal Waste Water	$	0.66	/gal	American Integrated estimate
72	Contingency Pond Water Treatment, RO and GAC	$	0.10	/gal	Based on Siemens experience with Arizona power plant project
73	Electricity	$	0.10	/KWhr	Assumed based on typical industrial utility rates
74	Escalation factors: 2000-2011	$	1.28		Based on CPI index
75	Escalation factors: 2005-2011	$	1.13		Based on CPI index
76	Escalation factors: 2011-2014	$	1.12		Based on 4% escalation per year

NOTES

1	Contractor estimates were based on verbal unit costs provided by :	**Quote Dates**
	John Farmer at ICS Construction (714-893-6366)	Jul-11
	Jeff Ogburn at Entact (925-225-9822)	Aug-11
	Chris Harvey at Ford Construction (209-333-1116)	Aug-11
	Jennifer Sherman at American Integrated (310-522-1168)	Jan-12
	Mike Sequino at Directional Technologies, Inc. (203-294-9200)	Mar-12
	Melynda at American Integrated (310-522-1168)	Jan-12
	Bill Malone at Siemens (562-889-7339)	Jul-11
	Bob McIntyre at Slimline Technologies (800-495-6145)	Sep-11
	Clark West at AgruAmerica (775-200-0657)	Aug-11
	Jimmy Youngblood at GSE Liner (281-230-2523)	Sep-11
	Xitech Instruments Inc. (888-867-9483)	Sep-11

2 Contractor estimates were obtained that were an approximate range of unit pricing. In general, the higher end of the range of unit price was used for all items. Though a majority of the prices were obtained in August/September of 2011, these prices are valid for use for this FS level cost estimate.

TABLE E-11-1
AGGRESSIVE GROUNDWATER RESTORATION ALTERNATIVE
Casmalia Resources Superfund Site
Final Feasibility Study

Flow Rate = 110 gpm					Flow Rate (gpm)			
Description	**Estimated Quantity**	**Unit**	**Unit Cost**	**Estimated Cost**	**50**	**30**	**20**	**10**
Direct Capital Costs					**Capital Cost**			
GROUNDWATER TREATMENT								
Additional GW Characterization/Design support/Bench Scale Test	1	ls	$ 500,000	$ 500,000				
Mobilization/Demobilization	1	ls	$ 200,000	$ 200,000				
Electrical and Natural Gas Service/Hookup	1	ls	$ 160,000	$ 160,000				
Site Preparation/Geophysical/Private Subsurface Utility Locate	1	ls	$ 100,000	$ 100,000				
Therm Oxidizer flow rate- 1000 cfm	1	ls	$ 145,000	$ 145,000	$ 83,500	$ 58,400	$ 44,000	$ 27,100
Advanced Oxidation Treatment system (UV+TiO2) 110 gpm	1	ls	$ 795,000	$ 795,000	$ 457,800	$ 320,200	$ 241,100	$ 148,400
Air Stripping Unit+Blower (QED 16.6)	2	ea	$ 70,000	$ 140,000	$ 40,300	$ 28,200	$ 21,200	$ 13,100
Carbon Adsorption Vessels - LGAC (3-5,000 lb) with manifolding	3	ea	$ 10,000	$ 30,000	$ 5,800	$ 4,000	$ 3,000	$ 1,900
Chemical Feed (Inline)- Demulsifying, Acidification, Neutralization Units with controls	3	ea	$ 4,250	$ 12,750	$ 2,400	$ 1,700	$ 1,300	$ 800
Scrubber for Thermal Ox Effluent	1	ea	$ 215,000	$ 215,000	$ 123,800	$ 86,600	$ 65,200	$ 40,100
Reverse Osmosis Units (Pair in series @ 110 gpm)	2	ea	$ 380,000	$ 760,000	$ 218,800	$ 153,000	$ 115,200	$ 70,900
Reject concentrator (3-module VSEP system)	1	ea	$ 930,000	$ 930,000	$ 535,500	$ 374,500	$ 282,000	$ 173,600
Misc Treat System: OWS, Tanks, Piping, Pumps, Bag Filters	1	ls	$ 425,000	$ 425,000	$ 244,700	$ 171,200	$ 128,900	$ 79,300
Housing- Equipment Pad/Enclosure/Fence	1	ea	$ 160,000	$ 160,000	$ 92,100	$ 64,400	$ 48,500	$ 29,900
Treatment System Installation and Startup	1	ls	$ 425,000	$ 425,000	$ 244,700	$ 171,200	$ 128,900	$ 79,300
Control and Instrumentation	1	ls	$ 110,000	$ 110,000	$ 63,300	$ 44,300	$ 33,400	$ 20,500
Misc: equipment rentals, Health and Safety, PID/FID	1	ls	$ 110,000	$ 110,000				
Trenching, Piping, Cables, Backfill and Resurfacing	50000	lf	$ 75	$ 3,750,000				
Evaporation Pond construction (6.6 acres)								
Grading 6.6 acre pond bottom south of PSCT	42,000	cy	$ 6	$ 252,000				
Foundation layer	42,000	cy	$ 6	$ 252,000				
HDPE membrane	290,000	sf	$ 0.80	$ 232,000				
Drainage layer, filter fabric	290,000	sf	$ 0.60	$ 174,000				
Gravel layer, 6"	5,400	cy	$ 15	$ 81,000				
Soil cover for pond bottom, 2'	21,500	cy	$ 10	$ 215,000				
Erosion control for sideslopes	2	acres	$ 8,700	$ 17,400				
Revegetation/hydroseeding	2	acres	$ 5,000	$ 10,000				
Equipment Rentals, ODCs	1	ls	$ 15,000	$ 15,000				
			Direct Capital Subtotal	**$ 10,216,000**	**$ 5,883,000**	**$ 4,114,000**	**$ 3,098,000**	**$ 1,907,000**

TABLE E-11-1
AGGRESSIVE GROUNDWATER RESTORATION ALTERNATIVE
Casmalia Resources Superfund Site
Final Feasibility Study

Flow Rate = 110 gpm					Flow Rate (gpm)			
Description	**Estimated Quantity**	**Unit**	**Unit Cost**	**Estimated Cost**	**50**	**30**	**20**	**10**
Annual Operation and Maintenance Cost					**Annual O&M Cost**			
Fuel: Natural Gas	12	mths	$ 10,000	$ 120,000	$ 54,545	$ 32,727	$ 21,818	$ 10,909
Electricity	12	mths	$ 41,000	$ 492,000	$ 223,636	$ 134,182	$ 89,455	$ 44,727
Operations & Maintenance, Sampling	12	mths	$ 70,000	$ 840,000	$ 600,000	$ 480,000	$ 360,000	$ 288,000
Chemicals : Acids, Titanium Dioxide, antiscaling/neutralizing/ defoaming/demulsifying/RO cleaning agents	12	mths	$ 21,000	$ 252,000	$ 114,545	$ 68,727	$ 45,818	$ 22,909
Carbon - Liquid Phase (4-5,000lb changeouts, annually)	12	mths	$ 2,500	$ 30,000	$ 28,000	$ 24,000	$ 20,000	$ 16,000
Groundwater/Vapor Treatment System Influent/Effluent/NPDES Monitoring/Lab Costs, Wellhead Lab Costs	12	mths	$ 22,000	$ 264,000	$ 216,000	$ 168,000	$ 120,000	$ 96,000
Project Management/Consultant support/Compliance reports	12	mths	$ 13,000	$ 156,000	$ 144,000	$ 120,000	$ 96,000	$ 96,000
NAPL/membrane/filter/misc waste disposal	12	mths	$ 11,000	$ 132,000	$ 60,000	$ 36,000	$ 24,000	$ 12,000
RO membrane replacement	12	mths	$ 6,125	$ 73,500	$ 60,000	$ 4,000	$ 36,000	$ 24,000
UV bulb replacement	12	mths	$ 14,000	$ 168,000	$ 76,364	$ 45,818	$ 30,545	$ 15,273
Well Re-development (once per year)	1	annual	$ 28,000	$ 28,000	$ 20,000	$ 16,000	$ 14,000	$ 10,000
System overhaul	2	annual	$ 40,000	$ 80,000	$ 60,000	$ 50,000	$ 45,000	$ 40,000
Miscellaneous: Equipment rentals, H&S	12	mths	$ 4,000	$ 48,000	$ 48,000	$ 40,000	$ 40,000	$ 40,000
Parts replacement (5% of Capital costs)	5%	of	$ 3,562,750	$ 178,138	$ 140,000	$ 120,000	$ 100,000	$ 80,000
Evaporation Pond Maintenance	12	mths	$ 8,333	$ 100,000	$ 100,000	$ 80,000	$ 80,000	$ 60,000
Annual Operation and Maintenance Subtotal				**$ 2,961,638**	**$ 1,945,000**	**$ 1,419,000**	**$ 1,123,000**	**$ 856,000**

NOTES/ASSUMPTIONS

1. This cost sheet uses cost estimate for process units such as the RO and VSEP units for 110 gpm treatment system to get a proportionate cost for process units for smaller flow rate systems: 10, 20, 30 and 50 gpm systems.
2. Use cost exponent method to get capital cost estimate with exponent of 0.7; Cost 2 = Cost 1*(Flow 2/Flow 1)^0.7
3. O&M cost line items are individually estimated for each flow rate.
4. Water is treated by sequential oil-water separator (OWS), air stripper, advanced oxidation (UV+TiO2), reverse osmosis, and polished by LPGAC before NPDES discharge.
5. RO reject brine (concentrated treated groundwater) would be further concentrated via VSEP and pumped to an evaporation pond.

ATTACHMENT E-1
IN-SITU REACTIVE WALL CALCULATIONS

CASMALIA REACTIVE BARRIER OPTION

This option consists of two funnel and gate zero valent iron (ZVI) permeable reactive barriers (PRB) constructed at the current PCT-B, and PCT-C locations. The existing “clay cores” at each of the locations would be utilized as the funnel sections of the PRBs and the gates would be formed by sheet pile supported excavations. The PCT-C PRB has 4 gates and PCT-B has 2 gates. The approximate locations and dimensions of the gates are shown on attached figures. This calculation assumes that the metals treatment requirements for the PRB would be similar to the chlorinated solvents.

Parameters used to develop this option

- Hydraulic conductivity (K) = 1 x 10^{-5} cm/sec = 0.028 ft/day
- Hydraulic conductivity of ZVI (K_z) = 300 ft/day
- Hydraulic gradient (i) = 0.1
- Aquifer porosity (n) = 0.01
- ZVI porosity (n_z) = 0.3
- TCE concentration to be treated = 1,000 µg/l
- TCE half life (from literature) = 2 hours = 0.083 days
- Width of flow path (W) in PCT catchment and saturated thickness (b)
    - PCT-B, W = 565 ft, b = 20 ft
    - PCT-C, W = 1300 ft, b = 28 ft

Flow into PRB, Q = K i (W b)

- Flow to PCT-B, Q = 0.28 ft/d x 0.1 x (565 ft x 20 ft) = 31.6 ft^3/d
- Flow to PCT-C, Q = 0.28 ft/d x 0.1 x (1300 ft x 28 ft) = 102 ft^3/d

Number of gates: PCT-B, 2 gates; PCT-C 4 gates

Reactive cross-sectional area (A) of gates

- PCT-B gates, A = 8 ft x 15 ft = 120 ft^2 x 2 gates = 240 ft^2
- PCT-C gates, A = 8 ft x 25 ft = 200 ft^2 x 4 gates = 800 ft^2

Q per unit area through gates

- PCT-B, Q = 31.6 ft^3/d ÷ 240 ft^2 = 0.13 ft^3/d/ft^2
- PCT-C, Q = 102 ft^3/d ÷ 800 ft^2 = 0.13 ft^3/d/ft^2

Velocity (V) through gates = Q per unit area ÷ n_z

- PCT-B, V = 0.13 ÷ 0.3 = 0.43 ft/d
- PCT-C, V = 0.13 ÷ 0.3 = 0.43 ft/d

Hydraulic gradient through gates (i_z) = Q per unit area ÷K_z, there is no excessive head loss through the gates

- PCT-B and PCT-C, i_z = 0.13 ft/d ÷ 300 ft/d = 0.00043

Time to degrade 1000 µg/l TCE to less than 5 µg/l = number of half lives x 0.83 days/half life

- Required half lives = 8
- Required residence time (t) = 8 half lives x 0.083 days = .7 days

ZVI flow through thickness (L) needed to degrade TCE to 5 µg/l = V through gates ÷ t

- PCT-B and PCT-C, L = 0.43 ft/d ÷ 0.7 days = 0.61 ft

ESTIMATED COST FOR PRB OPTION

Sheet Pile

- PCT-B, 55 ft x 8 ft x 12 ft gate excavation, 2200 ft^2 /gate x 2 gates = 4400 ft^2
- PCT-C, 50 ft x 8 ft x 12 ft gate excavation, 2000 ft^2 /gate x 4 gates = 8000 ft^2
- **(4400 ft^2 + 8000 ft^2) x \$90/ft^2 = \$1,116,000**

Excavate Gates

- PCT-B, (55 ft x 8 ft x 12 ft x 2 gates) ÷ 27 ft^3/yd^3 = 390 yd^3
- PCT-C, (50 ft x 8 ft x 12 ft x 4 gates) ÷ 27 ft^3/yd^3 = 710 yd^3
- **(390 yd^3 + 710 yd^3) x \$35/yd^3 = \$38,500**

ZVI

- PCT-B, (15 ft x 8 ft x 3 ft x 2 gates) ÷ 27 ft^3/yd^3) x 2 ton/yd^3 = 53 tons
- PCT-C, (25 ft x 8 ft x 3 ft x 4 gates) ÷ 27 ft^3/yd^3) x 2 ton/yd^3 = 180 tons
- **(53 tons + 180 tons) x \$800/ton = \$248,800**

Pea Gravel

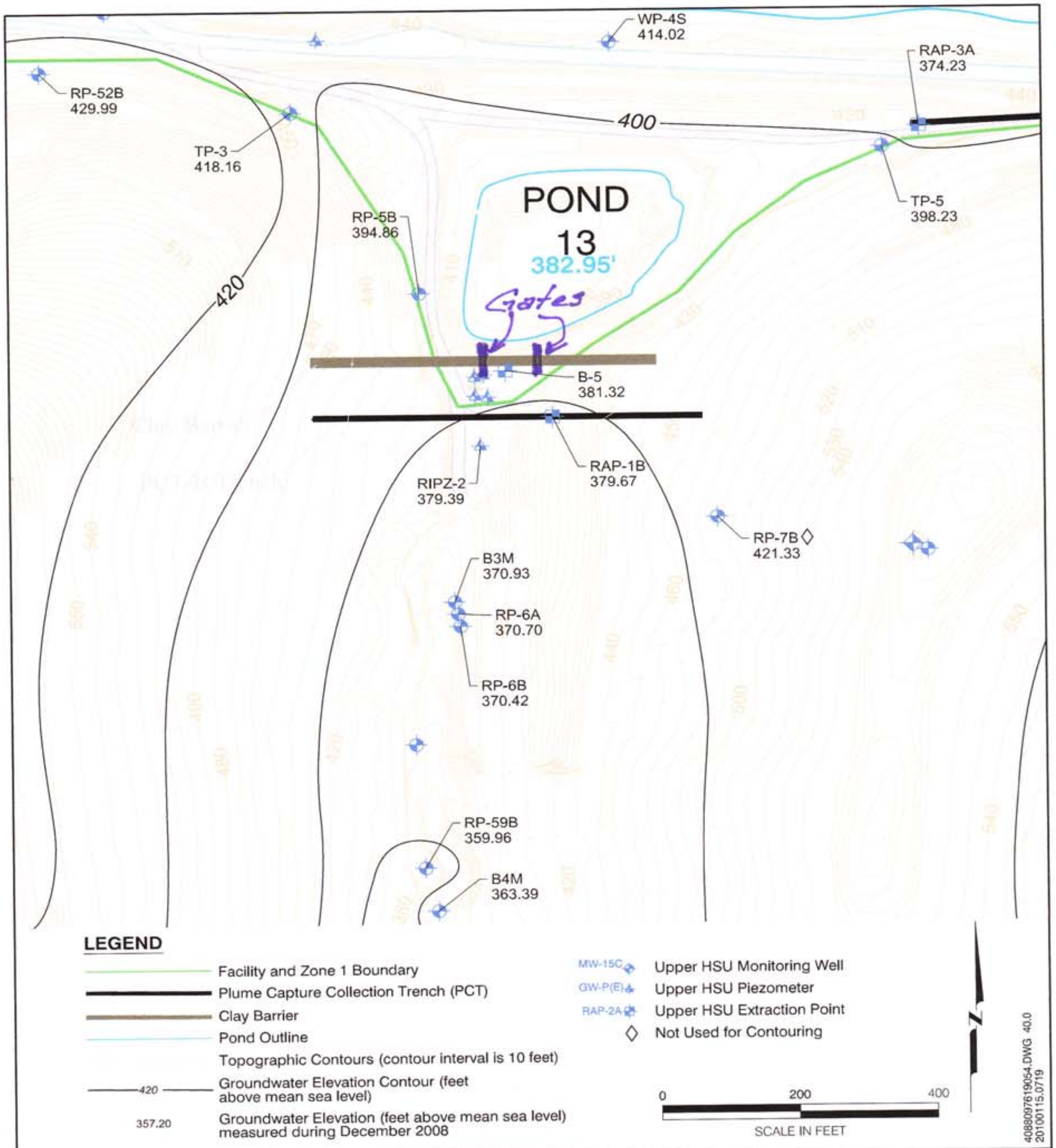
- PCT-B, (15 ft x 9 ft x 8 ft x 2 gates) ÷ 27 ft^3/yd^3 = 80 yd^3
- PCT-C, (25 ft x 9 ft x 8 ft x 4 gates) ÷ 27 ft^3/yd^3 = 265 yd^3
- **(80 yd^3 + 265 yd^3) x \$30/yd3 = \$10,350**

Impervious Fill

- PCT-B, (40ft x 8 ft x 12 ft x 2 gates) ÷ 27 ft^3/yd^3 = 284 yd^3
- PCT-C, (25 ft x 8 ft x 12 ft x 4 gates) ÷ 27 ft^3/yd^3 = 355 yd^3
- **(284 yd^3 + 355 yd^3) x \$35/yd3 = \$22,365**

Monitoring

Assume 3 – two well clusters at each of the 10 gates (clusters upgradient, in gate, and downgradient. Considering the lack of VOC contamination at the PRB locations, semi-annual sampling and analysis should be ample. Assume clusters with 5 foot screens at average depths of 40 and 50 feet.



Potentiometric Surface Contour Map
PCT-B Trench
December 2008
Draft Final Remedial Investigation
Casmalia, California

FIGURE
F-31

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	NAM	1/2010	WJF	1/2010

Fig 1

Owner ______ Unit ______
Plant ______
Project No. ______ File No. ______
Title PCT-B PRB

Computed By JEM
Date ______ 20 ______
Verified By ______
Date ______ 20 ______
Page ______ of ______

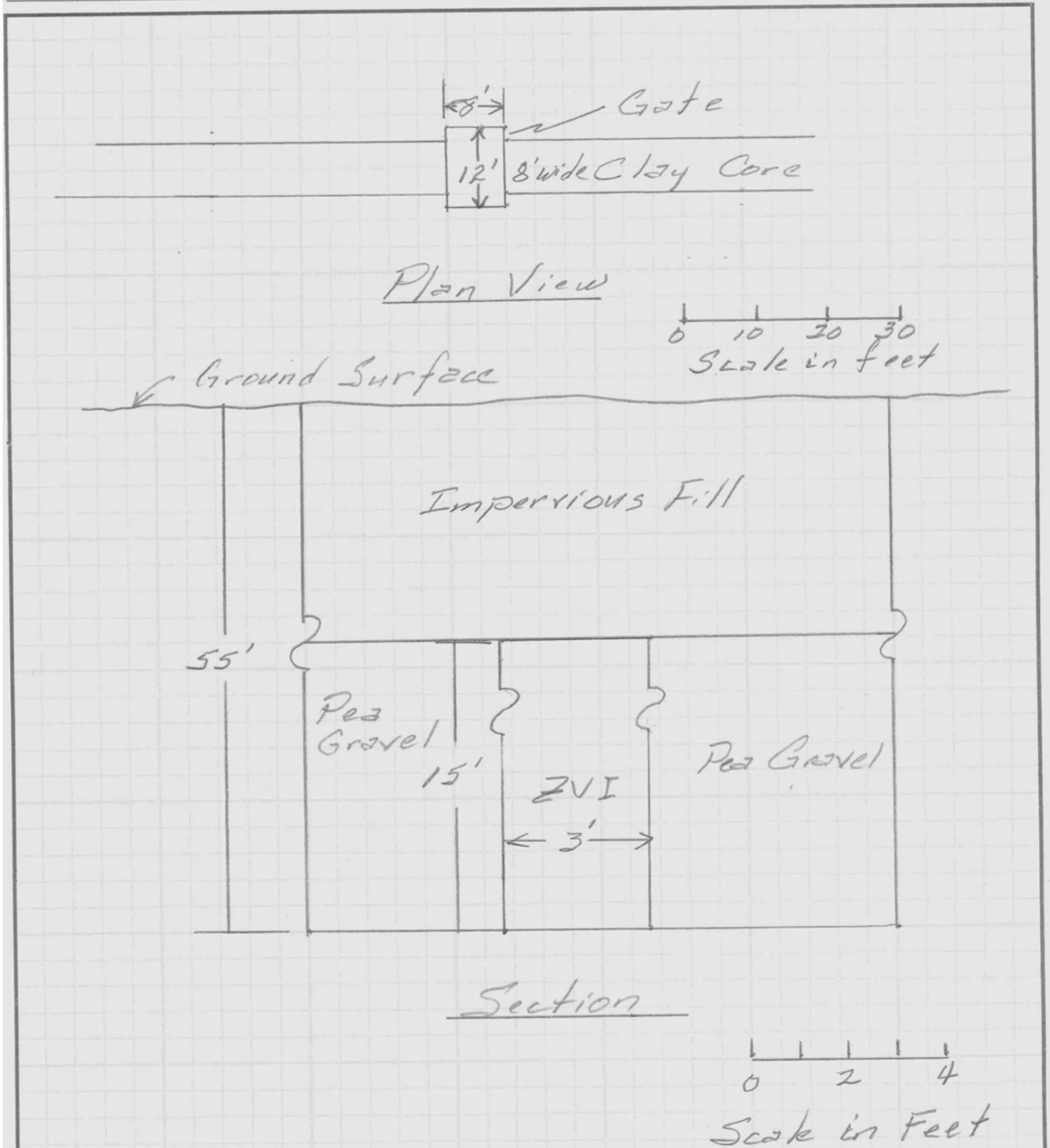
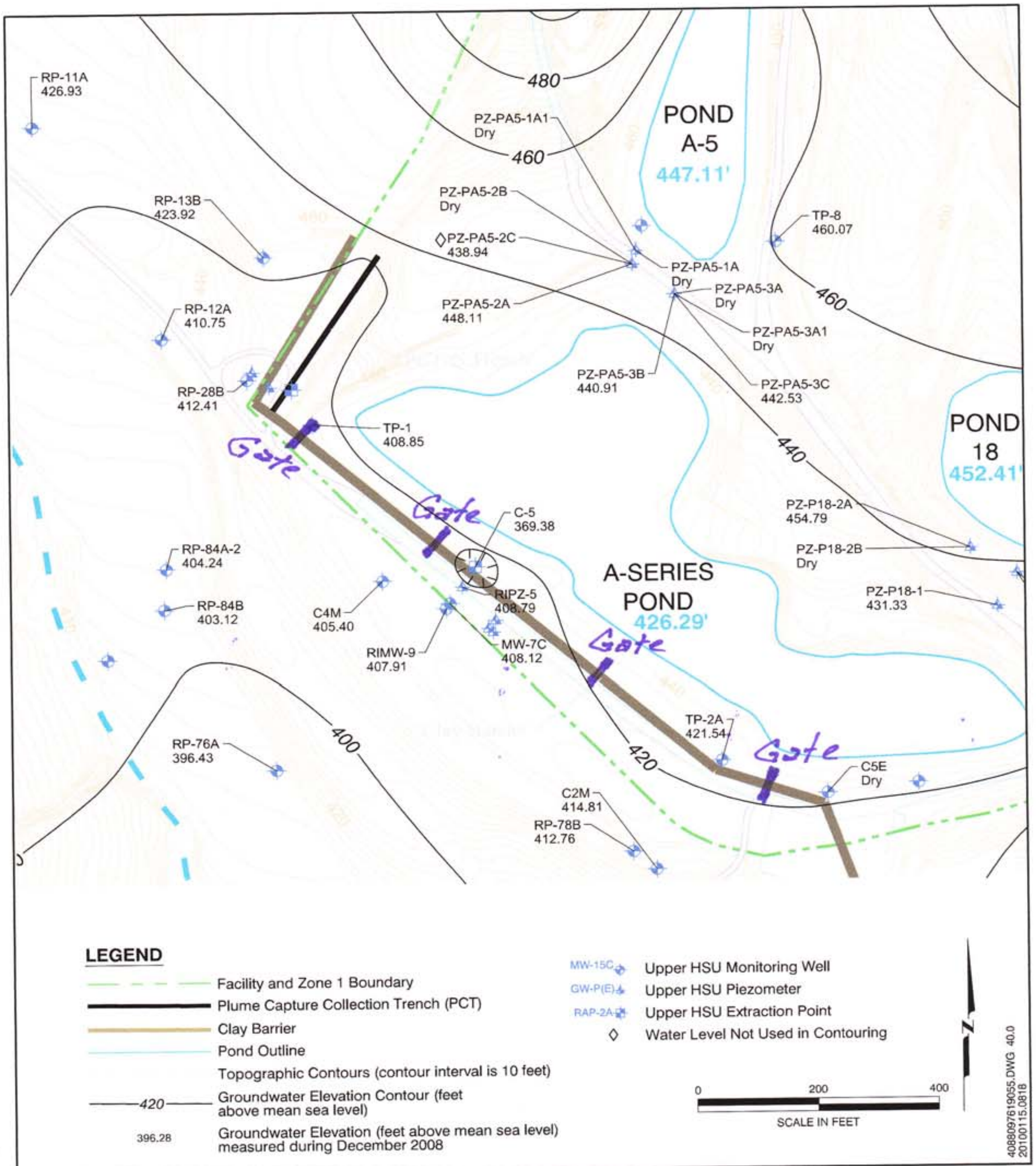


Fig 2



Potentiometric Surface Contour Map
PCT-C Trench
December 2008
Draft Final Remedial Investigation
Casmalia, California

FIGURE
F-32

DRAWN	JOB NUMBER	CHECKED	CHCK'D DATE	APPROVED	APPRV'D DATE
PCB	4088097619	NAM	1/2010	WJF	1/2010

Fig. 3

Owner

Plant Unit

Project No. File No.

Title PCT-C PRB

Computed By JEM

Date 20

Verified By

Date 20

Page of

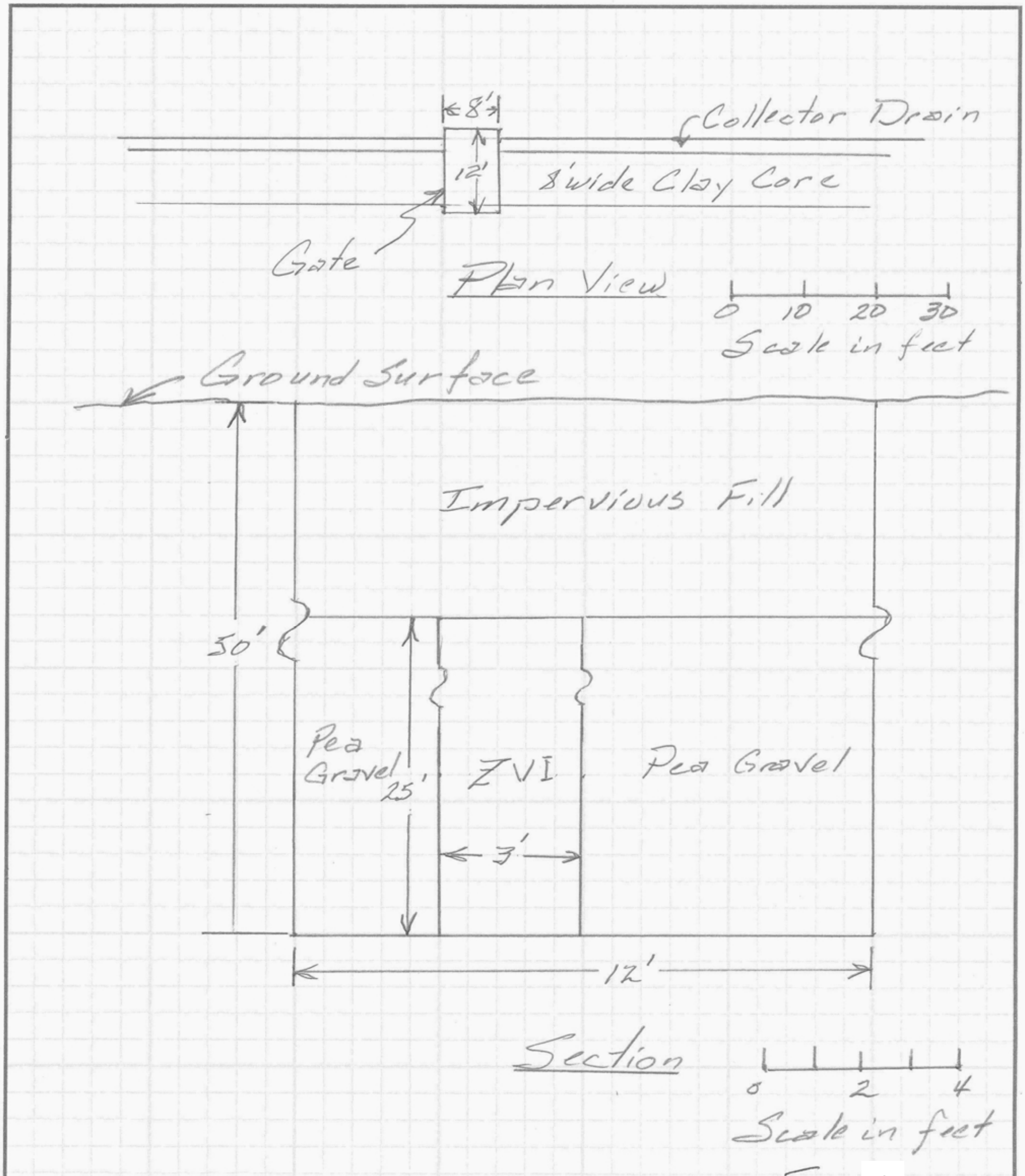


Fig 4