August 31, 2022

VIA ELECTRONIC MAIL ONLY

Mr. Jacky Luo
Bureau of Central Remedial Action
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway, 12th Floor
Albany, New York 12233

Re: RACER Trust – General Motors - Inland Fisher Guide (Registry #7-34-057) Site – NYSDEC Order on Consent Index #R7-0853-15-06 – Operable Unit 1 Proposed Remedial Action Plan Contingency Remedy Element Costs

Dear Mr. Luo:

Attached please find cost estimates developed to support the Draft Proposed Plan being developed by the New York State Department of Environmental Conservation (NYSDEC) and the United States Environmental Protection Agency (USEPA) Region 2 (collectively, NYSDEC and USEPA are referred to below as the Agencies) for Operable Unit 1 (OU1) of the General Motors - Inland Fisher Guide (GM-IFG) Site.

In its letter of August 8, 2022, RACER noted elements the Agencies have added to the remedial alternatives presented in the Draft Proposed Plan as compared to the June 2022 Revised FS. In order to reflect the costs for these elements, during a call on July 27, 2022 and in your subsequent email on August 9, 2022, the Agencies requested RACER's support in developing cost estimates for these elements. As documented in the Draft Proposed Plan Alternatives 2 through 5 include the following elements (not carried in the June 2022 Revised FS Alternatives 2, 3, 5, and 6[1]):

- Evaluation of sub-slab depressurization system (SSDS) for enhancement to remove source material under the building.
- Contingency in situ chemical oxidation (ISCO) if evaluation of targeted groundwater extraction does not address contamination under the building.
- Continency ISCO or groundwater extraction if evaluation of monitored natural attenuation (MNA) for off-property groundwater after five years of operation of the perimeter extraction system is not expected to achieve remedial goals within a reasonable timeframe.

Conceptual costs for these contingency elements are provided in Attachment 1 to this letter. The costs were developed based on the NYSDEC clarifications received in your email dated August 9, 2022 (see Attachment 2). Where possible, the conceptual costs make use of prior work (primarily IRMs) completed

[1] RACER acknowledges that the June 2022 Revised FS Alternative 4 was not included in the PRAP.

for OU1. In addition, as discussed during the biweekly call on August 24, 2022, there is a need to adjust the ISCO estimates for FS Alternatives 4, 5, and 6. The following table summarizes the updated costs:

FS Alternative (1)/Contingency	Total Capital Cost	Annual O&M Cost	Total PW Cost
Revised FS Alternative 4	$12,251,000	$233,300	$14,989,000
Revised FS Alternative 5	$ 6,349,000	$231,350	$ 9,063,000
Revised FS Alternative 6	$ 7,881,000	$231,350	$10,595,000
Contingency 1 (SVE)	$ 791,000	$ 44,400	$ 1,342,000
Contingency 2 (ISCO)	$ 4,034,000	$ 50,000	$ 4,165,000
Contingency 3a (ISCO)	$ 1,896,000	$ 50,000	$ 2,027,000
Contingency 3b (P&T)	$ 565,000	$ 13,100	$ 670,000
Contingency 3c (bio-barrier)	$ 668,000	$102,500	$ 958,000
Notes: (1) FS Alternative costs reflect updates to ISCO.			

RACER provides the following feedback regarding the NYSDEC conceptual approaches for consideration as it pertains to implementability and/or effectiveness of the approaches and potential for disruption of current building tenants.

Contingency #1 - *Possible enhancement to the existing SSDS to remove source material in the unsaturated soil beneath the former manufacturing building.*

- As documented in *Table 3-2 Screening and Evaluation of Remedial Technologies and Process Options for Soil* of the June 2022 Revised FS, soil vapor extraction (SVE) was screened out due to limited implementability and effectiveness in the low permeability soil at the site, the presence of subsurface utilities that would provide preferential pathways under the former manufacturing building, and subsurface heterogeneity. For these reasons SVE was not retained for consideration as a remedial technology for the site.
- Installation in 2010/2011 of the current horizontal boring-deployed SSDS required several excavations through the manufacturing building floor slab. Thus, RACER notes that horizontal boring technology may be disruptive to building tenants.
- Pre-design activities would be required to refine the area of impacted soil under the former manufacturing building prior to design of a soil vapor extraction system. These activities would, depending on ultimate scope, likely be disruptive to building tenants.

Contingency #2 - *If it is determined that targeted groundwater extraction would not achieve sufficient capture to address the contamination beneath the building in a reasonable timeframe, then ISCO would be implemented.*

- As noted above for Contingency #1, installation in 2011 of the current horizontal boring-deployed SSDS required several excavations through the manufacturing building floor slab. Thus, RACER notes that installation of 10 horizontal borings would be disruptive to building tenants.
- Also as noted above for Contingency #1, pre-design activities would be required to refine the area of impacted groundwater under the former manufacturing building prior to design of an in-situ treatment remedy. These activities would likely be disruptive to building tenants.
- The presence of abandoned storm and process sewers beneath the former manufacturing building would limit the implementability and effectiveness of in situ treatment under the building (i.e., these would present preferential pathways for the injected amendment).

- Post injection evaluation of groundwater conditions would require installation of new wells, which would likely be disruptive to building tenants.

Contingency #3 - *If it is determined that natural attenuation would not achieve remedial goals for the off-property groundwater within a reasonable timeframe, then groundwater extraction and treatment and ISCO would be evaluated, and the most appropriate remedial option would be implemented.*

- Potential off-property groundwater impacts are in the dissolved phase. ISCO has not been proven to be an effective treatment technology for a dissolved plume. For this reason, costs have also been provided for a bio-barrier, which may be a more appropriate technology for this area, should in situ treatment be found to be warranted. Biological treatment was a retained technology in the 2022 FS Report.
- The injection of treatment amendment to the deep groundwater may be ineffective due to low permeability soils, and heterogeneity would need to be considered during remedial design.
- ISCO is not compatible with potential existing natural attenuation
- Proximity of Ley Creek and artesian conditions observed in off-property groundwater monitoring wells at the Ley Creek PCB Dredgings Site will need to be considered when designing and implementing injections of treatment amendment for off-property groundwater.
- Given that this contingency is to be considered following a monitored natural attenuation study, RACER recommends that the in situ treatment technology not be specified, as this may be detrimental to biological processes should these be further proven to exist. In addition, biological treatment or other newer technologies may be more appropriate at the time of this evaluation.

It is RACER's position that the evaluations cited in the Draft Proposed Plan to be conducted to evaluate whether contingent remedy elements are to be implemented should include evaluation of the effectiveness in achieving the groundwater remedial action objective related to groundwater restoration. Specifically, should the timeframe to achieve groundwater restoration (and associated duration of the perimeter groundwater collection and treatment operation) not be significantly reduced, the significant costs associated with the contingency remedies may not be justified, and thus, a cost-effectiveness criterion should also be included in this evaluation.

As discussed in its August 8, 2022 letter, RACER maintains that the components of Alternative 3 in the June 2022 Revised FS and the Draft Proposed Plan (perimeter and targeted groundwater extraction and treatment with institutional controls) are protective of human health and the environment as it pertains to deep groundwater, and RACER sees no sufficient new bases in the Draft Proposed Plan to support the added costs associated with other alternatives ($1.7 to $11 million more in capital costs than FS Alternative 3) or the added contingency elements (that would add $6.2 to $7.5 million in capital costs to each alternative) to warrant preference or addition of these over Alternative 3 (capital cost: $1.2 million) as presented in the June 2022 FS.

RACER provides the attached additional minor comments on the Draft Proposed Plan remedy descriptions for your consideration. These are provided in Attachment 3.

As noted above, the unit pricing for ISCO was updated during the development of the cost estimates for the contingent remedies. For consistency, the FS cost estimates for Alternatives 4, 5, and 6 that included ISCO as remedial elements have also been accordingly updated. Updated cost estimate tables for these alternatives are provided as Attachment 4.

RACER looks forward to working with the you in the selection of a protective and cost-effective remedy for OU1.

Sincerely,

M. Brendan Mullen, P.E., BCEE
Cleanup Manager, NY

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cc: NYSDEC (Jason Pelton, via electronic mail)
USEPA (Patricia Pierre and Joel Singerman, both via electronic mail)
Ramboll (Brad Kubiak and Clare Leary, both via electronic mail)

Attachment 1

Conceptual Cost Estimates and Assumptions

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ENVIRONMENT & HEALTH

Table C1
GM - IFG OU1 Proposed Plan Contingency Remedy
Contingency 1

Enhancement to the existing sub-slab depressurization system (SSDS)

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
DIRECT CAPITAL CONSTRUCTION COSTS					
General Conditions	2	mo	$10,000	$20,000	Trailer, electrical and maintenance
SSDS System Enhancement Evaluation	1	ls	$35,000	$35,000	
Identify whether enhancements to the SSDS system could effectively improve VOC source removal in the unsaturated soil beneath the former manufacturing building					
Pre-Design Investigation					Adapted from June 2022 FS Costs
Structure and Process Sewer Evaluation	1	ls	$4,000	$4,000	Evaluate available record drawings of foundation and slab construction and sub-slab utilities
Subsurface VOC delineation					
Work Plan	1	ls	$5,000	$5,000	Letter WP
MIP-HTP Borings and Soil Borings	1	ls	$25,500	$25,500	Track mounted Geoprobe rig and MIHPt system; 10 soil borings and 20 MIP borings to approx. 15 ft bgs
Soil and Groundwater Sampling	1	ls	$14,000	$14,000	20 soil samples (VOCS, TOC, % moisture), 10 groundwater samples (VOCs)
Survey	1	ls	$1,700	$1,700	
Investigation Derived Wastes					
Characterization	1	ls	$1,100	$1,100	Sample collection and analysis of 1 soil sample
Transportation and Disposal	1	ls	$1,000	$1,000	5 drums
Reporting	1	ls	$7,500	$7,500	
Subtotal				$59,800	
Escalation Rate			9%		*Based on ENR CCI June 2021 to August 2022*
Escalated Subtotal				**$65,029**	2022 Dollars
SSDS Enhancement (Soil Vapor Extraction (SVE))					
Horizontal SVE piping	1	ls	$185,000	$185,000	4-inch perf. PVC, 500 LF installed via directional boring. Adapted from 2010 Quote, Escalated based on ENR CCI Oct 2010 to August 2022.
Off-gas Treatment System	1	ls	$145,000	$145,000	Package system: 350 SCFM at 50" WC, knockout tank, and 2 1000lb carbon units.
Installation (Electrical, Piping, Rigging, Startup)	1	ls	$105,000	$105,000	
Modeling	1	ls	$4,000	$4,000	Screening level modeling, assuming carbon off-gas treatment.
Permit	1	ls	$6,000	$6,000	
Subtotal				$445,000	
TOTAL DIRECT CAPITAL COST				**$565,029**	2022 Dollars
Engineering/Design/Oversight			15%	$84,754	
Legal			5%	$28,251	
Contingency			20%	$113,006	
TOTAL ALTERNATIVE CAPITAL COST (rounded)				**$791,000**	2022 Dollars
OPERATION AND MAINTENANCE COSTS					
Annual Costs (Years 1-30)					
SVE Operation and Maintenance					
Includes the following:	1	ls	$32,400	$32,400	based on current SSDS system O&M
Monitoring/Inspection for Contingency SVE (System 3); Weekly labor and reporting					
Labor, Materials and analytical (as needed); Repair/replacement;					
SVE power					
Off-gas treatment	1	ls	$12,000	$12,000	2000 lbs vapor phase activated carbon/yr at $3.5/lb to replace and $5K in labor
TOTAL ANNUAL O&M COST				**$44,400**	

PRESENT WORTH ANALYSIS (YEARS 1-30)		**Discount**		
Cost Type	**Total Cost**	**Factor (7%)**	**Cost Per Yr**	**Present Value**
Capital Cost - Year 0	$791,000	1.000	$791,000	$791,000
Annual O&M - Years 1-30		12.4081	$44,400	$550,900
TOTAL PROJECT PRESENT WORTH (rounded)				**$1,342,000**

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Table C2
GM - IFG OU1 Proposed Plan Contingency Remedy
Contingency 2

ISCO Evaluation and Implementation (Former Manufacturing Building)

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
DIRECT CAPITAL CONSTRUCTION COSTS					
General Conditions	6	mo	$10,000	$60,000	Trailer, electrical and maintenance
Evaluation of targeted Groundwater PDI results	1	ls	$20,000	$20,000	
Identify whether PDI results demonstrate sufficient capture to address elevated VOCs beneath the former manufacturing building in reasonable timeframe					
Pre-Design Investigation					Adapted from June 2022 FS Costs
Structure and Process Sewer Evaluation	1	ls	$4,000	$4,000	Evaluate available record drawings of foundation and slab construction and sub-slab utilities
Subsurface VOC delineation					
Work Plan	1	ls	$5,000	$5,000	Letter WP
MIP-HTP Borings and Soil Borings	1	ls	$25,500	$25,500	Track mounted Geoprobe rig and MIHPt system; 10 soil borings and 20 MIP borings to approx. 15 ft bgs
Soil and Groundwater Sampling	1	ls	$14,000	$14,000	20 soil samples (VOCS, TOC, % moisture), 10 groundwater samples (VOCs)
Survey	1	ls	$1,700	$1,700	
Investigation Derived Wastes					
Characterization	1	ls	$1,100	$1,100	Sample collection and analysis of 1 soil sample
Transportation and Disposal	1	ls	$1,500	$1,500	8 drums
Reporting	1	ls	$7,500	$7,500	
Subtotal				$60,300	
Escalation Rate			9%		*Based on ENR CCI June 2021 to August 2022*
Escalated Subtotal				**$65,573**	2022 Dollars
Residual Source Area Treatment (assumes "hot zone" 25% of total currently identified area)					
Bench-Scale Treatability Study (Pre-design)	1	ls	$50,000	$50,000	
Install injection well via directional drill - 15-ft depth	10	ea	$185,000	$1,850,000	4-inch perf. PVC, 500 LF installed via directional boring. Adapted from 2010 Quote, Escalated based on ENR CCI Oct 2010 to August 2022.
Chemical oxidant (including injection)	9,722	cy	$84	$816,667	Adapted from PRAP Alt 6 under building, Rnd 1: 100% inj; Rnd 2 = 75% inj
Post-Injection Monitoring Wells	1	ls	$19,000	$19,000	5 wells.
Subtotal				$2,735,667	
TOTAL DIRECT CAPITAL COST				**$2,881,239**	2022 Dollars
Engineering/Design/Oversight			15%	$432,186	
Legal			5%	$144,062	
Contingency			20%	$576,248	
TOTAL ALTERNATIVE CAPITAL COST (rounded)				**$4,034,000**	2022 Dollars
OPERATION AND MAINTENANCE COSTS					
Annual Costs (Years 1-3)					
Post-injection groundwater monitoring	1	ls	$50,000	$50,000	5 wells, baseline CSIA, quarterly sampling, analytical (VOCs, TOC, ethenes, inorganics), reporting.
TOTAL ANNUAL O&M COST				**$50,000**	

PRESENT WORTH ANALYSIS (YEARS 1-30)		**Discount**		
Cost Type	**Total Cost**	**Factor (7%)**	**Cost Per Yr**	**Present Value**
Capital Cost - Year 0	$4,034,000	1.000	$4,034,000	$4,034,000
Annual O&M - Years 1-3		2.6236	$50,000	$131,200
TOTAL PROJECT PRESENT WORTH (rounded)				**$4,165,000**

Table C3a
GM - IFG OU1 Proposed Plan Contingency Remedy
Contingency 3a

ISCO Evaluation and Implementation (Off-property Groundwater)

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
DIRECT CAPITAL CONSTRUCTION COSTS					
General Conditions	2	mo	$10,000	$20,000	Trailer, electrical and maintenance
MNA Evaluation (Off-property Groundwater)	1	ls	$30,000	$30,000	
Identify whether natural attenuation is suitable to address off-property groundwater contamination (following operation of perimeter groundwater extraction system for a period up to five years)					
Technology Evaluation - GW Extraction and Treatment or In Situ Treatment	1	ls	$40,000	$40,000	
Pre-Design Investigation					Adapted from June 2022 FS Costs
Subsurface VOC delineation					
Work Plan	1	ls	$5,000	$5,000	Letter WP
MIP-HTP Borings and Soil Borings	1	ls	$50,000	$50,000	Track mounted Geoprobe rig and MIHPt system; 5 soil borings and 11 MIP borings to approx. 25-35 ft bgs
Soil and Groundwater Sampling	1	ls	$14,000	$14,000	5 soil samples (VOCS, TOC, % moisture), 5 groundwater samples (VOCs)
Survey	1	ls	$1,800	$1,800	
Investigation Derived Wastes					
Characterization	1	ls	$1,100	$1,100	Sample collection and analysis of 1 soil sample
Transportation and Disposal	1	ls	$1,500	$1,500	8 drums
Reporting	1	ls	$7,500	$7,500	
Subtotal				$80,900	
Escalation Rate			9%		*Based on ENR CCI June 2021 to August 2022*
Escalated Subtotal				**$87,974**	2022 Dollars
Groundwater Treatment (downgradient of OBG-23D)					
***In Situ* Treatment (ISCO)**					2010 Dollars
Bench-Scale Treatability Study (Pre-design)	1	ls	$50,000	$50,000	For both OBG-23D and OBG-6D/7D areas
Install injection well points (35-ft depth)	60	ea	$735	$44,100	Transect layout (60 points); 1-inch diameter PVC; assumes 10-ft of screen
Chemical oxidant (including injection)	6,179	cy	$84	$519,069	Adapted from 2022 FS Alt 5 (1/4 volume for NE area); Rnd 1: 100% inj; Rnd 2 = 75% in; unit price updated.
Subtotal				$613,169	
Groundwater Treatment (downgradient of OBG-6D/7D)					
***In Situ* Treatment (ISCO)**					2010 Dollars
Install injection well points (35-ft depth)	60	ea	$735	$44,100	transect layout (60 points); 1-inch diameter PVC; assumes 10-ft of screen
Chemical oxidant (including injection)	6,179	cy	$84	$519,069	Adapted from 2022 FS Alt 5 (1/4 volume for NE area); Rnd 1: 100% inj; Rnd 2 = 75% in; unit price updated.
Subtotal				$563,169	
TOTAL DIRECT CAPITAL COST				**$1,354,313**	2022 Dollars
Engineering/Design/Oversight			15%	$203,147	
Legal			5%	$67,716	
Contingency			20%	$270,863	
TOTAL ALTERNATIVE CAPITAL COST (rounded)				**$1,896,000**	2022 Dollars
OPERATION AND MAINTENANCE COSTS					
Annual Costs (Years 1-3)					
Post-injection groundwater monitoring	1	ls	$50,000	$50,000	5 wells, baseline CSIA, analytical (VOCs, TOC, ethenes, inorganics) 4 rounds per year, reporting.
TOTAL ANNUAL O&M COST				**$50,000**	

PRESENT WORTH ANALYSIS (YEARS 1-30)		**Discount**		
Cost Type	**Total Cost**	**Factor (7%)**	**Cost Per Yr**	**Present Value**
Capital Cost - Year 0	$1,896,000	1.000	$1,896,000	$1,896,000
Annual O&M - Years 1-3		2.6236	$50,000	$131,200
TOTAL PROJECT PRESENT WORTH (rounded)				**$2,027,000**

Table C3b
GM - IFG OU1 Proposed Plan Contingency Remedy
Contingency 3b

Groundwater Extraction and Treatment Evaluation and Implementation (Off-property Groundwater)

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
DIRECT CAPITAL CONSTRUCTION COSTS					
General Conditions	2	mo	$10,000	$20,000	Trailer, electrical and maintenance
MNA Evaluation (Off-property Groundwater)	1	ls	$30,000	$30,000	
Identify whether natural attenuation is suitable to address off-property groundwater contamination (following operation of perimeter groundwater extraction system for a period up to five years)					
Technology Evaluation - GW Extraction and Treatment or In Situ Treatmen	1	ls	$40,000	$40,000	
Pre-Design Investigation					Adapted from June 2022 FS Costs
Subsurface VOC delineation					
Work Plan	1	ls	$5,000	$5,000	Letter WP
MIP-HTP Borings and Soil Borings	1	ls	$50,000	$50,000	Track mounted Geoprobe rig and MIHPt system; 5 soil borings and 11 MIP borings to approx. 25-35 ft bgs
Soil and Groundwater Sampling	1	ls	$14,000	$14,000	5 soil samples (VOCS, TOC, % moisture), 5 groundwater samples (VOCs)
Survey	1	ls	$1,800	$1,800	
Test and Observation Well Installation/Development	1	ls	$30,200	$30,200	1 test well and 3 observation wells
Yield Test	1	ls	$3,800	$3,800	On test well
Pumping Test	1	ls	$30,000	$30,000	72 hours and 12 hour recovery; 1 groundwater sample after test; Water assumed to be disposed of at existing treatment plant
Investigation Derived Wastes					
Characterization	1	ls	$1,100	$1,100	Sample collection and analysis of 1 soil sample
Transportation and Disposal	1	ls	$1,500	$1,500	8 drums
Reporting	1	ls	$7,500	$7,500	
Subtotal				$144,900	
Escalation Rate			9%		*Based on ENR CCI June 2021 to August 2022*
Escalated Subtotal				**$157,570**	2022 Dollars
Targeted Groundwater Extraction (downgradient of OBG-23D)					
Install 4-inch diameter recovery well to 35-ft	1	ea	$15,700	$15,700	Includes casing, screen, development, manhole, pump, and pitless adaptor
Discharge Piping	600	lf	$60	$36,000	2" HDPE pipe, valves, and fittings; includes excavation, backfill, and lawn restoration
Electrical Service; conduit	600	lf	$30	$18,000	Excavation, backfill, conduit, hand holes, and cable
Electrical Connection	1	ls	$10,000	$10,000	Assumes connection to perimeter system; inc. VFDs and panelboard
Subtotal				$79,700	
Escalation Rate			9%		*Based on ENR CCI June 2021 to August 2022*
Escalated Subtotal				**$86,669**	2022 Dollars
Targeted Groundwater Extraction (downgradient of OBG-6D/7D)					
Install 4-inch diameter recovery well to 35-ft	1	ea	$15,700	$15,700	Includes casing, screen, development, manhole, pump, and pitless adaptor
Discharge Piping	200	lf	$60	$12,000	2" HDPE pipe, valves, and fittings; includes excavation, backfill, and lawn restoration
Electrical Service; conduit	200	lf	$30	$6,000	Excavation, backfill, conduit, hand holes, and cable
Electrical Connection	1	ls	$10,000	$10,000	Assumes connection to perimeter system; inc. VFDs and panelboard
Factory Ave Crossing	1	ls	$20,000	$20,000	Mob/demob, asphalt demo, disposal, repair and traffic control
Subtotal				$63,700	
Escalation Rate			9%		*Based on ENR CCI June 2021 to August 2022*
Escalated Subtotal				**$69,270**	2022 Dollars

Table C3b
GM - IFG OU1 Proposed Plan Contingency Remedy
Contingency 3b

Groundwater Extraction and Treatment Evaluation and Implementation (Off-property Groundwater)

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
TOTAL DIRECT CAPITAL COST				**$403,509**	2022 Dollars
Engineering/Design/Oversight			15%	$60,526	
Legal			5%	$20,175	
Contingency			20%	$80,702	
TOTAL ALTERNATIVE CAPITAL COST (rounded)				**$565,000**	2022 Dollars
OPERATION AND MAINTENANCE COSTS					
Annual Costs (Years 1-30)					
Well/Pump Maintenance	2	ea	$1,200	$2,400	2 recovery wells, 2 pumps
Pump Replacement	2	ea	$2,100	$4,200	Submersible well pumps
Water treatment	1	ls	$1,500	$1,500	1% increment over current water treatment costs.
TOTAL ANNUAL O&M COST				**$8,100**	
Periodic Costs (Years 10, 20, 30)					
Well rehab	2	ea	$2,500	$5,000	Surge/pump wells every 10 years

PRESENT WORTH ANALYSIS (YEARS 1-30)		**Discount**		
Cost Type	**Total Cost**	**Factor (7%)**	**Cost Per Yr**	**Present Value**
Capital Cost - Year 0	$565,000	1.000	$565,000	$565,000
Annual O&M - Years 1-30		12.4081	$8,100	$100,500
Periodic Costs - Years 10, 20, 30		0.8981	$5,000	$4,500
TOTAL PROJECT PRESENT WORTH (rounded)				**$670,000**

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Table C3c
GM - IFG OU1 Proposed Plan Contingency Remedy
Contingency 3c

Bio Barrier Evaluation and Implementation (Off-property Groundwater)

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
DIRECT CAPITAL CONSTRUCTION COSTS					
General Conditions	2	mo	$10,000	$20,000	Trailer, electrical and maintenance
MNA Evaluation (Off-property Groundwater)	1	ls	$30,000	$30,000	
Identify whether natural attenuation is suitable to address off-property groundwater contamination (following operation of perimeter groundwater extraction system for a period up to five years)					
Technology Evaluation - GW Extraction and Treatment or In Situ Treatment	1	ls	$40,000	$40,000	
Pre-Design Investigation					Adapted from June 2022 FS Costs
Subsurface VOC delineation					
Work Plan	1	ls	$5,000	$5,000	Letter WP
MIP-HTP Borings and Soil Borings	1	ls	$50,000	$50,000	Track mounted Geoprobe rig and MIHPt system; 5 soil borings and 11 MIP borings to approx. 25-35 ft bgs
Soil and Groundwater Sampling	1	ls	$14,000	$14,000	5 soil samples (VOCS, TOC, % moisture), 5 groundwater samples (VOCs)
Survey	1	ls	$1,800	$1,800	
Investigation Derived Wastes					
Characterization	1	ls	$1,100	$1,100	Sample collection and analysis of 1 soil sample
Transportation and Disposal	1	ls	$1,500	$1,500	8 drums
Reporting	1	ls	$7,500	$7,500	
Subtotal				$80,900	
Escalation Rate			9%		*Based on ENR CCI June 2021 to August 2022*
Escalated Subtotal				**$87,974**	2022 Dollars
Groundwater Treatment (downgradient of OBG-23D)					Adapted from 2021 Remedial Options Assessment.
Bio Barrier Installation/Implementation					
Treatability Testing (Pre-design)	1	ls	$75,000	$75,000	For both OBG-23D and OBG-6D/7D areas
Injection well and monitoring point installation	9	ea	$2,800	$25,200	6 injection wells at 15 ft spacing, 30-35 ft deep and 3 monitoring points
Initial Amendment Injection	1	ls	$75,000	$75,000	1 injection event; includes manifold/equipment and injection amendment (EVO/lactate)
Subtotal				$175,200	
Escalation Rate			9%		*Based on ENR CCI June 2021 to August 2022*
Escalated Subtotal				**$190,519**	2022 Dollars
Groundwater Treatment (downgradient of OBG-6D/7D)					Adapted from 2021 Remedial Options Assessment.
Bio Barrier Installation/Implementation					
Injection well and monitoring point installation	9	ea	$2,800	$25,200	6 injection wells at 15 ft spacing, 30-35 ft deep and 3 monitoring points
Initial Amendment Injection	1	ls	$75,000	$75,000	1 injection event; includes manifold/equipment and injection amendment (EVO/lactate)
Subtotal				$100,200	
Escalation Rate			9%		*Based on ENR CCI June 2021 to August 2022*
Escalated Subtotal				**$108,961**	2022 Dollars
TOTAL DIRECT CAPITAL COST				**$477,455**	2022 Dollars
Engineering/Design/Oversight			15%	$71,618	
Legal			5%	$23,873	
Contingency			20%	$95,491	
				$668,000	2022 Dollars
OPERATION AND MAINTENANCE COSTS					
Periodic (Yr 3, 6, 9, 12, 15)					
Periodic Amendment Reinjection	1	ls	$90,000	$90,000	Reinjection every 3 years; includes labor and amendment cost; assume use of existing injection wells and equipment/manifold ; 60% of original cost each area.
Post-injection groundwater monitoring	1	ls	$12,500	$12,500	5 wells, baseline CSIA, analytical (VOCs, TOC, ethenes, inorganics), 1 round per year, reporting.
TOTAL ANNUAL O&M COST (Updated 2022)				**$102,500**	

PRESENT WORTH ANALYSIS (YEARS 1-30)		**Discount**		
Cost Type	**Total Cost**	**Factor (7%)**	**Cost Per Yr**	**Present Value**
Capital Cost - Year 0	$668,000	1.000	$668,000	$668,000
Periodic Costs - Years 3, 6, 9, 12, 15		2.83	$102,500	$290,300
TOTAL PROJECT PRESENT WORTH (rounded)				**$958,000**

Attachment 2

Agency Conceptual Clarification on Contingency Remedy Elements

From:	Luo, Jacky X (DEC)
To:	Brendan Mullen; Pelton, Jason M (DEC); Pierre, Patricia; Singerman, Joel
Cc:	Clare Leary; Sarah M Sauda
Subject:	RE: OU1 PRAP comments in RLSO and LOT
Date:	Tuesday, August 9, 2022 10:00:34 AM
Attachments:	image001.png

Brendan:

As we discussed on Wednesday July 27, 2022 we would appreciate Ramboll's assistance in developing feasibility study-level cost estimates for the following three contingencies noted below that have been included in the alternatives in the draft GM OU1 IFG Proposed Plan. Please note that the details provided for these contingencies are highly conceptual, but provide some definition for cost-estimating purposes.

1) **Contingency #1** – **Possible enhancement to the existing subslab depressurization system to remove source material in the unsaturated soil beneath the former manufacturing building.** Evaluation of the SSDS system. To avoid disruptions to the building occupants, we are assuming horizontal directional drilling techniques can be used to construct a third soil vapor extraction point/lateral similar to System #1 of the current SSDS as follows:
    - Using horizontal directional drilling (HDD) techniques, drill a boring beneath the building parallel to the existing SSDS trench.
    - Construct a horizontal soil vapor extraction well that is approximately 500 feet in length (the existing System #1 is 540 linear feet).
    - Construct a soil vapor extraction and treatment system on the exterior of the west-side of the site building.
    - Assume a 30-year operational period for the system.

2) **Contingency #2** - **If it is determined that targeted groundwater extraction would not achieve sufficient capture to address the contamination beneath the building in a reasonable timeframe, then ISCO would be implemented.** Once again, to avoid disruptions to the building occupants and for cost estimating purposes, we are assuming horizontal directional drilling techniques can be used to install ISCO injection wells to introduce oxidants into the groundwater beneath the building. For this contingency, we are assuming 5-10 HDD borings drilled at an approximately 50-foot spacing along the south-side of the building to introduce the ISCO beneath the central part of the building.

3) **Contingency #3** – **If it is determined that natural attenuation would not achieve remedial goals for the off-property groundwater within a reasonable timeframe, then groundwater extraction and treatment and ISCO would be evaluated, and the most appropriate remedial option would be implemented.** For this contingency we are assuming that either three off-property groundwater extraction wells would be installed to supplement the on-property groundwater extraction and treatment system or a series of ISCO injection points would be established along two to three transects immediately downgradient of the locations where we continue to observe high concentrations of site contaminants in site groundwater (i.e., OBG-6S/D, OBG-7S/D, and OBG-23S/D). For cost estimating purposes for the extraction wells, the water would be treated at the existing water treatment plant and for ISCO, the transects would

be focused (100 to 200 feet in length) in these areas and injections would be on approximate 10-20 foot intervals. One set of ISCO transects would be established downgradient of the OBG-23S/D area and a second set of ISCO transects would be established downgradient of the OBG-6S/D and OBG-7S/D area. For purposes of identifying a cost for this contingency, the more cost option would be utilized.

It would be appreciated if the basis for these costs could be provided in a letter report.

Thanks
Jacky

From: Brendan Mullen <bmullen@racertrust.org>
Sent: Monday, August 8, 2022 12:37 PM
To: Luo, Jacky X (DEC) <Jacky.Luo@dec.ny.gov>; Pelton, Jason M (DEC) <jason.pelton@dec.ny.gov>; Pierre, Patricia <Pierre.Patricia@epa.gov>; Singerman, Joel <Singerman.Joel@epa.gov>
Cc: Clare.Leary@ramboll.com; Sarah.Sauda@ramboll.com; Brad Kubiak <Brad.Kubiak@ramboll.com>; Carl Garvey <cgarvey@racertrust.org>; Sheen, Margaret A (DEC) <margaret.sheen@dec.ny.gov>; Argie Cirillo (Cirillo.Argie@epamail.epa.gov) (Cirillo.Argie@epamail.epa.gov) <Cirillo.Argie@epamail.epa.gov>; 'doyle.james@epa.gov' <doyle.james@epa.gov>
Subject: OU1 PRAP comments in RLSO and LOT

Jacky:
As discussed, attached are RACER Trust's comments on the Draft Proposed Plan…we welcome your review and are happy to respond to any questions you may have. Our goal is help in the selection of a fully protective, defensible, and cost-effective remedy. Also as discussed, we agree that a focused call regarding the remedial alternative elements is necessary before the draft Proposed Plan is provided to the public. We will make availability as a priority this week for a call on these critical elements.

You will also see I have included a letter for the record describing our concerns with the new elements added in alternatives in the Draft Proposed Plan as compared to the 2022 Revised FS, and our thoughts regarding the draft preferred remedy. In particular, we maintain that the limited shallow groundwater detections are adequately addressed by monitoring and ICs per Alternative 3 of the 2022 Revised FS. Therefore, the addition of $1.65M to address sporadic VOC and PCB concentrations that do not appear to be migrating is not we feel cost-effective vs MNA.

Further, we maintain that addition of ISCO in Alts 4 and 5 is not more protective than Alts 2 and 3 (that include targeted and perimeter collection and treatment and ICs). The ISCO treatment will not provide meaningful improvement in the likelihood of GW attainment of RAOs within the 30 yr FS evaluation timeframe and the treatment will not change the need for perimeter collection/treatment or groundwater ICs within 30 yrs. In essence, treatment of elevated VOC areas does not provide additional protectiveness to justify the added expenditures involved. Thus, failure to significantly alter the groundwater impact outcome does not we feel justify the added in-situ treatment included under Alt 4 ($8.27M) as compared to Alt 3 ($4M).

Finally, as the agencies are evidently moving towards imminently sharing the PRAP publicly, the Trust is concerned as to how to harmonize, on the one hand, its funding of both OUs through RD completion by means of the remaining EA account balance and, secondly, its outstanding NYSDEC AOC obligations.

We would like to expand the above-referenced conversation to afford all parties the opportunity to weigh in on the critical funding/obligation disconnect.

Thank you, Jacky, for the opportunity to offer input on the PRAP and we stand ready to assist you in driving this process toward timely completion,

Brendan Mullen
Cleanup Manager (NY)

201.247.4890
www.racertrust.org

Attachment 3
Additional Considerations for Alternative Descriptions in the Draft Proposed Plan Text

Alternative 2 – Perimeter Shallow Groundwater Collection and Treatment, Perimeter and Targeted Deep Groundwater Extraction and Treatment, and Soil Excavation with Off-Site Disposal

This alternative includes the construction of a perimeter shallow groundwater collection trench and the installation of deep groundwater extraction wells along the northern perimeter of the facility property. These two systems would collect contaminated groundwater and prevent further off-property migration. Alternative 2 also includes targeted deep groundwater extraction to address the contamination beneath and immediately northeast of the former manufacturing building; excavation and off-site disposal of surface soil exhibiting concentrations greater than the Industrial Use SCOs and/or the Protection of Groundwater SCOs in areas not currently addressed by an IRM, use of facility paved surfaces (roadways or parking lots), or the former manufacturing building as covers; restoration ofthe excavated areas with certified clean fill; and an enhancement and expansion of the Thinner Tanks Area Groundwater Recovery System.All groundwater would be treated at the current SPDES treatment system to meet discharge criteria prior to being discharged to Ley Creek. Groundwater monitoring would be performed to evaluate the effectiveness of the groundwater extraction systems.

During the Remedial Design phase, studies would be performed to determine the well placement, pumping rates, and drawdown levelsthat would allow for optimal capture for the three groundwater extraction systems (perimeter shallow, perimeter deep, and targeted northeast of). If it is determined that targeted groundwater extraction northeast of the former manufacturing building would not achieve sufficient capture to address the elevated VOCs beneath the building in a reasonable timeframe, then ISCO would be considered instead (such ISCO would not be disruptive to building occupants).

The enhancement to the Thinner Tanks Area Groundwater Recovery System would include the installation of a flow meter with a totalizer on each of the two existing collection trenches to monitor effluent withdrawn from each trench to the SPDES treatment system. The Thinner Tanks Area Groundwater Recovery System would be expanded withthe installation of an additional collection trench or groundwater extraction wells to help increase the removal of VOC (*i.e.,* xylene, ethylbenzene, and toluene) mass and the restoration of groundwater quality in this area. While the FS cost estimate assumes that two wells would be installed, the appropriate method for extracting the groundwater would be determined during the Remedial Design.

An evaluation of the sub-slab depressurization system during the Remedial Design phase would be undertaken to determine whether enhancements to the system could effectively improve removal of elevated VOCs in the unsaturated soil beneath the former manufacturing building.

Limited excavation of soil where surface soil exhibits concentrations greater than the Industrial Use SCO and/or the Protection of Groundwater SCO would occur in areas not currently covered by an approved IRM, facility paved surfaces (roadways or parking lots), or the Manufacturing Building. The approximate volume of targeted material associated with this excavation would be 38 cubic yards. The excavated areas would be restored back to grade with clean fill and covered following confirmatory sampling.

As part of the long-term groundwater quality monitoring, COC concentration and natural attenuation data would be collected in the shallow and deep groundwater throughout the Subsite. Following the operation of the perimeter groundwater extraction system for a period up to five years, an evaluation would be performed to determine whether natural attenuation is suitable to address the off-property groundwater contamination. If it is determined that natural attenuation would achieve remedial goals in the off-property groundwater within reasonable timeframe, then monitored natural attenuation (MNA) would be employed off-property. If,however, it is determined that natural attenuation would not achieve remedial goals for the off-property groundwater within a reasonable timeframe, then groundwater extraction and treatment and in situ treatment (e.g., biological treatment or ISCO) would be evaluated, and the most appropriate remedial option would be implemented. When long-term

Deleted: ISCO

groundwater quality monitoring data indicates that COC concentrations have declined to levels more amenable to natural attenuation, the on-property groundwater remedy would be assessed for MNA suitability. If the results of this assessment indicate that natural attenuation would achieve remedial goals in the on-property shallow and/or deep aquifer(s) within a reasonable timeframe, then MNA would be employed in combination with, or instead of, groundwater extraction and treatment.

The alternative also includes ICs in the form of an environmental easement that would:

- require the submission to NYSDEC a periodic certification of institutional and engineering controls in accordance withPart 375-1.8 (h)(3);
- restrict the use and development of the property to industrial use as defined by Part 375-1.8(g), subject to local zoning laws;
- restrict the use of groundwater as a source of potable or process water without appropriate treatment as determined bythe New York State Department of Health (NYSDOH) or the Onondaga County Health Department; and
- require compliance with an NYSDEC-approved SMP.

The SMP would include:
Institutional and Engineering Control Plan that identifies institutional and engineering controls (i.e., environmental easement and/or restrictive covenants, cover systems) for the Subsite and details the following steps and media-specificrequirements necessary to ensure that they remain in place and are effective:

- an excavation plan that details the provisions for management of future excavations in areas of remaining contamination;
- descriptions of the provisions of the environmental easement including any land use or groundwater use restrictions;
- a provision that future constructed on-site buildings should be evaluated for the potential for vapor intrusion and mayinclude vapor intrusion sampling and/or installation of mitigation measures, if necessary;
- a provision for the performance of an investigation to determine the extent of any remaining contamination if the former manufacturing building is demolished in the future. If present, residual contamination in the unsaturated zone would be excavated and disposed of off-Site or treated using ISCO, and residual contamination in the saturated zone would be addressed by groundwater extraction and/or ISCO;
- provisions for the management and inspection of the identified engineering controls;
- a requirement to maintain site access controls and NYSDEC notification; and
- steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

A Monitoring Plan would be developed to assess the performance and effectiveness of the remedy. The plan would include,but not be limited to:

- monitoring of groundwater to assess the performance and effectiveness of the remedy;
- a schedule of monitoring and frequency of submittals to NYSDEC;
- monitoring for vapor intrusion for any buildings on the site, as may be required by the Institutional and EngineeringControl Plan described above.
- An O&M Plan to ensure continued operation, maintenance, optimization, monitoring, inspection, and reporting of anymechanical or physical components of the remedy. The plan would include, but not be limited to:
    - procedures for operating and maintaining the remedy;
    - compliance monitoring of treatment systems to ensure proper O&M, as well as providing the data for any necessarypermit or permit equivalent reporting;
    - maintaining site access controls and NYSDEC notification; and
    - provide NYSDEC access to the site and O&M records.

Because this alternative would result in contaminants remaining above levels that allow for unrestricted use and unlimited exposure, CERCLA requires that the Subsite be reviewed at least once every five years.

The estimated construction time for this alternative is one (1) year.

The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	$2,900,000
Annual O&M Cost:	$219,500
Present-Worth Cost:	$5,650,000

Commented [RACER1]: Update here and below to reflect cost presented in this correspondence.

The cost estimates presented herein have been updated since the June 2022 FS to reflect the contingent elements[1] included in this document that were not presented in the FS, and to reflect an update to assumptions for in situ treatment costs.

Alternative 3 –Perimeter and Targeted Deep Groundwater Extraction and Treatment, and Soil Excavation with Off-Site Disposal

Alternative 3 includes the same remedial elements as Alternative 2, except there would be no shallow groundwater trench extraction system. Instead, since no off-site migration of VOCs or PCBs has been observed within the shallow overburden groundwater, low concentrations of PCBs and VOCs detected in shallow overburden groundwater near the perimeter of the facility would be addressed by ICs and monitoring to confirm that shallow groundwater impacts are limited and not affecting off-property groundwater. Alternative 3 relies on a deep groundwater extraction and treatment system combined with the targeted deep groundwater extraction system to address the contamination beneath and immediately northeast of the former manufacturing building.

The estimated construction time of this alternative is one (1) year.

The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	$1,230,000
Annual O&M Costs:	$221,500
Present-Worth Cost:	$4,000,000

Alternative 4 – *In-Situ* Treatment of Two Residual Source Areas, Perimeter Shallow Groundwater Collection and Treatment, Perimeter and Targeted Deep Groundwater Extraction and Treatment, and Soil Excavation with Off-Site Disposal

Alternative 4 includes the same remedial elements as Alternative 2, except the areas where elevated concentrations of site VOC contaminants are present in groundwater in the Former Thinner Tanks Area and northeast of the manufacturing building would be addressed using ISCO instead of groundwater extraction and treatment, and soil excavation extends to include subsurface soils in addition to surface soils.. Additionally, since ISCO would be applied to address VOC contamination in the Thinner Tanks Area, Alternative 4 would not include an expansion of the Thinner Tanks Area Groundwater Recovery System. The purpose of the ISCO would be to significantly reduce

[1] Contingent remedies being considered as potential common elements since the June 2022 FS include: enhancement of the SSDS to effect source removal, in situ treatment under the building, and off-property groundwater extraction and treatment or in situ treatment.

contaminant levels in the potential source areas. Given that the primary compounds are non-chlorinated VOCs (Thinner Tanks Area) and chlorinated VOCs (northeast of the manufacturing building), common chemical oxidation reagents such as ozone, permanganate, and hydrogen peroxide could be considered for application.

For cost estimation purposes, it was presumed that the ISCO oxidation injection points would consist of 1-inch diameter PVC risers and screen and would be installed on a 5-ft grid and two rounds of injection would occur.

The estimated construction time of this alternative is one (1) year.

The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	$5,560,000
Annual O&M Costs:	$217,100
Present-Worth Cost:	$8,270,000

Alternative 5 -- *In-Situ* Treatment of Residual Source Areas, Perimeter Shallow Groundwater Collection and Deep Groundwater Extraction and Treatment, and Soil Excavation with Off-Site Disposal

Alternative 5 includes the same remedial elements as Alternative 4, except it also includes ISCO treatment to address site contaminates that are present beneath the former manufacturing building. Under this alternative, treatment under the former Manufacturing Building would be conducted through the facility floor.

The estimated construction time of this alternative is one (1) year.

The estimated capital, annual, and present-worth costs of this alternative are as follows:

Capital Cost:	$6,440,000
Annual O&M Costs:	$217,100
Present-Worth Cost:	$9,160,000

Attachment 4
Revised FS Cost Estimates for Alternatives 4, 5 and 6

RAMBOLL

ENVIRONMENT & HEALTH

Table 4-5
GM - IFG OU1 Feasibility Study
Alternative 4

Perimeter and targeted deep groundwater extraction and treatment, *in situ* treatment, and surface soil excavation and off-site disposal

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
DIRECT CAPITAL CONSTRUCTION COSTS - 2010 Dollars					2010 Dollars
General Conditions, Surveys, & Permits	31	mo	$2,080	$64,498	Trailer, electrical and maintenance
Surveys, & Permits	1	ls	$6,000	$6,000	Applies to entire site
Erosion Control	2,000	lf	$2	$4,000	Double layer silt fence and hay bales
Deed restriction	1	LS	$20,000	$20,000	Restricts groundwater uses
Pre-Design Investigation (Perimeter Extraction System)					
Treatment process evaluation; groundwater sampling	8	ea	$1,125	$9,000	Assumes collection and analysis
Pumping test Investigation	1	ls	$71,000	$71,000	2 wells/6 piezometers to 40-ft; inc. two 72-hr pump test
Perimeter Collection System					*Assumes discharge to SPDES Treatment System*
Deep GW Wells					
Install 4-inch diameter recovery well to 35-ft	6	ea	$23,000	$138,000	Inc. casing, screen, development, manhole and pump
Discharge Piping (common header)	1,650	lf	$50	$82,500	4-ft wide; 4-inch solid pipe; Inc discharge connection
Discharge Piping connection vault	6	ea	$2,500	$15,000	4-ft dia manhole, 4-ft depth valve and fittings
Electrical Service; conduit	1,650	lf	$45	$74,250	Excavation, backfill, conduit, hand holes and cable.
Valve Vault with connection to SPDES wet well	1	ea	$5,000	$5,000	6-ft dia; 6-ft deep; inc. valves on connection piping
Electrical Connection	1	ls	$10,000	$10,000	Assumes connection to SPDES building panel
Install Monitoring Wells - Shallow	2	ea	$1,400	$2,800	2-inch diameter; screened from 5 to 15-ft bgs
Install Monitoring Wells - Deep	1	ea	$3,200	$3,200	2-inch diameter; screened from 25 to 35-ft bgs
Hot Spot Excavation and Off-Site Disposal					
Excavate hot-spot material	38	cy	$15	$570	Assumes 1-ft over-excavation
Off-site disposal of excavated material	38	cy	$75	$2,850	Trucking and disposal fee as non-hazardous
Place indicator layer	500	sf	$0.30	$150	Geotextile
Backfill excavations	38	cy	$35	$1,330	
Confirmation Sampling	25	ea	$300	$7,500	1 sample each wall and floor (5 per exc.)
Restoration - Asphalt Concrete	100	sf	$5	$500	Assumes 6-inch thickness
Restoration - Topsoil and Seeding	400	sf	$0.12	$48	6-inch depth over impacted area
Thinner Collection System Enhancement					
Flow Meters	2	ea	$849	$1,698	Totalizer, flow readout, battery power, paddle wheel with bronze housing
Valves and fittings	1	ls	$400	$400	4 ball valves and carbon steel fittings
Installation	1	ls	$1,700	$1,700	Assumes 2 days labor
Residual Source Area Treatment (Thinner Area and Northeast Area)					
Bench-Scale Treatability Study (Pre-design)	1	ls	$50,000	$50,000	
Install injection well points (15-ft depth)	1,432	ea	$315	$451,080	5-ft grid; 1-inch diameter PVC; assumes 10-ft of screen
Install injection well points (35-ft depth)	2,248	ea	$735	$1,652,280	5-ft grid; 1-inch diameter PVC; assumes 10-ft of screen
Inject Chemical oxidant	54,889	cy	$57	$3,136,508	Volume reflectes 2 rounds of injection
Post-Injection Monitoring (existing wells)	24	ea	$700	$16,800	Monthly for 6 wells; to 12 mos beyond 2nd injection
TOTAL DIRECT CAPITAL COST				**$5,828,662**	2010 Dollars
Escalation Rate			47%		Based on ENR CCI Oct 2010 to June 2022
ESCALATED DIRECT CAPITAL COST				**$8,565,604**	2022 Dollars
DIRECT CAPITAL CONSTRUCTION COSTS - 2021 DOLLARS					2021 Dollars
Pre-Design Investigation (Targeted Extraction Area)					
MIP-HTP Borings	10	ea	$2,200	$22,000	Track mounted Geoprobe rig and MIHPt system; borings to approx. 20-30 ft bgs
Soil and Groundwater Sampling	1	ls	$10,900	$10,900	Assumes up to 5 soil borings to 30 ft bgs co-located with MIP-HPT borings, 2 soil samples per boring and 5 groundwater samples
Test and Observation Well Installation/Development	1	ls	$30,200	$30,200	1 test well and 3 observation wells
Yield Test	1	ls	$3,800	$3,800	On test well
Pumping Test	1	ls	$30,000	$30,000	72 hours and 12 hour recovery; 1 groundwater sample after test; Water assumed to be disposed of at existing treatment plant

Table 4-5
GM - IFG OU1 Feasibility Study
Alternative 4

Perimeter and targeted deep groundwater extraction and treatment, *in situ* treatment, and surface soil excavation and off-site disposal

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
Targeted Groundwater Extraction and Treatment Installation/Implementation					
Install 4-inch diameter recovery well to 35-ft	2	ea	$15,700	$31,400	Includes casing, screen, development, manhole, pump, and pitless adaptor
Discharge Piping	300	lf	$60	$18,000	2" HDPE pipe, valves, and fittings; includes excavation, backfill, and lawn restoration
Electrical Service; conduit	300	lf	$30	$9,000	Excavation, backfill, conduit, hand holes, and cable
Electrical Connection	1	ls	$10,000	$10,000	Assumes connection to perimeter system; inc. VFDs and panelboard
Investigation Derived Wastes					
Characterization	1	ls	$1,200	$1,200	Sample collection and analysis of 1 soil sample
Transportation and Disposal	1	ls	$4,200	$4,200	
TOTAL DIRECT CAPITAL COST (2021 DOLLARS)				**$170,700**	2021 Dollars
Escalation Rate			8%		Based on ENR CCI June 2021 to June 2022
ESCALATED DIRECT CAPITAL COST				**$184,765**	2022 Dollars
TOTAL DIRECT CAPITAL COST (2022 DOLLARS)				**$8,750,369**	Escalated 2010 and 2021 Dollars to June 2022
Engineering/Design/Oversight			15%	$1,312,555	
Legal			5%	$437,518	
Contingency			20%	$1,750,074	
TOTAL ALTERNATIVE CAPITAL COST (escalated and rounded)				**$12,251,000**	2021 Dollars
OPERATION AND MAINTENANCE COSTS					
Annual Costs (Years 1-30)					
Perimeter Collection Monitoring					
Downgradient well groundwater monitoring and labor	12	ea	$900	$10,800	6 Shallow and 6 Deep wells for VOC/PCB; 4 hr labor per well
Well/Pump Maintenance	8	ea	$1,200	$9,600	8 recovery wells
Shallow Groundwater Monitoring					
Onsite well groundwater monitoring and labor	6	ea	$900	$5,400	6 Shallow wells for VOC/PCB; 4 hr labor per well
SPDES IRM/Consent Order Monitoring					
Includes the following:	1	LS	$145,000	$145,000	based on average 5-year costs incurred years 2014-2018 and 2022 annual budget for power
Annual Monitoring/Inspection, labor and analytical; SPDES system sampling, inspection and operational maintenance					
Thinner Area and Surf Imp #1 Wells - Sampling, Labor and Analytical; Annual; 8 VOCs and 1 PCB					
Thinner System and Sump Inspection; Weekly Control Inspection; Bi-monthly sumps inspection					
Treatment system power					direct bill for power from SIP to RACER
SSDS IRM Operation and Maintenance					
Includes the following:	1	LS	$32,400	$32,400	based on average 5-year costs incurred years 2014-2018 and 2022 budget for power
Monitoring/Inspection for VI Systems 1 and 2; Weekly labor and reporting					
Labor, Materials and analytical (as needed); Repair/replacement; VOCs sampling 3x per 5 years approx.					
SSDS power					direct bill for power from SIP to RACER
Other					
Site Mowing	2	ea	$3,000	$6,000	2x annually
Landfill O&M - Cover Inspections/Reporting	1	LS	$6,000	$6,000	Annual
Pump Power	26,000	KWH	$0.15	$3,900	Assumes 8 0.5 HP pumps at 80% eff.
TOTAL ANNUAL O&M COST (Updated 2022)				**$219,100**	
Periodic Costs (Years 5, 10, 15, 20, 25, 30))					
5-yr reviews	1	ea	$5,000	$5,000	
Periodic Costs (Years 10, 20, 30)					
Well rehab	2	ea	$2,500	$5,000	Surge/pump wells every 10 years
Pump Replacement	2	ea	$2,100	$4,200	Submersible well pumps

Table 4-5
GM - IFG OU1 Feasibility Study
Alternative 4

Perimeter and targeted deep groundwater extraction and treatment, *in situ* treatment, and surface soil excavation and off-site disposal

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
PRESENT WORTH ANALYSIS (YEARS 1-30)			**Discount**		
Cost Type	**Total Cost**		**Factor (7%)**	**Cost Per Yr**	**Present Value**
Capital Cost - Year 0	$12,251,000		1.000	$12,251,000	$12,251,000
Annual O&M - Years 1-30			12.4081	$219,100	$2,718,600
Periodic Costs - Years 5, 10, 15, 20, 25, 30			2.1577	$5,000	$10,800
Periodic Costs - Years 10, 20, 30			0.8981	$9,200	$8,300
TOTAL PROJECT PRESENT WORTH (rounded)					**$14,989,000**

Notes
1) DF = Discount Factor

Table 4-6
GM - IFG OU1 Feasibility Study
Alternative 5

Perimeter shallow groundwater extraction and treatment, perimeter and targeted deep groundwater extraction and treatment, *in situ* treatment, and surface and subsurface soil excavation and off-site disposal

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
DIRECT CAPITAL CONSTRUCTION COSTS - 2010 Dollars					2010 Dollars
General Conditions, Surveys, & Permits	5	mo	$2,080	$10,400	Trailer, electrical and maintenance
Surveys, & Permits	1	ls	$6,000	$6,000	Applies to entire site
Erosion Control	2,000	lf	$2	$4,000	Double layer silt fence and hay bales
Deed restriction	1	LS	$20,000	$20,000	Restricts groundwater uses
Pre-Design Investigation (Perimeter Extraction System)					
Soil Borings	12	ea	$1,850	$22,200	12 borings to 40-ft; 3 sieve/hygrometer per boring
Treatment process evaluation; groundwater sampling	8	ea	$1,125	$9,000	Assumes collection and analysis
Pumping test Investigation	1	ls	$71,000	$71,000	2 wells/6 piezometers to 40-ft; inc. two 72-hr pump test
Perimeter Collection System					*Assumes discharge to SPDES Treatment System*
Shallow GW Trench					
Excavate Collection Trench (15-ft depth)	1,800	lf	$25	$45,000	6-inch slotted pipe and fittings; 3-ft width
Stone Backfill	2,800	cy	$22	$61,600	14-ft depth; materials and placement
Clay Backfill	200	cy	$30	$6,000	Top 1-ft; materials and placement
Pump Manhole (18-ft)	2	ea	$8,800	$17,600	4-ft diameter manhole concrete and pump
Discharge Piping (common header)	750	lf	$50	$37,500	4-ft wide; 4-inch solid pipe; Inc discharge connection
Electrical Service; conduit	850	lf	$45	$38,250	Excavation, backfill, conduit, hand holes and cable.
Off-Site Disposal of Trench Spoils (> 5 ft)	2,000	cy	$250	$500,000	Trucking and disposal fee as TSCA
Off-Site Disposal of Trench Spoils (< 5 ft)	1,000	cy	$75	$75,000	Trucking and disposal fee as Non-haz
Deep GW Wells					
Install 4-inch diameter recovery well to 35-ft	6	ea	$23,000	$138,000	Inc. casing, screen, development, manhole and pump
Discharge Piping (common header)	1,650	lf	$50	$82,500	4-ft wide; 4-inch solid pipe; Inc discharge connection
Discharge Piping connection vault	6	ea	$2,500	$15,000	4-ft dia manhole, 4-ft depth valve and fittings
Electrical Service; conduit	1,650	lf	$45	$74,250	Excavation, backfill, conduit, hand holes and cable.
Valve Vault with connection to SPDES wet well	1	ea	$5,000	$5,000	6-ft dia; 6-ft deep; inc. valves on connection piping
Restoration - Topsoil and Seeding	54,000	sf	$0.12	$6,480	Assumes 30-ft wide along trench alignment; 6-inch depth
Electrical Connection	1	ls	$10,000	$10,000	Assumes connection to SPDES building panel
Install Monitoring Wells - Shallow	2	ea	$1,400	$2,800	2-inch diameter; screened from 5 to 15-ft bgs
Install Monitoring Wells - Deep	1	ea	$3,200	$3,200	2-inch diameter; screened from 25 to 35-ft bgs
Thinner Collection System Enhancement					
Flow Meters	2	ea	$849	$1,698	Totalizer, flow readout, battery power, paddle wheel with bronze housing
Valves and fittings	1	ls	$400	$400	4 ball valves and carbon steel fittings
Installation	1	ls	$1,700	$1,700	Assumes 2 days labor
Hot Spot Excavation and Off-Site Disposal					
Excavate hot-spot material	1,550	cy	$15	$23,250	
Off-site disposal of excavated material	670	cy	$75	$50,250	Trucking and disposal fee as non-hazardous
Off-site disposal of excavated TSCA material	880	cy	$250	$220,000	Trucking and disposal fee as TSCA
Off-site disposal of concrete/asphalt	72	tons	$250	$18,000	Truck and disposal as Non-Haz
Place indicator layer	4,400	sf	$0.30	$1,320	Geotextile
Backfill excavations	1,550	cy	$35	$54,250	
Confirmation Sampling	135	ea	$300	$40,500	1 sample each wall and floor (5 per exc.)
Restoration - Topsoil and Seeding	2,600	sf	$0.12	$312	6-inch depth over impacted area
Restoration - Asphalt Concrete	1,800	sf	$5	$9,000	Assumes 6-inch thickness
Residual Source Area Treatment (assumes "hot zone" 25% of total identified area)					
Bench-Scale Treatability Study (Pre-design)	1	ls	$50,000	$50,000	
Install injection well points (15-ft depth)	358	ea	$315	$112,770	5-ft grid; 1-inch diameter PVC; assumes 10-ft of screen
Install injection well points (35-ft depth)	562	ea	$735	$413,070	5-ft grid; 1-inch diameter PVC; assumes 10-ft of screen
Inject Chemical oxidant	12,007	cy	$57	$686,111	Volume, Rnd 1: 100% wells inj; Rnd 2 = 75% wells inj.
Post-Injection Monitoring (existing wells)	24	ea	$700	$16,800	Monthly for 6 wells; to 12 mos beyond 2nd injection
TOTAL DIRECT CAPITAL COST				**$2,960,211**	2010 Dollars
Escalation Rate			47%		Based on ENR CCI Oct 2010 to June 2022
ESCALATED DIRECT CAPITAL COST				**$4,350,226**	2022 Dollars

Table 4-6
GM - IFG OU1 Feasibility Study
Alternative 5

Perimeter shallow groundwater extraction and treatment, perimeter and targeted deep groundwater extraction and treatment, *in situ* treatment, and surface and subsurface soil excavation and off-site disposal

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
DIRECT CAPITAL CONSTRUCTION COSTS - 2021 DOLLARS					2021 Dollars
Pre-Design Investigation (Targeted Extraction Area)					
MIP-HTP Borings	10	ea	$2,200	$22,000	Track mounted Geoprobe rig and MIHPt system; borings to approx. 20-30 ft bgs
Soil and Groundwater Sampling	1	ls	$10,900	$10,900	Assumes up to 5 soil borings to 30 ft bgs co-located with MIP-HPT borings, 2 soil samples per boring and 5 groundwater samples
Test and Observation Well Installation/Development	1	ls	$30,200	$30,200	1 test well and 3 observation wells
Yield Test	1	ls	$3,800	$3,800	On test well
Pumping Test	1	ls	$30,000	$30,000	72 hours and 12 hour recovery; 1 groundwater sample after test; Water assumed to be disposed of at existing treatment plant
Targeted Groundwater Extraction and Treatment Installation/Implementation					
Install 4-inch diameter recovery well to 35-ft	2	ea	$15,700	$31,400	Includes casing, screen, development, manhole, pump, and pitless adaptor
Discharge Piping	300	lf	$60	$18,000	2" HDPE pipe, valves, and fittings; includes excavation, backfill, and lawn restoration
Electrical Service; conduit	300	lf	$30	$9,000	Excavation, backfill, conduit, hand holes, and cable
Electrical Connection	1	ls	$10,000	$10,000	Assumes connection to perimeter system; inc. VFDs and panelboard
Investigation Derived Wastes					
Characterization	1	ls	$1,200	$1,200	Sample collection and analysis of 1 soil sample
Transportation and Disposal	1	ls	$4,200	$4,200	
TOTAL DIRECT CAPITAL COST (2021 DOLLARS)				**$170,700**	2021 Dollars
Escalation Rate			8%		Based on ENR CCI June 2021 to June 2022
ESCALATED DIRECT CAPITAL COST				**$184,765**	2022 Dollars
TOTAL DIRECT CAPITAL COST (2022 DOLLARS)				**$4,534,991**	Escalated 2010 and 2021 Dollars to June 2022
Engineering/Design/Oversight			15%	$680,249	
Legal			5%	$226,750	
Contingency			20%	$906,998	
TOTAL ALTERNATIVE CAPITAL COST (escalated and rounded)				**$6,349,000**	2022 Dollars
OPERATION AND MAINTENANCE COSTS					
Annual Costs (Years 1-30)					
Perimeter Collection Monitoring					
Downgradient well groundwater monitoring and labor	12	ea	$900	$10,800	6 Shallow and 6 Deep wells for VOC/PCB; 4 hr labor per well
Well/Pump Maintenance	10	ea	$1,200	$12,000	8 recovery wells, 2 shallow trench pumps
SPDES IRM/Consent Order Monitoring					
Includes the following:	1	LS	$145,000	$145,000	based on average 5-year costs incurred years 2014-2018 and 2022 annual budget for power
Annual Monitoring/Inspection, labor and analytical; SPDES system sampling, inspection and operational maintenance					
Thinner Area and Surf Imp #1 Wells - Sampling, Labor and Analytical; Annual; 8 VOCs and 1 PCB					
Thinner System and Sump Inspection; Weekly Control Inspection; Bi-monthly sumps inspection					
Treatment system power					direct bill for power from SIP to RACER
SSDS IRM Operation and Maintenance					
Includes the following:	1	LS	$32,400	$32,400	based on average 5-year costs incurred years 2014-2018 and 2022 budget for power
Monitoring/Inspection for VI Systems 1 and 2; Weekly labor and reporting					
Labor, Materials and analytical (as needed); Repair/replacement; VOCs sampling 3x per 5 years approx.					
SSDS power					direct bill for power from SIP to RACER
Other					
Site Mowing	2	ea	$3,000	$6,000	2x annually
Landfill O&M - Cover Inspections/Reporting	1	LS	$6,000	$6,000	Annual
Pump Power	33,000	KWH	$0.15	$4,950	Assumes 10 0.5 HP pumps at 80% eff.
TOTAL ANNUAL O&M COST (Updated 2022)				**$217,150**	

Table 4-6
GM - IFG OU1 Feasibility Study
Alternative 5

Perimeter shallow groundwater extraction and treatment, perimeter and targeted deep groundwater extraction and treatment, *in situ* treatment, and surface and subsurface soil excavation and off-site disposal

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
Periodic Costs (Years 5, 10, 15, 20, 25, 30))					
5-yr reviews	1	ea	$5,000	$5,000	
Periodic Costs (Years 10, 20, 30)					
Well rehab	2	ea	$2,500	$5,000	Surge/pump wells every 10 years
Pump Replacement	2	ea	$2,100	$4,200	Submersible well pumps

PRESENT WORTH ANALYSIS (YEARS 1-30)		**Discount**		
Cost Type	**Total Cost**	**Factor (7%)**	**Cost Per Yr**	**Present Value**
Capital Cost - Year 0	$6,349,000	1.000	$6,349,000	$6,349,000
Annual O&M - Years 1-30		12.4081	$217,150	$2,694,400
Periodic Costs - Years 5, 10, 15, 20, 25, 30		2.1577	$5,000	$10,800
Periodic Costs - Years 10, 20, 30		0.8981	$9,200	$8,300
TOTAL PROJECT PRESENT WORTH (rounded)				**$9,063,000**

Table 4-7
GM - IFG OU1 Feasibility Study
Alternative 6

Perimeter shallow groundwater extraction and treatment, perimeter and targeted deep groundwater extraction and treatment, *in situ* treatment (including under former Manufacturing Building), and surface and subsurface soil excavation and off-site disposal

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
DIRECT CAPITAL CONSTRUCTION COSTS - 2010 Dollars					2010 Dollars
General Conditions, Surveys, & Permits	5	mo	$2,080	$10,400	Trailer, electrical and maintenance
Surveys, & Permits	1	ls	$6,000	$6,000	Applies to entire site
Erosion Control	2,000	lf	$2	$4,000	Double layer silt fence and hay bales
Deed restriction	1	LS	$20,000	$20,000	Restricts groundwater uses
Pre-Design Investigation (Perimeter Extraction System)					
Soil Borings	12	ea	$1,850	$22,200	12 borings to 40-ft; 3 sieve/hygrometer per boring
Treatment process evaluation; groundwater sampling	8	ea	$1,125	$9,000	Assumes collection and analysis
Pumping test Investigation	1	ls	$71,000	$71,000	2 wells/6 piezometers to 40-ft; inc. two 72-hr pump test
Perimeter Collection System					*Assumes discharge to SPDES Treatment System*
Shallow GW Trench					
Excavate Collection Trench (15-ft depth)	1,800	lf	$25	$45,000	6-inch slotted pipe and fittings; 3-ft width
Stone Backfill	2,800	cy	$22	$61,600	14-ft depth; materials and placement
Clay Backfill	200	cy	$30	$6,000	Top 1-ft; materials and placement
Pump Manhole (18-ft)	2	ea	$8,800	$17,600	4-ft diameter manhole concrete and pump
Discharge Piping (common header)	750	lf	$50	$37,500	4-ft wide; 4-inch solid pipe; Inc discharge connection
Electrical Service; conduit	850	lf	$45	$38,250	Excavation, backfill, conduit, hand holes and cable.
Off-Site Disposal of Trench Spoils (> 5 ft)	2,000	cy	$250	$500,000	Trucking and disposal fee as TSCA
Off-Site Disposal of Trench Spoils (< 5 ft)	1,000	cy	$75	$75,000	Trucking and disposal fee as Non-haz
Deep GW Wells					
Install 4-inch diameter recovery well to 35-ft	6	ea	$23,000	$138,000	Inc. casing, screen, development, manhole and pump
Discharge Piping (common header)	1,650	lf	$50	$82,500	4-ft wide; 4-inch solid pipe; Inc discharge connection
Discharge Piping connection vault	6	ea	$2,500	$15,000	4-ft dia manhole, 4-ft depth valve and fittings
Electrical Service; conduit	1,650	lf	$45	$74,250	Excavation, backfill, conduit, hand holes and cable.
Valve Vault with connection to SPDES wet well	1	ea	$5,000	$5,000	6-ft dia; 6-ft deep; inc. valves on connection piping
Restoration - Topsoil and Seeding	54,000	sf	$0.12	$6,480	Assumes 30-ft wide along trench alignment; 6-inch depth
Electrical Connection	1	ls	$10,000	$10,000	Assumes connection to SPDES building panel
Install Monitoring Wells - Shallow	2	ea	$1,400	$2,800	2-inch diameter; screened from 5 to 15-ft bgs
Install Monitoring Wells - Deep	1	ea	$3,200	$3,200	2-inch diameter; screened from 25 to 35-ft bgs
Thinner Collection System Enhancement					
Flow Meters	2	ea	$849	$1,698	Totalizer, flow readout, battery power, paddle wheel with bronze housing
Valves and fittings	1	ls	$400	$400	4 ball valves and carbon steel fittings
Installation	1	ls	$1,700	$1,700	Assumes 2 days labor
Hot Spot Excavation and Off-Site Disposal					
Excavate hot-spot material	1,550	cy	$15	$23,250	
Off-site disposal of excavated material	670	cy	$75	$50,250	Trucking and disposal fee as non-hazardous
Off-site disposal of excavated TSCA material	880	cy	$250	$220,000	Trucking and disposal fee as TSCA
Off-site disposal of concrete/asphalt	72	tons	$250	$18,000	Truck and disposal as Non-Haz
Place indicator layer	4,400	sf	$0.30	$1,320	Geotextile
Backfill excavations	1,550	cy	$35	$54,250	
Confirmation Sampling	135	ea	$300	$40,500	1 sample each wall and floor (5 per exc.)
Restoration - Topsoil and Seeding	2,600	sf	$0.12	$312	6-inch depth over impacted area
Restoration - Asphalt Concrete	1,800	sf	$5	$9,000	Assumes 6-inch thickness
Residual Source Area Treatment (assumes "hot zone" 25% of total identified area)					
Bench-Scale Treatability Study (Pre-design)	1	ls	$50,000	$50,000	
Install injection well points (15-ft depth)	958	ea	$315	$301,770	5-ft grid; 1-inch diameter PVC; assumes 10-ft of screen
Install injection well points (35-ft depth)	562	ea	$735	$413,070	5-ft grid; 1-inch diameter PVC; assumes 10-ft of screen
Inject Chemical oxidant	21,729	cy	$57	$1,241,667	Volume, Rnd 1: 100% wells inj; Rnd 2 = 75% wells inj.
Post-Injection Monitoring (existing wells)	24	ea	$700	$16,800	Monthly for 6 wells; to 12 mos beyond 2nd injection
TOTAL DIRECT CAPITAL COST				**$3,704,767**	2010 Dollars
Escalation Rate			47%		Based on ENR CCI Oct 2010 to June 2022
ESCALATED DIRECT CAPITAL COST				**$5,444,400**	2022 Dollars

Table 4-7
GM - IFG OU1 Feasibility Study
Alternative 6

Perimeter shallow groundwater extraction and treatment, perimeter and targeted deep groundwater extraction and treatment, *in situ* treatment (including under former Manufacturing Building), and surface and subsurface soil excavation and off-site disposal

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
DIRECT CAPITAL CONSTRUCTION COSTS - 2021 DOLLARS					2021 Dollars
Pre-Design Investigation (Targeted Extraction Area)					
MIP-HTP Borings	10	ea	$2,200	$22,000	Track mounted Geoprobe rig and MIHPt system; borings to approx. 20-30 ft bgs
Soil and Groundwater Sampling	1	ls	$10,900	$10,900	Assumes up to 5 soil borings to 30 ft bgs co-located with MIP-HPT borings, 2 soil samples per boring and 5 groundwater samples
Test and Observation Well Installation/Development	1	ls	$30,200	$30,200	1 test well and 3 observation wells
Yield Test	1	ls	$3,800	$3,800	On test well
Pumping Test	1	ls	$30,000	$30,000	72 hours and 12 hour recovery; 1 groundwater sample after test; Water assumed to be disposed of at existing treatment plant
Targeted Groundwater Extraction and Treatment Installation/Implementation					
Install 4-inch diameter recovery well to 35-ft	2	ea	$15,700	$31,400	Includes casing, screen, development, manhole, pump, and pitless adaptor
Discharge Piping	300	lf	$60	$18,000	2" HDPE pipe, valves, and fittings; includes excavation, backfill, and lawn restoration
Electrical Service; conduit	300	lf	$30	$9,000	Excavation, backfill, conduit, hand holes, and cable
Electrical Connection	1	ls	$10,000	$10,000	Assumes connection to perimeter system; inc. VFDs and panelboard
Investigation Derived Wastes					
Characterization	1	ls	$1,200	$1,200	Sample collection and analysis of 1 soil sample
Transportation and Disposal	1	ls	$4,200	$4,200	
TOTAL DIRECT CAPITAL COST (2021 DOLLARS)				**$170,700**	2021 Dollars
Escalation Rate			8%		Based on ENR CCI June 2021 to June 2022
ESCALATED DIRECT CAPITAL COST				**$184,765**	2022 Dollars
TOTAL DIRECT CAPITAL COST (2022 DOLLARS)				**$5,629,165**	Escalated 2010 and 2021 Dollars to June 2022
Engineering/Design/Oversight			15%	$844,375	
Legal			5%	$281,458	
Contingency			20%	$1,125,833	
TOTAL ALTERNATIVE CAPITAL COST (escalated and rounded)				**$7,881,000**	2022 Dollars
OPERATION AND MAINTENANCE COSTS					
Annual Costs (Years 1-30)					
Perimeter Collection Monitoring					
Downgradient well groundwater monitoring and labor	12	ea	$900	$10,800	6 Shallow and 6 Deep wells for VOC/PCB; 4 hr labor per well
Well/Pump Maintenance	10	ea	$1,200	$12,000	8 recovery wells, 2 shallow trench pumps
SPDES IRM/Consent Order Monitoring					
Includes the following:	1	LS	$145,000	$145,000	based on average 5-year costs incurred years 2014-2018 and 2022 annual budget for power
Annual Monitoring/Inspection, labor and analytical; SPDES system sampling, inspection and operational maintenance					
Thinner Area and Surf Imp #1 Wells - Sampling, Labor and Analytical; Annual; 8 VOCs and 1 PCB					
Thinner System and Sump Inspection; Weekly Control Inspection; Bi-monthly sumps inspection					
Treatment system power					direct bill for power from SIP to RACER
SSDS IRM Operation and Maintenance					
Includes the following:	1	LS	$32,400	$32,400	based on average 5-year costs incurred years 2014-2018 and 2022 budget for power
Monitoring/Inspection for VI Systems 1 and 2; Weekly labor and reporting					
Labor, Materials and analytical (as needed); Repair/replacement; VOCs sampling 3x per 5 years approx.					
SSDS power					direct bill for power from SIP to RACER
Other					
Site Mowing	2	ea	$3,000	$6,000	2x annually
Landfill O&M - Cover Inspections/Reporting	1	LS	$6,000	$6,000	Annual
Pump Power	33,000	KWH	$0.15	$4,950	Assumes 10 0.5 HP pumps at 80% eff.
TOTAL ANNUAL O&M COST (Updated 2022)				**$217,150**	

Table 4-7
GM - IFG OU1 Feasibility Study
Alternative 6

Perimeter shallow groundwater extraction and treatment, perimeter and targeted deep groundwater extraction and treatment, *in situ* treatment (including under former Manufacturing Building), and surface and subsurface soil excavation and off-site disposal

	QTY	UNIT	UNIT COST	TOTAL COST	Notes
Periodic Costs (Years 5, 10, 15, 20, 25, 30))					
5-yr reviews	1	ea	$5,000	$5,000	
Periodic Costs (Years 10, 20, 30)					
Well rehab	2	ea	$2,500	$5,000	Surge/pump wells every 10 years
Pump Replacement	2	ea	$2,100	$4,200	Submersible well pumps

PRESENT WORTH ANALYSIS (YEARS 1-30)		**Discount**		
Cost Type	**Total Cost**	**Factor (7%)**	**Cost Per Yr**	**Present Value**
Capital Cost - Year 0	$7,881,000	1.000	$7,881,000	$7,881,000
Annual O&M - Years 1-30		12.4081	$217,150	$2,694,400
Periodic Costs - Years 5, 10, 15, 20, 25, 30		2.1577	$5,000	$10,800
Periodic Costs - Years 10, 20, 30		0.8981	$9,200	$8,300
TOTAL PROJECT PRESENT WORTH (rounded)				**$10,595,000**

Notes
1) DF = Discount Factor