TABLE 2

Evaluation of PLS Costs
Gelman Sciences Site
Ann Arbor, Michigan

Alternative	Item		Cost Issue
2	Capital	Monitoring well	•Per-monitoring well installation costs overestimated by ~$5,000. Also, item listed twice on Table 14. Therefore, total monitoring well installation costs overestimated by $350,000.
	O&M	Analytical	•Natural attenuation analytical costs underestimated by ~$20,500 •1,4-Dioxane costs overestimated by ~$234,000
		Pall Staff	•Labor costs for well maintenance and monitoring already included as separate O&M items. Therefore, Pall Staff total costs were overestimated by $2,240,000.
	Post Closure	Plugging of Monitoring wells	•Monitoring well plugging costs underestimated by ~$70,000. The per-well unit cost for plugging was underestimated. Not all monitor wells. Tere included in total quantity.

TABLE 2

Evaluation of PLS Costs
Gelman Sciences Site
Ann Arbor, Michigan

Alternative	Item		Cost Issue
3a	Capital	Modeling and other Consulting Fees	•Costs for modeling not included. Therefore costs underestimated by ~$220,000 based on estimate for these costs in Alt. 2.
		Connection Piping	•Costs for connection piping overestimated by ~$29,500.
		Pipeline from Leading Edge Wells to Pall	•Costs for pipeline overestimated by ~$190,000.
		Pipeline from Pall to River	•Costs for pipeline overestimated by ~$1,390,000.
		Pumping System/Process	•Costs for extraction well pumping system/process controls overestimated by ~$53,000.
		Treatment System (O3/H2O2)	•Costs for treatment system overestimated by ~$239,100.
		Pipeline Installation Oversight	•Costs not included. Therefore total cost underestimated.
		Monitoring well	•Costs for installation overestimated by ~$5,000. Therefore, total costs overestimated for four monitoring wells by ~$20,000. Access costs not included.
		NPDES Permit	•Costs for NPDES application preparation, monitoring $~5,000.
	O&M	Treatment System (O3/H2O2)	•Cost of $0.91 per 1,000 gallons for leading edge wells overestimated (assuming influent of 85 ppb and effluent at 10 ppb, treatment costs are $0.15/1,000 gal).
		Analytical (groundwater)	•1,4-Dioxane costs overestimated by ~$65/sample or by a total ~$280,800.
		NPDES	•Monitoring and analytical costs overestimated by ~$25,000/year or by a total of ~$510,000.
		NPDES Reporting/Fees	•Costs not included. Therefore total costs underestimated by ~$5,200/year or by a total of ~$103,000.
		Pipeline Maintenance	•Costs are overestimated at a rate of $100,000/year for 20 years. WESTON estimates costs (required maintenance/inspection) at $20,000/year.
	Post Closure	Plugging of Pipelines	•Costs are overestimated based on standard definition of "plugging". Estimated costs are ~$1,600 per section pipe regardless of length (not $3/ft). If pipelines are grouted, costs are underestimated by an order of magnitude (estimated costs for grouting are $30/ft).
		Plugging of Extraction Wells	•Costs underestimated by ~$500/well or by total of ~$1,500.
		Plugging of Monitoring Wells	•Costs are not included. Costs for plugging of well estimated at $2,000 per well. Therefore, total costs are underestimated by ~$72,000 assuming 36 wells require plugging.

TABLE 2

Evaluation of PLS Costs
Gelman Sciences Site
Ann Arbor, Michigan

Alternative	Item		Cost Issue
3c	Capital	Modeling and other Consulting Fees	•Costs for modeling not included. Therefore, costs underestimated by ~$220,000 based on estimate for these costs in Alt. 2.
		Connection Piping	•Costs for connection piping overestimated by ~$29,500.
		Pipeline from Leading Edge Wells to Pall	•Costs for pipeline overestimated by ~$190,000.
		Piping from Pall to Injection Wells	•Costs for piping overestimated by ~$31,500.
		Pumping System/Process	•Costs for extraction well pumping system/process controls overestimated by ~$140,000.
		Treatment System (O3/H2O2)	•Costs for treatment system overestimated by ~$239,100.
		Pipeline Installation	•Costs not included, therefore total cost underestimated. Access costs not included.
		Monitoring well	•Costs for installation overestimated by ~$5,000. Therefore, total costs overestimated for six monitoring wells by ~$30,000. Access costs not included for off-site wells because only on-site locations assumed.
	O&M	Treatment System (O3/H2O2)	•Cost of $0.91 per 1,000 gallons for leading edge wells overestimated (assuming influent of 85 ppb and effluent at 10 ppb, treatment costs are $0.15/1,000 gal).
		Analytical (groundwater)	•1,4-Dioxane costs overestimated by ~$65/sample or by a total ~$280,800.
		Pipeline Maintenance	•Costs are overestimated at a rate of $100,000/year for 20 years. WESTON estimates costs (required maintenance/inspection) at $20,000/year.
	Post Closure	Plugging of Pipelines/Piping	•Costs are overestimated based on standard definition of "plugging". Estimated costs are ~$1,600 per section pipe regardless of length (not $3/ft). If pipelines are grouted, costs are underestimated by order of magnitude (estiamted costs for grouting are $30/ft).
		Plugging of Extraction Wells	•Costs underestimated by ~$500/well or by total of ~$1,500.
		Plugging of Monitoring Wells	•Costs are not included. Costs for plugging of well estimated at $2,000 per well. Therefore, total costs are underestimated by ~$72,000 assuming 36 wells require plugging.

TABLE 2

Evaluation of PLS Costs
Gelman Sciences Site
Ann Arbor, Michigan

Alternative	Item		Cost Issue
3e	Capital	Modeling and other Consulting Fees	•Costs for modeling not included, therefore costs underestimated by ~$220,000 based on estimate for these costs in Alternative 2.
		Monitoring well	•Costs for installation overestimated by ~$5,000. Therefore, total costs overestimated for four monitoring wells by ~$20,000.
		Connection Piping	•Costs for connection piping overestimated by ~$29,500.
		Pipeline from Leading Edge Wells to Pall	•Costs for pipeline overestimated by ~$190,000. Access costs not included.
		Piping to Honey Creek	•Costs for piping overestimated by ~$21,150.
		Pumping System/Process	•Costs for extraction well pumping system/process controls overestimated by ~$53,000.
		Pipeline/piping Installation Oversight	•Costs not included. Therefore total cost underestimated.
		NPDES Permit	•Costs for NPDES amendment preparation, monitoring and fees overestimated by as much as an order of magnitude.
	O&M	Pipeline Maintenance	•Costs are overestimated at a rate of $100,000/year for 20 years. WESTON estimates costs (required maintenance/inspection) at $20,000/year.
		Analytical (groundwater)	•1,4-Dioxane costs overestimated by ~$65/sample or by a total ~$280,800.
		NPDES	•Monitoring and analytical costs not included.
		NPDES Reporting/Fees	•Costs not included. Therefore total costs underestimated by ~$5,200/year or by a total of ~$103,000.
	Post Closure	Plugging of Pipelines	•Costs are overestimated based on standard definition of "plugging". Estimated costs are ~$1,600 per section pipe regardless of length (not $3/ft). If pipelines are grouted, costs are underestimated by order of magnitude (estiamted costs for grouting are $30/ft).
		Plugging of Extraction Wells	•Costs overestimated by ~$1,000/well or by total of ~$3,000.
		Plugging of Monitoring Wells	•Costs for only four monitoring wells. Therefore, costs are underestimated by ~$7,600 assuming $2,000 per well and 40 wells,

TABLE 2

Evaluation of PLS Costs
Gelman Sciences Site
Ann Arbor, Michigan

Alternative	Item		Cost Issue
4a	Capital	Modeling and other Consulting Fees	•Costs for modeling not included. Therefore costs underestimated by ~$220,000 based on estimate for these costs in Alternative 2.
		Connection Piping	•Costs for connection piping overestimated by ~$29,500.
		Pipeline from Leading Edge Wells to Maple Rd.	•Costs for pipeline overestimated by ~$94,000. Access costs not included.
		Piping from Maple Rd to River	•Costs for piping overestimated by ~$1,202,900.
		Pumping System/Process	•Costs for extraction well pumping system/process controls overestimated by ~$22,500.
		Pipeline/piping Installation Oversight	•Costs not included, therefore total cost underestimated.
		Monitoring well	•Well installation costs overestimated by ~$5,000. Therefore, total monitoring well installation costs for four wells overestimated by ~$20,000.
		NPDES Permit	•Costs for NPDES application preparation, monitoring and fees not included. Therefore, total costs underestimated by ~$15,000.
		Treatment System (O3/H2O2)	•Costs for treatment system overestimated by ~$239,100.
	O&M	Pipeline Maintenance	•Costs are overestimated at a rate of $75,000/year for 20 years. WESTON estimates costs (required maintenance/inspection) at $20,000/year.
		Treatment System (O3/H2O2)	•Cost of $0.91 per 1,000 gallons for leading edge wells overestimated (assuming influent of 85 ppb and effluent at 10 ppb, treatment costs are $0.15/1,000 gal).
		Analytical (groundwater)	•1,4-Dioxane costs overestimated by ~$65/sample or by a total ~$234,000.
		NPDES	•Monitoring and analytical costs not included.
		NPDES Reporting/Fees	•Costs not included. Therefore total costs underestimated by ~$5,200/year or by a total of ~$103,000.
	Post Closure	Plugging of Pipelines	•Costs are overestimated based on standard definition of "plugging". Estimated costs are ~$1,600 per section pipe regardless of length (not $3/ft). If pipelines are grouted, costs are underestimated by order of magnitude (estiamted costs for grouting are $30/ft).
		Plugging of Extraction Wells	•Costs overestimated by ~$1,000/well or by total of ~$3,000.
		Plugging of Monitoring Wells	•Costs not included. Therefore, costs are underestimated by ~$2,000 per well.
		Plugging of Injection Wells	•Costs included however there are no injection wells for this alternative. Therefore, costs are overestimated by $15,000.

TABLE 2

Evaluation of PLS Costs
Gelman Sciences Site
Ann Arbor, Michigan

Alternative	Item		Cost Issue
4c	Capital	Modeling and other Consulting Fees	•Costs for modeling not included. Therefore costs underestimated by ~$220,000 based on estimate for these costs in Alternative 2.
		Connection Piping	•Costs for connection piping overestimated by ~$206,500.
		Pipeline from Leading Edge Wells to Maple Rd.	•Costs for pipeline overestimated by ~$94,000. Access costs not included.
		Piping from Maple Rd to injection Wells	•Costs for piping overestimated by ~$132,000.
		Pumping System/Process	•Costs for extraction well pumping system/process controls overestimated by ~$140,000.
		Pipeline/piping Installation Oversight	•Costs not included. Therefore total cost underestimated.
		Monitoring well	•Per monitoring well installation costs overestimated by ~$5,000. Therefore, total monitoring well installation costs for four wells overestimated by ~$40,000.
		Treatment System (O3/H2O2)	•Costs for treatment system overestimated by ~$239,100.
	O&M	Pipeline Maintenance	•Costs are overestimated at a rate of $75,000/year for 20 years. WESTON estimates costs (required maintenance/inspection) at $20,000/year.
		Treatment System (O3/H2O2)	•Cost of $0.91 per 1,000 gallons for leading edge wells overestimated (assuming influent of 85 ppb and effluent at 10 ppb, treatment costs are $0.15/1,000 gal).
		Analytical (groundwater)	•1,4-Dioxane costs overestimated by ~$65/sample or by a total ~$234,000.
	Post Closure	Plugging of Pipelines	•Costs are overestimated based on standard definition of "plugging". Estimated costs are ~$1,600 per section pipe regardless of length (not $3/ft). If pipelines are grouted, costs are underestimated by order of magnitude (estiamted costs for grouting are $30/ft).
		Plugging of Extraction Wells	•Costs overestimated by ~$1,000/well or by total of ~$3,000.
		Plugging of Monitoring Wells	•Costs for only four monitoring wells. Therefore, costs are underestimated by ~$7,600 assuming $2,000 per well and 40 wells,
		Plugging of Injection Wells	•Costs overestimated by ~$1,000/well or by total of ~$5,000.

TABLE 2

Evaluation of PLS Costs
Gelman Sciences Site
Ann Arbor, Michigan

Alternative	Item		Cost Issue
5	Capital	Modeling and other Consulting Fees	•Costs for modeling not included. Therefore costs underestimated by ~$220,000 based on estimate for these costs in Alternative 2.
		Connection Piping	•Costs for connection piping overestimated by ~$29,500.
		Pipeline from Leading Edge Wells to Pall	•Costs for pipeline overestimated by ~$190,000.
		Pumping System/Process	•Costs for extraction well pumping system/process controls overestimated by ~$52,500.
		Pipeline/piping Installation Oversight	•Costs not included. Therefore total cost underestimated.
		Monitoring well	•Additional monitoring well installation costs not included.
	O&M	Pipeline Maintenance	•Costs are overestimated at a rate of $75,000/year for 20 years. WESTON estimates costs (required maintenance/inspection) at $20,000/event.
		Extraction wells	•Access costs not included.
		Analytical (groundwater)	•1,4-Dioxane costs overestimated by ~$65/sample or by a total ~$234,000.
	Post Closure	Plugging of Pipelines	•Costs are overestimated based on standard definition of "plugging". Estimated costs are ~$1,600 per section pipe regardless of length (not $3/ft). If pipelines are grouted, costs are underestimated by order of magnitude (estiamted costs for grouting are $30/ft).
		Plugging of Extraction Wells	•Costs underestimated by ~$500/well or by total of ~$1,500.
		Plugging of Monitoring Wells	•Costs not included.

TABLE 2

Evaluation of PLS Costs
Gelman Sciences Site
Ann Arbor, Michigan

Alternative	Item		Cost Issue
6	Capital	Connection Piping	•Costs for connection piping overestimated by ~$29,500.
		Pipeline from near River to River	•Costs for pipeline overestimated by ~$68,000.
		Pumping System/Process	•Costs for extraction well pumping system/process controls overestimated by ~$108,500.
		Treatment System (O3/H2O2)	•Costs for treatment system overestimated by ~$239,100.
		Pipeline Installation Oversight	•Costs not included. Therefore total cost underestimated.
		Monitoring well	•Per monitoring well installation costs overestimated by ~$5,000. Also, item listed twice on Table 14. Therefore, total monitoring well installation costs overestimated by $350,000.
		NPDES Permit	•Costs for NPDES application preparation, monitoring and fees overestimated by $~5,000.
	O&M	Treatment System (O3/H2O2)	•Cost of $0.91 per 1,000 gallons for leading edge wells overestimated (assuming influent of 85 ppb and effluent at 10 ppb, treatment costs are $0.15/1,000 gal). Treating 262,800,000 gallons per year for 30 years would cost $7,174,440 (using $0.91/1,000 gallons) or $1,182,600 (using $0.15/1,000 gallons), a difference of $5,991,840.
		Analytical (groundwater)	•1,4-Dioxane costs overestimated by ~$65/sample or by a total ~$280,800.
		NPDES	•Monitoring and analytical costs overestimated by ~$25,000/year or by a total of ~$510,000.
		NPDES Reporting/Fees	•Costs not included. Therefore total costs underestimated by ~$5,200/year or by a total of ~$103,000.
		Pipeline Maintenance	•Costs are overestimated at a rate of $100,000/year for 20 years. WESTON estimates costs (required maintenance/inspection) at $20,000/event.
	Post Closure	Plugging of Pipelines	•Costs are overestimated based on standard definition of "plugging". Estimated costs are ~$1,600 per section pipe regardless of length (not $3/ft). If pipelines are grouted, costs are underestimated by order of magnitude (estiamted costs for grouting are $30/ft).
		Plugging of Extraction Wells	•Costs underestimated by ~$500/well or by total of ~$1,500.
		Plugging of Monitoring Wells	•Costs underestimated by ~$1,000 per well or by a total of $20,000.

TABLE 3

Summary of MDEQ Alternative Costs
Gelman Sciences Site
Ann Arbor, Michigan

Present Worth Calculation

	Wagner Road	Maple Road	Leading Edge	Total
Mobilization	$ 25,000	$ 25,000	$ 25,000	$ 75,000
Groundwater Modeling	$ 130,000	$ -	$ 360,000	$ 490,000
Infrastructure	$ 290,000	$ 3,890,000	$ 7,020,000	$ 11,200,000
Access Fees	$ -	$ 110,000	$ 200,000	$ 310,000
Consulting Engineering Fees	$ 30,000	$ 330,000	$ 700,000	$ 1,100,000
Post Closure	$ 50,000	$ 50,000	$ 60,000	$ 200,000
Subtotal Capital Costs	**$ 525,000**	**$ 4,405,000**	**$ 8,365,000**	**$ 13,295,000**
O&M Annual	$ 30,000	$ 90,000	$ 500,000	$ 600,000
Total Job with 1 year O&M	**$ 600,000**	**$ 4,000,000**	**$ 9,000,000**	**$ 14,000,000**
20 Yr O&M Present Worth		$ 986,000		$ 986,000
10 Yr O&M Present Worth	$ 209,000		$ 3,234,000	$ 3,443,000
Total Job with 10/20 year O&M	**$ 1,000,000**	**$ 5,000,000**	**$ 12,000,000**	**$ 18,000,000**

Current Cost Calculation

	Wagner Road	Maple Road	Leading Edge	Total
Mobilization	$ 25,000	$ 25,000	$ 25,000	$ 80,000
Groundwater Modeling	$ 100,000	$ -	$ 400,000	$ 500,000
Infrastructure	$ 300,000	$ 4,000,000	$ 7,000,000	$ 11,000,000
Access Fees	$ -	$ 100,000	$ 200,000	$ 300,000
Consulting Engineering Fees	$ 30,000	$ 300,000	$ 700,000	$ 1,000,000
Post Closure	$ 50,000	$ 50,000	$ 60,000	$ 200,000
Subtotal Capital Costs	**$ 500,000**	**$ 4,000,000**	**$ 8,000,000**	**$ 13,000,000**
O&M Annual	$ 30,000	$ 90,000	$ 500,000	$ 600,000
Total Job with 1 year O&M	**$ 500,000**	**$ 4,000,000**	**$ 9,000,000**	**$ 14,000,000**
20 Yr O&M Current Cost		$ 2,000,000		$ 2,000,000
10 Yr O&M Current Cost	$ 300,000		$ 5,000,000	$ 5,000,000
Total Job with 10/20 year O&M	**$ 1,000,000**	**$ 6,000,000**	**$ 13,000,000**	**$ 20,000,000**

Costs used to evaluate the MDEQ alternative were generated by both PLS (in their Feasibility Study) and WESTON.

TABLE 1

Alternative Cost Comparison
Gelman Sciences Site
Ann Arbor, Michigan

Alternative		PLS Cost Estimate				WESTON Estimate	Reference	Notes
		Capital	O & M	Post Closure	Total			
2	Monitored Natural Attenuation with Institutional Controls	$1,362,800	$5,173,850	**$42,000**	$6,578,650	$4,000,000	Table 4 - changes discussed below	
3a-1	Groundwater Pumping, Pipeline to Wagner Rd Facility, Treatment at Wagner Rd with Ozone/Hydrogen Peroxide Followed by Transmission through a New Pipeline to the Huron River for Disposal Under a NPDES permit	$9,014,314	$19,419,508	$147,420	$28,581,242		Table 5	3 leading edge extraction wells. Transport untreated water to PLS. Treat with O3/H2O2 system. Transport treated water to Huron River to discharge.
3a-2	Groundwater Pumping, Pipeline to Wagner Rd Facility, Treatment at Wagner Rd with Hydrogen Peroxide/UV Followed by Transmission through a New Pipeline to the Huron River for Disposal Under a NPDES permit	$8,973,050	$34,178,356	$147,420	$43,298,826		Table 6	3 leading edge extraction wells. Transport untreated water to PLS. Treat with UV/H2O2 system. Transport treated water to Huron River to discharge.
3c-1	Groundwater Pumping, Pipeline to Wagner Rd Facility, Treatment at Wagner Rd with Ozone/Hydrogen Peroxide Followed by Injection into Unit E Through Multiple New Wells at Locations Where 1,4-Dioxane Levels are less than 85 ppb, but exceed 1 ppb under a Part 22 Permit	$7,616,753	$20,088,890	$130,312	$27,835,955		Table 7	3 leading edge extraction wells. Transport untreated water to PLS. Treat with UV/H2O2 system. Inject treated water into Unit E where <85 ppb and >1 ppb.
3c-2	Groundwater Pumping, Pipeline to Wagner Rd Facility, Treatment at Wagner Rd with Hydrogen Peroxide/UV Followed by Injection into Unit E Through Mutliple New Wells at Locations Where 1,4-Dioxane Levels are less than 85 ppb, but exceed 1 ppb under a Part 22 Permit	$7,588,129	$34,847,738	$130,312	$42,566,179		Table 8	3 leading edge extraction wells. Transport untreated water to PLS. Treat with O3/H2O2 system. Inject treated water into Unit E where <85 ppb and >1 ppb.
3e-1	Groundwater Pumping, Pipeline to Wagner Rd Facility, Treatment at Wagner Rd with Ozone/Hydrogen Peroxide, Discharge into Honey Creek (Tributary)	$7,028,664	$17,475,370	$111,540	$24,615,574		Table 9	3 leading edge extraction wells. Transport untreated water to PLS. Treat with O3/H2O2 system. Discharge into Honey Creek.
3e-2	Groundwater Pumping, Pipeline to Wagner Rd Facility, Treatment at Wagner Rd with Hydrogen Peroxide/UV , Discharge into Honey Creek (Tributary)	$7,028,664	$32,234,218	$111,540	$39,374,422		Table 10	3 leading edge extraction wells. Transport untreated water to PLS. Treat with UV/H2O2 system. Discharge into Honey Creek.
4a	Groundwater Pumping, Treatment Near Maple Rd with Ozone/Hydrogen Peroxide Treatment Followed by Transmission through a New Pipeline to the Huron River for Disposal Under and NPDES Permit	$6,989,529	$17,880,950	$140,400	$25,010,879		Table 11	3 leading edge extraction wells. Transport untreated water to Maple Rd and treat with O3/H2O2 system. Transport treated water to Huron River to discharge.

TABLE 1

Alternative Cost Comparison
Gelman Sciences Site
Ann Arbor, Michigan

Alternative		PLS Cost Estimate Capital	O & M	Post Closure	Total	WESTON Estimate	Reference	Notes
4c	Groundwater Pumping, Treatment at Site Near Maple Rd with Ozone/Hydrogen Peroxide Treatment Followed by Injection into Unit E Through Multiple New Wells at Locations Where 1,4-Dioxane Levels are less than 85 ppb, but exceed 1 ppb under a Part 22 Permit	$9,982,329	$20,418,469	$95,160	$30,495,958		Table 12	3 leading edge extraction wells. Transport untreated water to Maple Rd and treat with O3/H2O2 system. Inject into Unit E where <85 ppb and >1 ppb.
5	Groundwater Pumping, Pipeline to Wagner Road Facility, No Treatment, Injection into Deep Geological Unit	$8,380,165	$10,785,219	$168,168	$19,333,552		Table 13	3 leading edge extraction wells. Transport untreated water to PLS and dispose into deep injection well.
6	Groundwater Pumping with Active Remediation Proximate to the Huron River, if necessary	**$5,663,456**	**$31,981,191**	$72,332	$37,716,979	$25,000,000	Table 14 with changes discussed below	Costs assume active remediation at Huron River necessary (30 years)
6a (PLS Preferred Alternative)	Groundwater Pumping with Active Remediation Proximate to the Huron River, if necessary, AND interim response measures that include mass removal at both PLS property and in the vicinity of Maple Rd.	***$5,663,456*** *$225,150* *$752,832* $6,641,438	***$31,981;191*** ***$540,958*** *$471,672* $32,993,821	*$72,332* *$7,020* *$23,993* $103,345	*$37,716,979* *$773,128* *$1,248,497* $39,738,604	$27,000,000	Table 14 (Alternative 6) App G (On-site Extraction) App G (Maple Rd Ext/Trtmt/Inj) - changes discussed below Total	•Costs assume active remediation at Huron River necessary (see costs for Alternative 6, 30 years) . •On-site groundwater extraction (one additional extraction well): O&M costs for ONE year operation only. •Extraction/treatment/injection at Maple Rd. (one extraction well, O3/H202 treatment/ one injection well): O&M costs for ONE year operation only. Capital costs for treatment system NOT included. Access costs at Maple Rd NOT included.

Alternative		WESTON Cost Estimate Capital	O & M	Post Closure		WESTON Total	Reference	Notes
MDEQ	Two additional recovery wells at PLS with treatment/discharge of recovered groundwater with current on-site system, AND 3 recovery wells at Maple Rd. and 3 recovery wells at leading edge, with recovered water treatment by O3/H202 system at Maple Rd. and discharge to Huron River.	$500,000 $4,400,000 $8,400,000 $13,300,000	$300,000 $1,900,000 $4,600,000 $6,800,000	Included in Capital Costs		$800,000 $6,300,000 $13,000,000 $20,000,000	uses both WESTON and PLS costs Total	NOTES: •Total on-site extraction rate is unaffected by additional extraction well. •Estimated 500 gpm extracted at Maple Rd. and 650 gpm extracted at leading edge requires treatment system rate and capacity for pipeline to Huron River of 1,150 gpm. Unit costs for various elements of FS alternatives must be adjusted when applied to MDEQ alternative to account for increase in rates of water recovered, treated, transported and disposed.

Present Worth:	
Alternative 6a - PLS costs	$10,492,729
Alternative 6a - WESTON costs	$8,000,000
MDEQ Alternative	$18,000,000

Notes: WESTON costs are a combination of PL-S and WESTON- generated costs, while PLS costs are based on on their unit rates, except the following:
- **Alternative 2**; $10,000 was added because Post Closure Costs for reporting was not included.
- **Alternative 6** equals $33,061,388 according to PLS Table 14
$600,000 for hydrogeologic is in Table 14 but not added into a subtotal. WESTON added this amount
Supporting Calcualtion B, Appendix E does not include $28,600 for manholes, with 12% contingency. WESTON added $32,032.
$9,610 added to 30% contingency for infrastructure
$700,000 for access legal fees and treatment system was not included in subtotal, WESTON added this amount
$3,313,949 was added to the 30% O&M contingency because PLS did not apply the contingency to the O&M subtotal
- **Alternative 6a**; $1,350 was added to the Wagner Road O&M 15% contingency to correct value

TABLE 4

MDEQ Combined Alternative
Wagner Road Cost Estimate with 10 and 1 Year O&M
Gelman Sciences Site
Ann Arbor, Michigan

COMPONENT	ENGINEER'S ESTIMATE					COMMENTS
	Quantity	Unit	Unit Price	Cost	Subtotal	
MOBILIZATION/DEMOBILIZATION	1	Estimate	$25,000	$25,000		Includes all labor, materials, equipment, administrative costs.
Subtotal					$25,000	
GROUNDWATER MODELING						
Install Monitoring Wells	4	each	$20,000	$ 80,000		
Sample Wells	4	wells	$135	$ 500		
Analytical	4	samples	$385	$ 1,500		
Modeling	1	LS	$50,000	$ 50,000		
Subtotal					$ 132,000	
INFRASTRUCTURE						
Extraction Wells	2	each	$ 50,000	$ 100,000		
Connection piping to Extraction Wells	200	LF	$ 70	$ 14,000		Assume 100 feet per well connection to existing piping
Electrical Service	3	each	$ 10,000	$ 30,000		Supply service and connect
Pumping Systems	3	each	$ 3,000	$ 9,000		
Process Control	3	each	$ 10,000	$ 30,000		
Monitoring Wells	2	each	$ 20,000	$ 40,000		
Contingencies	1	LS	30%	$ 66,900		
Subtotal					$289,900	
Access Fees						
Subtotal					$0	Not needed. Located on facility property.
Consulting/Engineering Fees						
Extraction Wells	1	LS	12%	$ 12,000		
Pipeline Construction	1	LS	12%	$ 1,680		
Connection Piping	1	LS	12%	$ 1,680		
Pumping System/Process Contros	1	LS	12%	$ 4,680		
Monitoring Wells	1	LS	12%	$ 4,800		
Contingencies	1	LS	30%	$ 7,452		
Subtotal					$ 32,292	
Post Closure						
Plug Extraction Wells	3	each	$2,000	$ 6,000		
Plug Monitoring Wells	3	each	$2,000	$ 6,000		
Plug Pipeline to Treatment system	5	section	$ 1,800.00	$ 9,000		Cut and cap
Plug Pipeline to Honey Creek	5	section	$ 1,800.00	$ 9,000		Cut and cap
Technical/Professional Services	1	LS	20%	$ 6,000		
Contingencies	1	LS	30%	$ 10,800		
Subtotal					$46,800	
DIRECT COST SUBTOTAL					$525,992	
ANNUAL OPERATION AND MAINTENANCE COSTS						
Pipeline Maintenance	1	year	$ 10,000	$ 10,000		O&M only included for the new facilities
Well Maintenance	2	year	$ 2,000	$ 4,000		O&M only included for the new facilities
Analytical - Extraction Wells	48	samples	$ 185	$ 8,880		Four deep wells sampled quarterly
Contingencies	1	LS	30%	$ 6,864		
ANNUAL O & M SUBTOTAL					$29,744	
TOTAL CAPITAL COST (INDIRECT AND DIRECT COSTS)					$525,992	
PRESENT WORTH OF ANNUAL O & M OVER 10 YEAR PERIOD					$208,900	Assumes a discount rate of 7 percent over a 10 year period.
TOTAL PRESENT WORTH (10 YEAR O&M)					**$734,892**	Capital cost plus 10 O&M
PRESENT WORTH OF ANNUAL O&M OVER 1 YEAR PERIOD					$29,744	
TOTAL PRESENT WORTH (1 YEAR O&M)					**$555,736**	Capital cost plus 1 year O&M

Alternative includes groundwater extraction, treatment and discharge to Honey Creek
Costs used to evaluate the MDEQ alternative were generated by both PLS (in their Feasibility Study) and WESTON.

TABLE 5

MDEQ Combined Alternative
Maple Road Cost Estimate with 20 and 1 Year O&M
Gelman Sciences Site
Ann Arbor, Michigan

COMPONENT	ENGINEER'S ESTIMATE					COMMENTS
	Quantity	Unit	Unit Price	Cost	Subtotal	
MOBILIZATION/DEMOBILIZATION	1	Estimate	$25,000	$25,000		Includes all labor, materials, equipment, administrative costs.
Subtotal					$25,000	
INFRASTRUCTURE						
Extraction Wells	3	each	$ 50,000	$ 150,000		
Connection piping to Extraction Wells	300	LF	$ 91	$ 27,300		Assume 100 feet per well connection
Pipeline to K Mart						
8 inch HDPE	7500	LF	$ 225	$ 1,687,500		Assume open cut
Steel casing under roads all roads	675	LF	$ 290	$ 195,800		Assume directional drill 9 crossings at 75 LF each
Manholes	14	each	$ 4,500	$ 63,000		
Electrical Service	3	each	$ 25,000	$ 75,000		Supply service and connect
Pumping Systems	3	each	$ 3,000	$ 9,000		Per Pall FS
Process Control	1	LS	$ 10,501	$ 10,500		
Treatment System	1	LS	$ 775,000	$ 775,000		
Contingencies	1	LS	30%	$ 897,930		
Subtotal					$3,891,030	
Access Fees						
Extraction Wells	1	LS	$ 10,000	$ 10,000		
Pipeline to K Mart	1	LS	$ 50,000	$ 50,000		
Well Pipelines	1	LS	$ 25,000	$ 25,000		
Contingencies	1	LS	30%	$ 25,500		
Subtotal					$110,500	
Consulting/Engineering Fees						
Extraction Wells	1	LS	12%	$ 18,000		
Pipeline Construction	1	LS	12%	$ 233,556		
Connection Piping	1	LS	12%	$ 3,276		
Pumping System/Process Contros	1	LS	12%	$ 2,340		
Contingencies	1	LS	30%	$ 77,152		
Subtotal					$ 334,324	
Post Closure						
Plug Extraction Wells	3		$ 1,500	$ 4,500		
Plug Pipeline To Maple Road	14	section	$1,800.00	$ 25,200		
Technical/Professional Services	1	LS	20%	$ 5,940		
Contingencies	1	LS	30%	$ 10,692		
Subtotal					$46,332	
DIRECT COST SUBTOTAL					$4,407,186	
ANNUAL OPERATION AND MAINTENANCE COSTS						
Treatment system operation	0	1000 gal	$ 0.27	$ -		1200GPM - 24 hr per day - 365 days per year
Pipeline Maintenance	1	year	$ 20,000	$ 20,000		
Well Maintenance	3	year	$ 2,000	$ 6,000		
Analytical - Extraction Wells	36	samples	$ 185	$ 6,660		
Electrical for Pumping	1	Year	$ 38,956	$ 38,956		
Contingencies	1	LS	30%	$ 21,485		
ANNUAL O & M SUBTOTAL					$93,101	
TOTAL CAPITAL COST (INDIRECT AND DIRECT COSTS)					$4,407,186	
PRESENT WORTH OF ANNUAL O & M OVER 20 YEAR PERIOD					$986,300	Assumes a discount rate of 7 percent over a 20 year period.
TOTAL PRESENT WORTH (20 YEAR O&M)					**$5,393,486**	Capital cost plus 20 O&M
SINGLE YEAR OF OPERATION O&M					$93,101	
TOTAL PRESENT WORTH (1 YEAR O&M)					**$4,500,286**	Capital cost plus 1 year O&M

Alternative includes groundwater extraction, treatment and discharge to Huron River

TABLE 6

MDEQ Combined Alternative
Leading Edge Cost Estimate with 10 and 1 Year O&M
Gelman Sciences Site
Ann Arbor, Michigan

COMPONENT	ENGINEER'S ESTIMATE Quantity	Unit	Unit Price	Cost	Subtotal	COMMENTS
MOBILIZATION/DEMOBILIZATION	1	Estimate	$25,000	$25,000		Includes all labor, materials, equipment, administrative costs.
Subtotal					$25,000	
GROUNDWATER MODELING						
Install Monitoring Wells	10	each	$20,000	$200,000		
Sample Wells	10	wells	$135	$1,350		
Analytical	10	samples	$385	$3,850		
Modeling	1	LS	$150,000	$150,000		
Subtotal					$355,200	
INFRASTRUCTURE						
Extraction Wells	3	each	$ 50,000	$ 150,000		
Connection piping to Extraction Wells	300	LF	$ 91	$ 27,300		Assume 100 feet per well connection
Pipeline to K-Mart						
12 inch HDPE	2500	LF	$ 225	$ 562,500		Assume open cut
Steel casing under roads all roads	0	LF	$ 290	$ -		
Manholes	5	each	$ 4,500	$ 22,500		
Pipeline to Huron River						
8 inch HDPE	35250	LF	$ 90	$ 3,172,500		Assume open cut with doubled 8-inch lines ($90/LF for single line, $50/LF for double line)
Steel casing under roads all roads	1950	LF	$ 240	$ 468,000		Assume directional drill 13 crossings at 75 LF each
Manholes	12	each	$ 4,500	$ 54,000		
Electrical Service	3	each	$ 50,000	$ 150,000		Supply service and connect
Pumping Systems	3	each	$ 3,000	$ 9,000		
Process Control	1	each	$ 10,304	$ 10,300		
Treatment System	1	LS	$ 775,000	$ 775,000		
Contingencies	1	LS	30%	$ 1,620,330		
Subtotal					$7,021,430	
Access Fees						
Extraction Wells	1	LS	$ 10,000	$ 10,000		
Pipeline to Maple Road	1	LS	$ 50,000	$ 50,000		
Pipeline to Huron River	1	LS	$ 50,000	$ 50,000		
Treatment System	1	LS	$ 20,000	$ 20,000		
Well Pipelines	1	LS	$ 25,000	$ 25,000		
Contingencies	1	LS	30%	$ 46,500		
Subtotal					$201,500	
Consulting/Engineering Fees						
Extraction Wells	1	LS	12%	$ 18,000		
Pipeline Construction	1	LS	12%	$ 513,540		
Connection Piping	1	LS	12%	$ 3,276		
Pumping System/Process Contros	1	LS	12%	$ 2,316		
Contingencies	1	LS	30%	$ 161,140		
Subtotal					$ 698,272	
Post Closure						
Plug Extraction Wells	3		$ 2,000	$ 6,000		
Plug Monitoring Wells	0		$ 2,000	$ -		
Plug Pipeline To Maple Road	5	section	$ 1,800	$ 9,000		
Plug Pipeline to Huron River	12	section	$ 1,800	$ 21,600		
Technical/Professional Services	1	LS	20%	$ 7,320		
Contingencies	1	LS	30%	$ 13,176		
Subtotal					$57,096	
DIRECT COST SUBTOTAL					$8,358,498	
ANNUAL OPERATION AND MAINTENANCE COSTS						
Treatment system operation	630700	1000 gal	$ 0.26	$ 163,982		1200GPM - 24 hr per day - 365 days per year
Pipeline Maintenance	1	year	$ 20,000	$ 20,000		
NPDES monitoring, reporting, fees	1	year	$ 30,150	$ 30,150		
Well Maintenance	3	year	$ 2,000	$ 6,000		
Groundwater Sampling	144	samples	$ 135	$ 19,440		Sample 36 wells Quarterly
Analytical - Monitoring Wells	144	samples	$ 385	$ 55,440		Sample 36 wells Quarterly
Analytical - Extraction Wells	36	samples	$ 185	$ 6,660		
Electrical for Pumping	1	year	$ 49,448	$ 49,448		
Electrical for Discharge	1	Month	$ 3,012	$ 3,012		Per Pall FS
Contingencies	1	LS	30%	$ 106,240		
ANNUAL O & M SUBTOTAL					$460,372	

TOTAL CAPITAL COST (INDIRECT AND DIRECT COSTS)	$8,358,498	
PRESENT WORTH OF ANNUAL O & M OVER 10 YEAR PERIOD	$3,233,500	Assumes a discount rate of 7 percent over a 10 year period.
TOTAL PRESENT WORTH (10 YEAR O&M)	**$11,591,998**	Capital cost plus 10 year O&M
SINGLE YEAR OF OPERATION O&M	$460,372	
TOTAL PRESENT WORTH (1 YEAR O&M)	**$8,818,869**	Capital cost plus 1 year O&M

Alternative includes groundwater extraction, treatment and discharge to Huron River
Costs used to evaluate the MDEQ alternative were generated by both PLS (in their Feasibility Study) and WESTON.