Appendix B Cost Analysis

Gasoline Equipment Review Technical Report

Conventional Equipment

OAQPS Factors (Table 1.4 Capital Costs Carbon Adsorbers)

Variable		Cost	Notes
Equipment Cost	A	$3,273	see equipment costs tab
Purchased Equipment Cost	B	$3,862.53	
Direct Installation Cost	DC	$5,021.29	
Indirect Cost	IC	$695.26	
Contractor Fees		$571.65	
Contingencies	C	$571.65	10% contingency assumed
Total Capital Investment	TCI	$6,859.86	
Annualized Cost		$1,116.41	
Maintenance		$857.48	
Testing		$2,000.00	$2,000 economic benefit for annual stage 2 compliance tests $1,000 economic benefit for pressure decay tests
Total Annual Cost		$3,973.89	

Cost Recovery Factors from ODEQ analysis:

Cost Recovery Factor CRF1 (10% discount, 10 yr. life) -- All Others	0.1627
Cost Recovery Factor CRF2 (10% discount, 7 yr. life) -- Dispensers	0.2054
Cost Recovery Factor CRF3 (10% discount, 3 yr. life) -- Nozzles	0.4021

Conventional System

200,000 gallon/yr
500,000 gallon/yr
700,000 gallon/yr
1,000,000 gallon/yr
6,000,000 gallon/yr
36,000,000 gallon/yr

VOC Emissions (lbs)

Refueling					
ORVR	Non-ORVR	Spillage	Presure-Driven Losses		Total VOC Emissions (ton/yr)
72.49	230.16	122.00	152.00	0.29	
181.23	575.40	305.00	380.00	0.72	
253.72	805.56	427.00	532.00	1.01	
362.46	1150.80	610.00	760.00	1.44	
2174.76	6904.80	3660.00	4560.00	8.65	
13048.56	41428.80	21960.00	27360.00	51.90	

Appendix B Cost Analysis

Gasoline Equipment Review Technical Report

Enhanced Conventional and Low Perm Hose

OAQPS Factors (Table 1.4 Capital Costs Carbon Adsorbers)

Variable		Cost	Notes
Equipment Cost	A	$7,817	see equipment costs tab
Purchased Equipment Cost	B	$9,223.67	OAQPS method 1.18A
Direct Installation Cost	DC	$11,990.77	OAQPS method 1.3B
Indirect Cost	IC	$1,660.26	OAQPS method 0.18B
Contractor Fees		$1,365.10	OAQPS method 0.1(IC+ contractor)
Contingencies	C	$1,365.10	10% contingency assumed
Total Capital Investment	TCI	$16,381.23	
Annualized Cost		$2,665.97	
Maintenance		$2,047.65	
Testing		$2,000.00	$2,000 economic benefit for annual stage 2 compliance tests $1,000 economic benefit for
Total Annual Cost		$6,713.62	
Incremental Annual Cost		$2,739.73	
Incremental $/ton 500k gal/yr		$15,341.39	
Incremental $/ton 700k gal/yr		$10,958.14	

Cost Recovery Factors from ODEQ analysis:

Cost Recovery Factor CRF1 (10% discount, 10 yr. life) -- All Others	0.1627
Cost Recovery Factor CRF2 (10% discount, 7 yr. life) -- Dispensers	0.2054
Cost Recovery Factor CRF3 (10% discount, 3 yr. life) -- Nozzles	0.4021

Eco and Low Perm	VOC Emissions (lbs) Refueling ORVR	Refueling Non-ORVR	Spillage	Presure-Driven	Total VOC Emissions (ton/yr)	VOC decrease
200,000 gallon/yr	3.62	230.16	48.00	152.00	0.22	0.07
500,000 gallon/yr	9.06	575.40	120.00	380.00	0.54	0.18
700,000 gallon/yr	12.69	805.56	168.00	532.00	0.76	0.25
1,000,000 gallon/yr	18.12	1150.80	240.00	760.00	1.08	0.36
6,000,000 gallon/yr	108.74	6904.80	1440.00	4560.00	6.51	2.14
36,000,000 gallon/yr	652.43	41428.80	8640.00	27360.00	39.04	12.86

Appendix B Cost Analysis
Gasoline Equipment Review Technical Report

Enhanced Conventional Nozzle Only

OAQPS Factors (Table 1.4 Capital Costs Carbon Adsorbers)

Variable		Cost	Notes
Equipment Cost	A	$5,945	see equipment costs tab
Purchased Equipment Cost	B	$7,015.49	OAQPS method 1.18A
Direct Installation Cost	DC	$9,120.14	OAQPS method 1.3B
Indirect Cost	IC	$1,262.79	OAQPS method 0.18B
Contractor Fees		$1,038.29	OAQPS method 0.1(IC+ contractor)
Contingencies	C	$1,038.29	10% contingency assumed
Total Capital Investment	TCI	$12,459.52	
Annualized Cost		$2,027.73	
Maintenance		$1,557.44	
Testing		$2,000.00	$2,000 economic benefit for annual stage 2 compliance tests $1,000 economic benefit for pressure decay tests
Total Annual Cost		$5,585.17	
Incremental Annual Cost		$1,611.28	
Incremental $/ton 500k gal/yr		$9,022.50	
Incremental $/ton 700k gal/yr		$6,444.64	

Cost Recovery Factors from ODEQ analysis:

Cost Recovery Factor CRF1 (10% discount, 10 yr. life) -- All Others	0.1627
Cost Recovery Factor CRF2 (10% discount, 7 yr. life) -- Dispensers	0.2054
Cost Recovery Factor CRF3 (10% discount, 3 yr. life) -- Nozzles	0.4021

VOC Emissions (lbs)

Eco and Low Perm	Refueling ORVR	Refueling Non-ORVR	Spillage	Presure-Driven	Total VOC Emissions (ton/yr)	VOC decrease
200,000 gallon/yr	3.62	230.16	48.00	152.00	0.22	0.07
500,000 gallon/yr	9.06	575.40	120.00	380.00	0.54	0.18
700,000 gallon/yr	12.69	805.56	168.00	532.00	0.76	0.25
1,000,000 gallon/yr	18.12	1150.80	240.00	760.00	1.08	0.36
6,000,000 gallon/yr	108.74	6904.80	1440.00	4560.00	6.51	2.14
36,000,000 gallon/yr	652.43	41428.80	8640.00	27360.00	39.04	12.86

Appendix B Cost Analysis

Gasoline Equipment Review Technical Report

EVR (without vapor processor)

OAQPS Factors (Table 1.4 Capital Costs Carbon Adsorbers)

Variable		Cost	Notes
Equipment Cost	A	$11,621	see equipment costs tab
Purchased Equipment Cost	B	$13,713.17	OAQPS method 1.18A
Direct Installation Cost	DC	$17,827.13	OAQPS method 1.3B
Indirect Cost	IC	$2,468.37	OAQPS method 0.18B
Contractor Fees		$2,029.55	OAQPS method 0.1(IC+ contractor)
Contingencies	C	$2,029.55	10% contingency assumed
Total Capital Investment	TCI	$24,354.60	
Annualized Cost		$3,963.60	
Maintenance		$3,044.32	
			$2,000 economic benefit for annual stage 2 compliance tests
			$1,000 economic benefit for pressure
Testing		$4,000.00	decay tests
Total Annual Cost		$11,007.92	
Incremental Annual Cost		$7,034.03	
Incremental $/ton 700k gal/yr		$9,484.75	
Incremental $/ton 1 million gal/yr		$6,639.32	

Cost Recovery Factors from ODEQ analysis:

Cost Recovery Factor CRF1 (10% discount, 10 yr. life) -- All Others	0.1627
Cost Recovery Factor CRF2 (10% discount, 7 yr. life) -- Dispensers	0.2054
Cost Recovery Factor CRF3 (10% discount, 3 yr. life) -- Nozzles	0.4021

VOC Emissions (lbs)

EVR no processor	Refueling					
	ORVR	Non-ORVR	Spillage	Presure-Driven	Total VOC Emissions	VOC decrease
200,000 gallon/yr	20.71	65.76	48.00	18.40	0.08	0.21
500,000 gallon/yr	51.78	164.40	120.00	46.00	0.19	0.53
700,000 gallon/yr	72.49	230.16	168.00	64.40	0.27	0.74
1,000,000 gallon/yr	103.56	328.80	240.00	92.00	0.38	1.06
6,000,000 gallon/yr	621.36	1972.80	1440.00	552.00	2.29	6.36
36,000,000 gallon/yr	3728.16	11836.80	8640.00	3312.00	13.76	38.14

Appendix B Cost Analysis
Gasoline Equipment Review Technical Report

EVR (including vapor processor)

OAQPS Factors (Table
1.4 Capital Costs
Carbon Adsorbers)

Cost Recovery Factors from ODEQ analysis:

Cost Recovery Factor CRF1 (10% discount, 10 yr. life) -- All Others	0.1627
Cost Recovery Factor CRF2 (10% discount, 7 yr. life) -- Dispensers	0.2054
Cost Recovery Factor CRF3 (10% discount, 3 yr. life) -- Nozzles	0.4021

Variable		Cost	Notes
Equipment Cost	A	$32,621	see equipment costs tab
Purchased Equipment Cost	B	$38,493.17	OAQPS method 1.18A
Direct Installation Cost	DC	$50,041.13	OAQPS method 1.3B
Indirect Cost	IC	$6,928.77	OAQPS method 0.18B
Contractor Fees		$5,696.99	OAQPS method 0.1(IC+ contractor)
Contingencies	C	$5,696.99	10% contingency assumed
Total Capital Investment	TCI	$68,363.88	
Annualized Cost		$11,125.91	
Maintenance		$4,518.73	1/8 of nozzles, hanging hardware and hoses
			$2,000 economic benefit for annual stage 2 compliance tests
			$1,000 economic benefit for pressure
Testing		$4,000.00	decay tests
Total Annual Cost		$19,644.64	
Recovered Gasoline Benefit 700,000		$ 14,000.00	ARID permeator spec 5 gallons recovered per 1,000 gallons @ $4.00/gallon
Recovered Gasoline Benefit 1,000,000		$ 20,000.00	
Recovered Gasoline Benefit 6,000,000		$ 120,000.00	
Recovered Gasoline Benefit 36,000,000		$ 720,000.00	

Incremental $/ton 1 million gal/yr	($279.41)
Incremental $/ton 6 million gal/yr	($13,151.37)
Incremental $/ton 36 million gal/yr	($13,764.93)

Appendix B Cost Analysis

Gasoline Equipment Review Technical Report

EVR (including vapor processor)

VOC Emissions (lbs)

EVR and vapor processor	Refueling		Spillage	Presure-Driven Losses	Total VOC Emissions (ton/yr)	VOC decrease
	ORVR	Non-ORVR				
200,000 gallon/yr	3.62	11.51	48.00	4.80	0.03	0.25
500,000 gallon/yr	9.06	28.77	120.00	12.00	0.08	0.64
700,000 gallon/yr	12.69	40.28	168.00	16.80	0.12	0.89
1,000,000 gallon/yr	18.12	57.54	240.00	24.00	0.17	1.27
6,000,000 gallon/yr	108.74	345.24	1440.00	144.00	1.02	7.63
36,000,000 gallon/yr	108.74	345.24	1440.00	144.00	1.02	50.88

Conventional Refueling

Hardware	Unit Cost	Installation	# Units	Source
Nozzle	$89	$100	8	
Breakaway	$76		8	unit cost: September 2019 PSCAA Notification cut sheet - diesel
Standard Whip Hose	$40		8	
Standard Fuel Hose	$ 180.00	$100	8	installation cost: SWCAA and ODEQ GDF cost analyses
Swivel	$25		8	

Enhanced Conventional Nozzle only

Hardware	Unit Cost	Installation	# Units
Nozzle	$ 422.50	$100	8
Breakaway	$76		8
Standard Whip Hose	$40		8
Standard Fuel Hose	$ 180.00		8
Swivel	$25		8

Enhanced Conventional and Low Perm Hoses

Hardware	Unit Cost	Installation	# Units	
Nozzle	$ 422.50	$100	8	SWCAA and ODEQ GDF cost analyses
Low Perm Hoses	$479	$100	8	EVR low perm combined whip and primary
Breakaway	$76		8	reconnectable conventional

EVR Stage 2 System without Vapor Processor

Hardware	Unit Cost	Installation	# Units
EVR Nozzle	$735	$100	8
Whip Hose	$174	$100	8
Coaxial Hose	$ 304.75		8
Breakway	$239		

EVR Stage 2 System with Vapor Processor

Hardware	Unit Cost	Installation	# Units	
				unit cost: September 2019 PSCAA Notification cut sheet - EVR
EVR Nozzle	$735	$100	8	installation cost: SWCAA and ODEQ GDF cost analyses
Whip Hose	$174	$100	8	
Coaxial Hose	$ 304.75		8	
Breakway	$239			
Vapor Processor	$21,000		1	
				ARID permeator 5 gallons recovered per 1,000 gallons dispensed
Gasoline Recovery				$4.00/gallon assumed

Unit Cost Values (online vendors & 2019 PSCAA notification cut sheet)

EVR Nozzles	
VST EVR Balance G2	$1,325
EMCO A4005EVR	$712
EMCO A4005EVR-052	$488
EMCO A4005EVR-052	$416
EVR Breakaway	
VST Enviro LOC	$377
EMCO A4119EVR	$213
ZOPW 66CLP-5100	$220
OPW Balance Breakway CLP	$144
EVR Whip Hose (Low Perm)	
VST Enviro Loc Platinum	213.5
VST VDV EVR 8'	250
VSTEVR-012	$59
EVR Primary Hose (Low Perm)	
EVST Enviro Loc Platinum	$ 644.00
VST VDV EVR 12"	$133
Contitech 8ft	$242
VST 8" Coaxial	$200
Conventional Hose	
VSTaflex Primary & Whip	$ 220.00
Low Perm Hose	
EnviroLOC VST Low Perm	$ 593.50
Enhanced Conventional Nozzles	
EnviroLOC Dripless Gas	$ 512.00
OPW 14E Eco	$373
Husky 6025 Eco	$ 505.00
Vapor Processor	
Green Machine	$52,000
Veeder Root Vapor Polisher	$19,000
Healy Clean Air Separator	$21,000
Conventional Nozzle	
OPW 11BP	$80
11BP-0400 OPW	$97
Conventional Breakaway	
697-137-01 EWB	$58
OPW 66REC	$104