# APPENDIX F
# GROUNDWATER REMEDIATION CALCULATIONS AND BACKUP DOCUMENTATION

**PORE VOLUME FLUSHING ANALYSIS - REMEDIATION TO BACKGROUND (ZONE A BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**Governing Equations:**

Single Pore Volume of Plume: $PV = BnA$

Number of Pore Volume Flushes: $NPV = -R_f \ln(\frac{C_f}{C_o})$

**PORE VOLUME FLUSHING AND REMEDIATION TIME**

| PARAMETER | UNIT | Sr |
|---|---|---|
| Impacted Thickness | ft | 2.5 |
| Porosity | unitless | 0.35 |
| Area of Plume | $ft^2$ | 180,800 |
| Pore Volume | gal | 1,183,336 |
| Retardation Factor (Rf) | unitless | 1 |
| Target Concentration (Cf) | unitless | 0.57 |
| Initial Concentration (Co) | unitless | 1.18 |
| NPV | | 0.7 |
| Recovery volume to achieve remediation target | gal | 861,035 |
| Aquifer pumping rate (single well) | gpm | 0.11 |
| Number of recovery wells | ea | 28 |
| Depth of recovery wells | ft | 40 |
| GW Recovery Rate | gpd | 4,435 |
| Time to reach remedial target | years | 0.5 |

**COST FOR GROUNDWATER RECOVERY WITH OFFSITE DISPOSAL OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE A BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 56 | | | $109,200 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 1120 | | | $77,280 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 1120 | | | $4,480 |
| Submersible recovery pump and installation | $1,331 | ea | 28 | | | $37,265 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $37,475 | unit | 1 | | | $37,475 |
| Well Surface Completions | $800 | ea | 28 | | | $22,400 |
| Electrical (equipment, labor & materials) | $35,537 | unit | 1 | | | $35,537 |
| | | | | | Capital Costs Subtotal | $346,737 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $17,337 |
| Construction Management (6% of capital costs) | | | 6% | | | $20,804 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $34,674 |
| | | | | | TOTAL CAPITAL COSTS | $419,552 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $4,900 | QTR | 2 | | | $10,425 |
| GW Laboratory Analysis | $8,000 | QTR | 2 | $3,404 | | $20,424 |
| GW Report | $2,500 | ea | 1 | | | $2,659 |
| | | | | | Subtotal | $33,509 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $37,265 | event | 0 | | | $0 |
| Electricity | $0.08 | kWh | 89,213 | | | $7,137 |
| Discharge Sampling | $1,950 | QTR | 2 | | | $4,149 |
| Discharge Lab Analysis | $750 | QTR | 2 | $319 | | $1,915 |
| | | | | | Subtotal | $13,200 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $46,709 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $934 |
| Project Management (5% of O&M costs) | | | 5% | | | $2,335 |
| | | | | | TOTAL O&M COSTS | $49,979 |
| | | | | | | |
| ***Offsite Disposal of Concentrated Wastewater From RO*** | | | | | | |
| Offsite Disposal | $6.00 | bbl | 10,250 | | | $61,502 |
| Transportation | $2.25 | bbl | 10,250 | | | $23,063 |
| | | | | | TOTAL DISPOSAL COSTS | $84,566 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$554,096** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**COST FOR GROUNDWATER RECOVERY WITH ONSITE INJECTION OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE A BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 56 | | | $109,200 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 1120 | | | $77,280 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 1120 | | | $4,480 |
| Submersible recovery pump and installation | $1,331 | ea | 28 | | | $37,265 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $37,475 | unit | 1 | | | $37,475 |
| Well Surface Completions | $800 | ea | 28 | | | $22,400 |
| Electrical (equipment, labor & materials) | $35,537 | unit | 1 | | | $35,537 |
| | | | | | Capital Costs Subtotal | $346,737 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $17,337 |
| Construction Management (6% of capital costs) | | | 6% | | | $20,804 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $34,674 |
| | | | | | TOTAL CAPITAL COSTS | $419,552 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $4,900 | QTR | 2 | | | $10,425 |
| GW Laboratory Analysis | $8,000 | QTR | 2 | $3,404 | | $20,424 |
| GW Report | $2,500 | ea | 1 | | | $2,659 |
| | | | | | Subtotal | $33,509 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $37,265 | event | 0 | | | $0 |
| Electricity | $0.08 | kWh | 89,213 | | | $7,137 |
| Discharge Sampling | $1,950 | QTR | 2 | | | $4,149 |
| Discharge Lab Analysis | $750 | QTR | 2 | $319 | | $1,915 |
| | | | | | Subtotal | $13,200 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $46,709 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $934 |
| Project Management (5% of O&M costs) | | | 5% | | | $2,335 |
| | | | | | TOTAL O&M COSTS | $49,979 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$469,530** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**POWER CONSUMPTION CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE A BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| | # of Units | Unit Rated Power (kW) | Duration of Daily Operation (hr) | Daily Energy Consumption (kWh/d) | Quarterly Energy Consumption (kWh) |
|---|---|---|---|---|---|
| **PUMPS** | | | | | |
| Submersible Pumps | 28 | 0.7 | 22 | 460 | **41,933** |
| | 28 | | | | **41,933** |

**PIPING CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE A BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**PIPING, FITTINGS AND WIRING REQUIREMENTS**

| | |
|---|---|
| GW distribution pipe 3" Schedule 40 PVC | 4,200 |
| 1.5"discharge line from pump to distribution piping | 980 |
| 3" Elbow fittings (45°) | 56 |
| 3" Couplings | 210 |
| 3" T fittings | 28 |
| 3/4 "electrical conduit | 4,200 |

**PORE VOLUME FLUSHING ANALYSIS - REMEDIATION TO BACKGROUND (ZONE E BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**Governing Equations:**

Single Pore Volume of Plume: $PV = BnA$

Number of Pore Volume Flushes: $NPV = -R_f \ln(\frac{C_f}{C_o})$

**PORE VOLUME FLUSHING AND REMEDIATION TIME**

| PARAMETER | UNIT | Sr |
|---|---|---|
| Impacted Thickness | ft | 2.5 |
| Porosity | unitless | 0.35 |
| Area of Plume | $ft^2$ | 1,067,865 |
| Pore Volume | gal | 6,989,176 |
| Retardation Factor (Rf) | unitless | 1 |
| Target Concentration (Cf) | unitless | 0.57 |
| Initial Concentration (Co) | unitless | 1.80 |
| NPV | | 1.1 |
| Recovery volume to achieve remediation target | gal | 8,036,893 |
| Aquifer pumping rate (single well) | gpm | 0.14 |
| Number of recovery wells | ea | 167 |
| Depth of recovery wells | ft | 39 |
| GW Recovery Rate | gpd | 33,667 |
| Time to reach remedial target | years | 0.7 |

**COST FOR GROUNDWATER RECOVERY WITH OFFSITE DISPOSAL OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE E BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 334 | | | $651,300 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 6513 | | | $449,397 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 6513 | | | $26,052 |
| Submersible recovery pump and installation | $1,331 | ea | 167 | | | $222,256 |
| Storage Tanks | $20,600 | ea | 2 | | | $41,200 |
| Recovery piping and fittings (incl. labor & materials) | $223,281 | unit | 1 | | | $223,281 |
| Well Surface Completions | $800 | ea | 167 | | | $133,600 |
| Electrical (equipment, labor & materials) | $211,955 | unit | 1 | | | $211,955 |
| | | | | | Capital Costs Subtotal | $1,961,540 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $98,077 |
| Construction Management (6% of capital costs) | | | 6% | | | $117,692 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $196,154 |
| | | | | | TOTAL CAPITAL COSTS | $2,373,464 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $29,225 | QTR | 3 | | | $76,454 |
| GW Laboratory Analysis | $42,750 | QTR | 3 | $22,367 | | $134,204 |
| GW Report | $2,500 | ea | 1 | | | $3,270 |
| | | | | | Subtotal | $213,929 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $222,256 | event | 0 | | | $0 |
| Electricity | $0.08 | kWh | 654,273 | | | $52,342 |
| Discharge Sampling | $1,950 | QTR | 3 | | | $5,101 |
| Discharge Lab Analysis | $750 | QTR | 3 | $392 | | $2,354 |
| | | | | | Subtotal | $59,798 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $273,726 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $5,475 |
| Project Management (5% of O&M costs) | | | 5% | | | $13,686 |
| | | | | | TOTAL O&M COSTS | $292,887 |
| | | | | | | |
| ***Offsite Disposal of Concentrated Wastewater From RO*** | | | | | | |
| Offsite Disposal | $6.00 | bbl | 95,677 | | | $574,064 |
| Transportation | $2.25 | bbl | 95,677 | | | $215,274 |
| | | | | | TOTAL DISPOSAL COSTS | $789,338 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$3,455,689** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

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**COST FOR GROUNDWATER RECOVERY WITH ONSITE INJECTION OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE E BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 334 | | | $651,300 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 6513 | | | $449,397 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 6513 | | | $26,052 |
| Submersible recovery pump and installation | $1,331 | ea | 167 | | | $222,256 |
| Storage Tanks | $20,600 | ea | 2 | | | $41,200 |
| Recovery piping and fittings (incl. labor & materials) | $223,281 | unit | 1 | | | $223,281 |
| Well Surface Completions | $800 | ea | 167 | | | $133,600 |
| Electrical (equipment, labor & materials) | $211,955 | unit | 1 | | | $211,955 |
| | | | | | Capital Costs Subtotal | $1,961,540 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $98,077 |
| Construction Management (6% of capital costs) | | | 6% | | | $117,692 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $196,154 |
| | | | | | TOTAL CAPITAL COSTS | $2,373,464 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $29,225 | QTR | 3 | | | $76,454 |
| GW Laboratory Analysis | $42,750 | QTR | 3 | $22,367 | | $134,204 |
| GW Report | $2,500 | ea | 1 | | | $3,270 |
| | | | | | Subtotal | $213,929 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $222,256 | event | 0 | | | $0 |
| Electricity | $0.08 | kWh | 654,273 | | | $52,342 |
| Discharge Sampling | $1,950 | QTR | 3 | | | $5,101 |
| Discharge Lab Analysis | $750 | QTR | 3 | $392 | | $2,354 |
| | | | | | Subtotal | $59,798 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $273,726 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $5,475 |
| Project Management (5% of O&M costs) | | | 5% | | | $13,686 |
| | | | | | TOTAL O&M COSTS | $292,887 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$2,666,351** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**POWER CONSUMPTION CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE E BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| | # of Units | Unit Rated Power (kW) | Duration of Daily Operation (hr) | Daily Energy Consumption (kWh/d) | Quarterly Energy Consumption (kWh) |
|---|---|---|---|---|---|
| **PUMPS** | | | | | |
| Submersible Pumps | 167 | 0.7 | 22 | 2741 | **250,098** |
| | 167 | | | | **250,098** |

**PIPING CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE E BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**PIPING, FITTINGS AND WIRING REQUIREMENTS**

| | |
|---|---|
| GW distribution pipe 3" Schedule 40 PVC | 25,050 |
| 1.5"discharge line from pump to distribution piping | 5,678 |
| 3" Elbow fittings (45°) | 334 |
| 3" Couplings | 1,253 |
| 3" T fittings | 167 |
| 3/4 "electrical conduit | 25,050 |

**PORE VOLUME FLUSHING ANALYSIS - REMEDIATION TO BACKGROUND (ZONE F BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**Governing Equations:**

Single Pore Volume of Plume: $PV = BnA$

Number of Pore Volume Flushes: $NPV = -R_f \ln(\frac{C_f}{C_o})$

**PORE VOLUME FLUSHING AND REMEDIATION TIME**

| PARAMETER | UNIT | Sr |
|---|---|---|
| Impacted Thickness | ft | 7 |
| Porosity | unitless | 0.35 |
| Area of Plume | $ft^2$ | 176,701 |
| Pore Volume | gal | 3,238,223 |
| Retardation Factor (Rf) | unitless | 1 |
| Target Concentration (Cf) | unitless | 0.57 |
| Initial Concentration (Co) | unitless | 15.44 |
| NPV | | 3.3 |
| Recovery volume to achieve remediation target | gal | 10,682,108 |
| Aquifer pumping rate (single well) | gpm | 0.33 |
| Number of recovery wells | ea | 10 |
| Depth of recovery wells | ft | 40 |
| GW Recovery Rate | gpd | 4,752 |
| Time to reach remedial target | years | 6.2 |

**COST FOR GROUNDWATER RECOVERY WITH OFFSITE DISPOSAL OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE F BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 20 | | | $39,000 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 400 | | | $27,600 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 400 | | | $1,600 |
| Submersible recovery pump and installation | $1,331 | ea | 10 | | | $13,309 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $13,384 | unit | 1 | | | $13,384 |
| Well Surface Completions | $800 | ea | 10 | | | $8,000 |
| Electrical (equipment, labor & materials) | $12,692 | unit | 1 | | | $12,692 |
| | | | | | Capital Costs Subtotal | $138,685 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $6,934 |
| Construction Management (6% of capital costs) | | | 6% | | | $8,321 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $13,868 |
| | | | | | TOTAL CAPITAL COSTS | $167,808 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $1,750 | QTR | 25 | | | $43,111 |
| GW Laboratory Analysis | $3,500 | QTR | 25 | $17,244 | | $103,466 |
| GW Report | $2,500 | ea | 12 | | | $30,793 |
| | | | | | Subtotal | $177,370 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $13,309 | event | 1 | | | $13,309 |
| Electricity | $0.08 | kWh | 368,928 | | | $29,514 |
| Discharge Sampling | $1,950 | QTR | 25 | | | $48,038 |
| Discharge Lab Analysis | $750 | QTR | 25 | $3,695 | | $22,171 |
| | | | | | Subtotal | $113,032 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $290,402 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $5,808 |
| Project Management (5% of O&M costs) | | | 5% | | | $14,520 |
| | | | | | TOTAL O&M COSTS | $310,730 |
| | | | | | | |
| ***Offsite Disposal of Concentrated Wastewater From RO*** | | | | | | |
| Offsite Disposal | $6.00 | bbl | 152,602 | | | $915,609 |
| Transportation | $2.25 | bbl | 152,602 | | | $343,353 |
| | | | | | TOTAL DISPOSAL COSTS | $1,258,963 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$1,737,501** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**COST FOR GROUNDWATER RECOVERY WITH ONSITE INJECTION OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE F BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 20 | | | $39,000 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 400 | | | $27,600 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 400 | | | $1,600 |
| Submersible recovery pump and installation | $1,331 | ea | 10 | | | $13,309 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $13,384 | unit | 1 | | | $13,384 |
| Well Surface Completions | $800 | ea | 10 | | | $8,000 |
| Electrical (equipment, labor & materials) | $12,692 | unit | 1 | | | $12,692 |
| | | | | | Capital Costs Subtotal | $138,685 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $6,934 |
| Construction Management (6% of capital costs) | | | 6% | | | $8,321 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $13,868 |
| | | | | | TOTAL CAPITAL COSTS | $167,808 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $1,750 | QTR | 25 | | | $43,111 |
| GW Laboratory Analysis | $3,500 | QTR | 25 | $17,244 | | $103,466 |
| GW Report | $2,500 | ea | 12 | | | $30,793 |
| | | | | | Subtotal | $177,370 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $13,309 | event | 1 | | | $13,309 |
| Electricity | $0.08 | kWh | 368,928 | | | $29,514 |
| Discharge Sampling | $1,950 | QTR | 25 | | | $48,038 |
| Discharge Lab Analysis | $750 | QTR | 25 | $3,695 | | $22,171 |
| | | | | | Subtotal | $113,032 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $290,402 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $5,808 |
| Project Management (5% of O&M costs) | | | 5% | | | $14,520 |
| | | | | | TOTAL O&M COSTS | $310,730 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$478,538** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**POWER CONSUMPTION CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE F BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| | # of Units | Unit Rated Power (kW) | Duration of Daily Operation (hr) | Daily Energy Consumption (kWh/d) | Quarterly Energy Consumption (kWh) |
|---|---|---|---|---|---|
| **PUMPS** | | | | | |
| Submersible Pumps | 10 | 0.7 | 22 | 164 | **14,976** |
| | 10 | | | | **14,976** |

**PIPING CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE F BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**PIPING, FITTINGS AND WIRING REQUIREMENTS**

| | |
|---|---|
| GW distribution pipe 3" Schedule 40 PVC | 1,500 |
| 1.5"discharge line from pump to distribution piping | 350 |
| 3" Elbow fittings (45°) | 20 |
| 3" Couplings | 75 |
| 3" T fittings | 10 |
| 3/4 "electrical conduit | 1,500 |

**PORE VOLUME FLUSHING ANALYSIS - REMEDIATION TO BACKGROUND (ZONE G BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**Governing Equations:**

Single Pore Volume of Plume: $PV = BnA$

Number of Pore Volume Flushes: $NPV = -R_f \ln(\frac{C_f}{C_o})$

**PORE VOLUME FLUSHING AND REMEDIATION TIME**

| PARAMETER | UNIT | Sr |
|---|---|---|
| Impacted Thickness | ft | 6 |
| Porosity | unitless | 0.35 |
| Area of Plume | $ft^2$ | 294,975 |
| Pore Volume | gal | 4,633,467 |
| Retardation Factor (Rf) | unitless | 1 |
| Target Concentration (Cf) | unitless | 0.57 |
| Initial Concentration (Co) | unitless | 2.15 |
| NPV | | 1.3 |
| Recovery volume to achieve remediation target | gal | 6,151,330 |
| Aquifer pumping rate (single well) | gpm | 0.31 |
| Number of recovery wells | ea | 16 |
| Depth of recovery wells | ft | 40 |
| GW Recovery Rate | gpd | 7,142 |
| Time to reach remedial target | years | 2.4 |

**COST FOR GROUNDWATER RECOVERY WITH OFFSITE DISPOSAL OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE G BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 32 | | | $62,400 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 640 | | | $44,160 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 640 | | | $2,560 |
| Submersible recovery pump and installation | $1,331 | ea | 16 | | | $21,294 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $27,127 | unit | 1 | | | $27,127 |
| Well Surface Completions | $800 | ea | 16 | | | $12,800 |
| Electrical (equipment, labor & materials) | $26,661 | unit | 1 | | | $26,661 |
| | | | | | Capital Costs Subtotal | $220,102 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $11,005 |
| Construction Management (6% of capital costs) | | | 6% | | | $13,206 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $22,010 |
| | | | | | TOTAL CAPITAL COSTS | $266,323 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $2,800 | QTR | 9 | | | $26,427 |
| GW Laboratory Analysis | $5,000 | QTR | 9 | $9,438 | | $56,630 |
| GW Report | $2,500 | ea | 5 | | | $11,798 |
| | | | | | Subtotal | $94,855 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $21,294 | event | 0 | | | $0 |
| Electricity | $0.08 | kWh | 226,155 | | | $18,092 |
| Discharge Sampling | $1,950 | QTR | 9 | | | $18,405 |
| Discharge Lab Analysis | $750 | QTR | 9 | $1,416 | | $8,494 |
| | | | | | Subtotal | $44,991 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $139,846 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $2,797 |
| Project Management (5% of O&M costs) | | | 5% | | | $6,992 |
| | | | | | TOTAL O&M COSTS | $149,635 |
| | | | | | | |
| ***Offsite Disposal of Concentrated Wastewater From RO*** | | | | | | |
| Offsite Disposal | $6.00 | bbl | 73,230 | | | $439,381 |
| Transportation | $2.25 | bbl | 73,230 | | | $164,768 |
| | | | | | TOTAL DISPOSAL COSTS | $604,148 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$1,020,107** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**COST FOR GROUNDWATER RECOVERY WITH ONSITE INJECTION OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE G BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 32 | | | $62,400 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 640 | | | $44,160 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 640 | | | $2,560 |
| Submersible recovery pump and installation | $1,331 | ea | 16 | | | $21,294 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $27,127 | unit | 1 | | | $27,127 |
| Well Surface Completions | $800 | ea | 16 | | | $12,800 |
| Electrical (equipment, labor & materials) | $26,661 | unit | 1 | | | $26,661 |
| | | | | | Capital Costs Subtotal | $220,102 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $11,005 |
| Construction Management (6% of capital costs) | | | 6% | | | $13,206 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $22,010 |
| | | | | | TOTAL CAPITAL COSTS | $266,323 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $2,800 | QTR | 9 | | | $26,427 |
| GW Laboratory Analysis | $5,000 | QTR | 9 | $9,438 | | $56,630 |
| GW Report | $2,500 | ea | 5 | | | $11,798 |
| | | | | | Subtotal | $94,855 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $21,294 | event | 0 | | | $0 |
| Electricity | $0.08 | kWh | 226,155 | | | $18,092 |
| Discharge Sampling | $1,950 | QTR | 9 | | | $18,405 |
| Discharge Lab Analysis | $750 | QTR | 9 | $1,416 | | $8,494 |
| | | | | | Subtotal | $44,991 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $139,846 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $2,797 |
| Project Management (5% of O&M costs) | | | 5% | | | $6,992 |
| | | | | | TOTAL O&M COSTS | $149,635 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$415,959** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**POWER CONSUMPTION CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE G BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| | # of Units | Unit Rated Power (kW) | Duration of Daily Operation (hr) | Daily Energy Consumption (kWh/d) | Quarterly Energy Consumption (kWh) |
|---|---|---|---|---|---|
| **PUMPS** | | | | | |
| Submersible Pumps | 16 | 0.7 | 22 | 263 | **23,962** |
| | 16 | | | | **23,962** |

**PIPING CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE G BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**PIPING, FITTINGS AND WIRING REQUIREMENTS**

| | |
|---|---|
| GW distribution pipe 3" Schedule 40 PVC | 3,200 |
| 1.5"discharge line from pump to distribution piping | 560 |
| 3" Elbow fittings (45°) | 32 |
| 3" Couplings | 160 |
| 3" T fittings | 16 |
| 3/4 "electrical conduit | 3,200 |

**PORE VOLUME FLUSHING ANALYSIS - REMEDIATION TO BACKGROUND (ZONE H BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**Governing Equations:**

Single Pore Volume of Plume: $PV = BnA$

Number of Pore Volume Flushes: $NPV = -R_f \ln(\frac{C_f}{C_o})$

**PORE VOLUME FLUSHING AND REMEDIATION TIME**

| PARAMETER | UNIT | Sr |
|---|---|---|
| Impacted Thickness | ft | 4 |
| Porosity | unitless | 0.35 |
| Area of Plume | $ft^2$ | 364,043 |
| Pore Volume | gal | 3,812,258 |
| Retardation Factor (Rf) | unitless | 1 |
| Target Concentration (Cf) | unitless | 0.57 |
| Initial Concentration (Co) | unitless | 0.69 |
| NPV | | 0.2 |
| Recovery volume to achieve remediation target | gal | 728,352 |
| Aquifer pumping rate (single well) | gpm | 0.17 |
| Number of recovery wells | ea | 32 |
| Depth of recovery wells | ft | 36 |
| GW Recovery Rate | gpd | 7,834 |
| Time to reach remedial target | years | 0.3 |

**COST FOR GROUNDWATER RECOVERY WITH OFFSITE DISPOSAL OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE H BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 64 | | | $124,800 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 1152 | | | $79,488 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 1152 | | | $4,608 |
| Submersible recovery pump and installation | $1,331 | ea | 32 | | | $42,588 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $42,651 | unit | 1 | | | $42,651 |
| Well Surface Completions | $800 | ea | 32 | | | $25,600 |
| Electrical (equipment, labor & materials) | $40,614 | unit | 1 | | | $40,614 |
| | | | | | Capital Costs Subtotal | $383,449 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $19,172 |
| Construction Management (6% of capital costs) | | | 6% | | | $23,007 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $38,345 |
| | | | | | TOTAL CAPITAL COSTS | $463,974 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $5,600 | QTR | 1 | | | $5,706 |
| GW Laboratory Analysis | $9,000 | QTR | 1 | $1,834 | | $11,005 |
| GW Report | $2,500 | ea | 1 | | | $1,274 |
| | | | | | Subtotal | $17,984 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $42,588 | event | 0 | | | $0 |
| Electricity | $0.08 | kWh | 48,831 | | | $3,906 |
| Discharge Sampling | $1,950 | QTR | 1 | | | $1,987 |
| Discharge Lab Analysis | $750 | QTR | 1 | $153 | | $917 |
| | | | | | Subtotal | $6,810 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $24,795 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $496 |
| Project Management (5% of O&M costs) | | | 5% | | | $1,240 |
| | | | | | TOTAL O&M COSTS | $26,530 |
| | | | | | | |
| ***Offsite Disposal of Concentrated Wastewater From RO*** | | | | | | |
| Offsite Disposal | $6.00 | bbl | 8,671 | | | $52,025 |
| Transportation | $2.25 | bbl | 8,671 | | | $19,509 |
| | | | | | TOTAL DISPOSAL COSTS | $71,535 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$562,039** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**COST FOR GROUNDWATER RECOVERY WITH ONSITE INJECTION OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE H BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 64 | | | $124,800 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 1152 | | | $79,488 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 1152 | | | $4,608 |
| Submersible recovery pump and installation | $1,331 | ea | 32 | | | $42,588 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $42,651 | unit | 1 | | | $42,651 |
| Well Surface Completions | $800 | ea | 32 | | | $25,600 |
| Electrical (equipment, labor & materials) | $40,614 | unit | 1 | | | $40,614 |
| | | | | | Capital Costs Subtotal | $383,449 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $19,172 |
| Construction Management (6% of capital costs) | | | 6% | | | $23,007 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $38,345 |
| | | | | | TOTAL CAPITAL COSTS | $463,974 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $5,600 | QTR | 1 | | | $5,706 |
| GW Laboratory Analysis | $9,000 | QTR | 1 | $1,834 | | $11,005 |
| GW Report | $2,500 | ea | 1 | | | $1,274 |
| | | | | | Subtotal | $17,984 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $42,588 | event | 0 | | | $0 |
| Electricity | $0.08 | kWh | 48,831 | | | $3,906 |
| Discharge Sampling | $1,950 | QTR | 1 | | | $1,987 |
| Discharge Lab Analysis | $750 | QTR | 1 | $153 | | $917 |
| | | | | | Subtotal | $6,810 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $24,795 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $496 |
| Project Management (5% of O&M costs) | | | 5% | | | $1,240 |
| | | | | | TOTAL O&M COSTS | $26,530 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$490,504** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**POWER CONSUMPTION CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE H BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| | # of Units | Unit Rated Power (kW) | Duration of Daily Operation (hr) | Daily Energy Consumption (kWh/d) | Quarterly Energy Consumption (kWh) |
|---|---|---|---|---|---|
| **PUMPS** | | | | | |
| Submersible Pumps | 32 | 0.7 | 22 | 525 | **47,923** |
| | 32 | | | | **47,923** |

**PIPING CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE H BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**PIPING, FITTINGS AND WIRING REQUIREMENTS**

| | |
|---|---|
| GW distribution pipe 3" Schedule 40 PVC | 4,800 |
| 1.5"discharge line from pump to distribution piping | 992 |
| 3" Elbow fittings (45°) | 64 |
| 3" Couplings | 240 |
| 3" T fittings | 32 |
| 3/4 "electrical conduit | 4,800 |

**PORE VOLUME FLUSHING ANALYSIS - REMEDIATION TO BACKGROUND (ZONE I BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**Governing Equations:**

Single Pore Volume of Plume: $PV = BnA$

Number of Pore Volume Flushes: $NPV = -R_f \ln(\frac{C_f}{C_o})$

**PORE VOLUME FLUSHING AND REMEDIATION TIME**

| PARAMETER | UNIT | Sr |
|---|---|---|
| Impacted Thickness | ft | 2 |
| Porosity | unitless | 0.35 |
| Area of Plume | $ft^2$ | 929,750 |
| Pore Volume | gal | 4,868,171 |
| Retardation Factor (Rf) | unitless | 1 |
| Target Concentration (Cf) | unitless | 0.57 |
| Initial Concentration (Co) | unitless | 1.41 |
| NPV | | 0.9 |
| Recovery volume to achieve remediation target | gal | 4,409,144 |
| Aquifer pumping rate (single well) | gpm | 0.10 |
| Number of recovery wells | ea | 185 |
| Depth of recovery wells | ft | 40 |
| GW Recovery Rate | gpd | 26,640 |
| Time to reach remedial target | years | 0.5 |

**COST FOR GROUNDWATER RECOVERY WITH OFFSITE DISPOSAL OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE I BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 370 | | | $721,500 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 7400 | | | $510,600 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 7400 | | | $29,600 |
| Submersible recovery pump and installation | $1,331 | ea | 185 | | | $246,212 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $247,603 | unit | 1 | | | $247,603 |
| Well Surface Completions | $800 | ea | 185 | | | $148,000 |
| Electrical (equipment, labor & materials) | $234,800 | unit | 1 | | | $234,800 |
| | | | | | Capital Costs Subtotal | $2,161,415 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $108,071 |
| Construction Management (6% of capital costs) | | | 6% | | | $129,685 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $216,142 |
| | | | | | TOTAL CAPITAL COSTS | $2,615,312 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $32,375 | QTR | 2 | | | $58,721 |
| GW Laboratory Analysis | $47,250 | QTR | 2 | $17,140 | | $102,842 |
| GW Report | $2,500 | ea | 1 | | | $2,267 |
| | | | | | Subtotal | $163,831 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $246,212 | event | 0 | | | $0 |
| Electricity | $0.08 | kWh | 502,520 | | | $40,202 |
| Discharge Sampling | $1,950 | QTR | 2 | | | $3,537 |
| Discharge Lab Analysis | $750 | QTR | 2 | $272 | | $1,632 |
| | | | | | Subtotal | $45,371 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $209,202 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $4,184 |
| Project Management (5% of O&M costs) | | | 5% | | | $10,460 |
| | | | | | TOTAL O&M COSTS | $223,846 |
| | | | | | | |
| ***Offsite Disposal of Concentrated Wastewater From RO*** | | | | | | |
| Offsite Disposal | $6.00 | bbl | 52,490 | | | $314,939 |
| Transportation | $2.25 | bbl | 52,490 | | | $118,102 |
| | | | | | TOTAL DISPOSAL COSTS | $433,041 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$3,272,199** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**COST FOR GROUNDWATER RECOVERY WITH ONSITE INJECTION OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE I BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 370 | | | $721,500 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 7400 | | | $510,600 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 7400 | | | $29,600 |
| Submersible recovery pump and installation | $1,331 | ea | 185 | | | $246,212 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $247,603 | unit | 1 | | | $247,603 |
| Well Surface Completions | $800 | ea | 185 | | | $148,000 |
| Electrical (equipment, labor & materials) | $234,800 | unit | 1 | | | $234,800 |
| | | | | | Capital Costs Subtotal | $2,161,415 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $108,071 |
| Construction Management (6% of capital costs) | | | 6% | | | $129,685 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $216,142 |
| | | | | | TOTAL CAPITAL COSTS | $2,615,312 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $32,375 | QTR | 2 | | | $58,721 |
| GW Laboratory Analysis | $47,250 | QTR | 2 | $17,140 | | $102,842 |
| GW Report | $2,500 | ea | 1 | | | $2,267 |
| | | | | | Subtotal | $163,831 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $246,212 | event | 0 | | | $0 |
| Electricity | $0.08 | kWh | 502,520 | | | $40,202 |
| Discharge Sampling | $1,950 | QTR | 2 | | | $3,537 |
| Discharge Lab Analysis | $750 | QTR | 2 | $272 | | $1,632 |
| | | | | | Subtotal | $45,371 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $209,202 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $4,184 |
| Project Management (5% of O&M costs) | | | 5% | | | $10,460 |
| | | | | | TOTAL O&M COSTS | $223,846 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$2,839,158** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**POWER CONSUMPTION CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE I BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| | # of Units | Unit Rated Power (kW) | Duration of Daily Operation (hr) | Daily Energy Consumption (kWh/d) | Quarterly Energy Consumption (kWh) |
|---|---|---|---|---|---|
| **PUMPS** | | | | | |
| Submersible Pumps | 185 | 0.7 | 22 | 3036 | **277,055** |
| | 185 | | | | **277,055** |

**PIPING CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE I BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**PIPING, FITTINGS AND WIRING REQUIREMENTS**

| | |
|---|---|
| GW distribution pipe 3" Schedule 40 PVC | 27,750 |
| 1.5"discharge line from pump to distribution piping | 6,475 |
| 3" Elbow fittings (45°) | 370 |
| 3" Couplings | 1,388 |
| 3" T fittings | 185 |
| 3/4 "electrical conduit | 27,750 |

**PORE VOLUME FLUSHING ANALYSIS - REMEDIATION TO BACKGROUND (ZONE J BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**Governing Equations:**

Single Pore Volume of Plume: $PV = BnA$

Number of Pore Volume Flushes: $NPV = -R_f \ln(\frac{C_f}{C_o})$

**PORE VOLUME FLUSHING AND REMEDIATION TIME**

| PARAMETER | UNIT | Cl |
|---|---|---|
| Impacted Thickness | ft | 2.5 |
| Porosity | unitless | 0.35 |
| Area of Plume | $ft^2$ | 185,094 |
| Pore Volume | gal | 1,211,440 |
| Retardation Factor (Rf) | unitless | 1 |
| Target Concentration (Cf) | unitless | 428 |
| Initial Concentration (Co) | unitless | 1,690 |
| NPV | | 1.4 |
| Recovery volume to achieve remediation target | gal | 1,663,744 |
| Aquifer pumping rate (single well) | gpm | 0.13 |
| Number of recovery wells | ea | 29 |
| Depth of recovery wells | ft | 36 |
| GW Recovery Rate | gpd | 5,429 |
| Time to reach remedial target | years | 0.8 |

**COST FOR GROUNDWATER RECOVERY WITH OFFSITE DISPOSAL OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE J BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 58 | | | $113,100 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 1044 | | | $72,036 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 1044 | | | $4,176 |
| Submersible recovery pump and installation | $1,331 | ea | 29 | | | $38,595 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $38,653 | unit | 1 | | | $38,653 |
| Well Surface Completions | $800 | ea | 29 | | | $23,200 |
| Electrical (equipment, labor & materials) | $36,807 | unit | 1 | | | $36,807 |
| | | | | | Capital Costs Subtotal | $349,667 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $17,483 |
| Construction Management (6% of capital costs) | | | 6% | | | $20,980 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $34,967 |
| | | | | | TOTAL CAPITAL COSTS | $423,097 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $5,075 | QTR | 3 | | | $17,045 |
| GW Laboratory Analysis | $8,250 | QTR | 3 | $5,542 | | $33,249 |
| GW Report | $2,500 | ea | 2 | | | $4,198 |
| | | | | | Subtotal | $54,492 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $38,595 | event | 0 | | | $0 |
| Electricity | $0.08 | kWh | 145,862 | | | $11,669 |
| Discharge Sampling | $1,950 | QTR | 3 | | | $6,549 |
| Discharge Lab Analysis | $750 | QTR | 3 | $504 | | $3,023 |
| | | | | | Subtotal | $21,241 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $75,733 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $1,515 |
| Project Management (5% of O&M costs) | | | 5% | | | $3,787 |
| | | | | | TOTAL O&M COSTS | $81,034 |
| | | | | | | |
| ***Offsite Disposal of Concentrated Wastewater From RO*** | | | | | | |
| Offsite Disposal | $6.00 | bbl | 19,806 | | | $118,839 |
| Transportation | $2.25 | bbl | 19,806 | | | $44,565 |
| | | | | | TOTAL DISPOSAL COSTS | $163,403 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$667,534** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**COST FOR GROUNDWATER RECOVERY WITH ONSITE INJECTION OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE J BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 58 | | | $113,100 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 1044 | | | $72,036 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 1044 | | | $4,176 |
| Submersible recovery pump and installation | $1,331 | ea | 29 | | | $38,595 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $38,653 | unit | 1 | | | $38,653 |
| Well Surface Completions | $800 | ea | 29 | | | $23,200 |
| Electrical (equipment, labor & materials) | $36,807 | unit | 1 | | | $36,807 |
| | | | | | Capital Costs Subtotal | $349,667 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $17,483 |
| Construction Management (6% of capital costs) | | | 6% | | | $20,980 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $34,967 |
| | | | | | TOTAL CAPITAL COSTS | $423,097 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $5,075 | QTR | 3 | | | $17,045 |
| GW Laboratory Analysis | $8,250 | QTR | 3 | $5,542 | | $33,249 |
| GW Report | $2,500 | ea | 2 | | | $4,198 |
| | | | | | Subtotal | $54,492 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $38,595 | event | 0 | | | $0 |
| Electricity | $0.08 | kWh | 145,862 | | | $11,669 |
| Discharge Sampling | $1,950 | QTR | 3 | | | $6,549 |
| Discharge Lab Analysis | $750 | QTR | 3 | $504 | | $3,023 |
| | | | | | Subtotal | $21,241 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $75,733 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $1,515 |
| Project Management (5% of O&M costs) | | | 5% | | | $3,787 |
| | | | | | TOTAL O&M COSTS | $81,034 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$504,131** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**POWER CONSUMPTION CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE J BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| | # of Units | Unit Rated Power (kW) | Duration of Daily Operation (hr) | Daily Energy Consumption (kWh/d) | Quarterly Energy Consumption (kWh) |
|---|---|---|---|---|---|
| **PUMPS** | | | | | |
| Submersible Pumps | 29 | 0.7 | 22 | 476 | **43,430** |
| | 29 | | | | **43,430** |

**PIPING CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE J BED A)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**PIPING, FITTINGS AND WIRING REQUIREMENTS**

| | |
|---|---|
| GW distribution pipe 3" Schedule 40 PVC | 4,350 |
| 1.5"discharge line from pump to distribution piping | 899 |
| 3" Elbow fittings (45°) | 58 |
| 3" Couplings | 218 |
| 3" T fittings | 29 |
| 3/4 "electrical conduit | 4,350 |

**PORE VOLUME FLUSHING ANALYSIS - REMEDIATION TO BACKGROUND (ZONES A, B, C and D - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**Governing Equations:**

Single Pore Volume of Plume: $PV = BnA$

Number of Pore Volume Flushes: $NPV = -R_f \ln(\frac{C_f}{C_o})$

**PORE VOLUME FLUSHING AND REMEDIATION TIME**

| PARAMETER | UNIT | Chloride |
|---|---|---|
| Impacted Thickness | ft | |
| Porosity | unitless | 0.35 |
| Area of Plume | $ft^2$ | |
| Pore Volume | gal | 7,499,443 |
| Retardation Factor (Rf) | unitless | 1 |
| Target Concentration (Cf) | unitless | 428 |
| Initial Concentration (Co) | unitless | 12,542 |
| NPV | | 3.4 |
| Recovery volume to achieve remediation target | gal | 25,330,934 |
| Aquifer pumping rate (single well) | gpm | 2.05 |
| Number of recovery wells | ea | 2 |
| Depth of recovery wells | ft | 60 |
| GW Recovery Rate | gpd | 5,904 |
| Time to reach remedial target | years | 11.8 |

**COST FOR GROUNDWATER RECOVERY WITH OFFSITE DISPOSAL OF RETENTATE - REMEDIATION TO BACKGROUND (ZONES A, B, C and D - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 4 | | | $7,800 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 120 | | | $8,280 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 120 | | | $480 |
| Submersible recovery pump and installation | $1,331 | ea | 2 | | | $2,662 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $7,730 | unit | 1 | | | $7,730 |
| Well Surface Completions | $800 | ea | 2 | | | $1,600 |
| Electrical (equipment, labor & materials) | $8,098 | unit | 1 | | | $8,098 |
| | | | | | Capital Costs Subtotal | $59,751 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $2,988 |
| Construction Management (6% of capital costs) | | | 6% | | | $3,585 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $5,975 |
| | | | | | TOTAL CAPITAL COSTS | $72,298 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $350 | QTR | 47 | | | $16,457 |
| GW Laboratory Analysis | $1,500 | QTR | 47 | $14,106 | | $84,634 |
| GW Report | $2,500 | ea | 24 | | | $58,774 |
| | | | | | Subtotal | $159,864 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $2,662 | event | 2 | | | $5,324 |
| Electricity | $0.08 | kWh | 140,830 | | | $11,266 |
| Discharge Sampling | $1,950 | QTR | 47 | | | $91,687 |
| Discharge Lab Analysis | $750 | QTR | 47 | $7,053 | | $42,317 |
| | | | | | Subtotal | $150,594 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $310,458 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $6,209 |
| Project Management (5% of O&M costs) | | | 5% | | | $15,523 |
| | | | | | TOTAL O&M COSTS | $332,190 |
| | | | | | | |
| ***Offsite Disposal of Concentrated Wastewater From RO*** | | | | | | |
| Offsite Disposal | $6.00 | bbl | 361,870 | | | $2,171,223 |
| Transportation | $2.25 | bbl | 361,870 | | | $814,209 |
| | | | | | TOTAL DISPOSAL COSTS | $2,985,431 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$3,389,920** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**COST FOR GROUNDWATER RECOVERY WITH ONSITE INJECTION OF RETENTATE - REMEDIATION TO BACKGROUND (ZONES A, B, C and D - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 4 | | | $7,800 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 120 | | | $8,280 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 120 | | | $480 |
| Submersible recovery pump and installation | $1,331 | ea | 2 | | | $2,662 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $7,730 | unit | 1 | | | $7,730 |
| Well Surface Completions | $800 | ea | 2 | | | $1,600 |
| Electrical (equipment, labor & materials) | $8,098 | unit | 1 | | | $8,098 |
| | | | | | Capital Costs Subtotal | $59,751 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $2,988 |
| Construction Management (6% of capital costs) | | | 6% | | | $3,585 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $5,975 |
| | | | | | TOTAL CAPITAL COSTS | $72,298 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $350 | QTR | 47 | | | $16,457 |
| GW Laboratory Analysis | $1,500 | QTR | 47 | $14,106 | | $84,634 |
| GW Report | $2,500 | ea | 24 | | | $58,774 |
| | | | | | Subtotal | $159,864 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $2,662 | event | 2 | | | $5,324 |
| Electricity | $0.08 | kWh | 140,830 | | | $11,266 |
| Discharge Sampling | $1,950 | QTR | 47 | | | $91,687 |
| Discharge Lab Analysis | $750 | QTR | 47 | $7,053 | | $42,317 |
| | | | | | Subtotal | $150,594 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $310,458 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $6,209 |
| Project Management (5% of O&M costs) | | | 5% | | | $15,523 |
| | | | | | TOTAL O&M COSTS | $332,190 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$404,488** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**POWER CONSUMPTION CALCULATIONS - REMEDIATION TO BACKGROUND (ZONES A, B, C and D - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| | # of Units | Unit Rated Power (kW) | Duration of Daily Operation (hr) | Daily Energy Consumption (kWh/d) | Quarterly Energy Consumption (kWh) |
|---|---|---|---|---|---|
| **PUMPS** | | | | | |
| Submersible Pumps | 2 | 0.7 | 22 | 33 | **2,995** |
| | 2 | | | | **2,995** |

**PIPING CALCULATIONS - REMEDIATION TO BACKGROUND (ZONES A, B, C and D - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**PIPING, FITTINGS AND WIRING REQUIREMENTS**

| | |
|---|---|
| GW distribution pipe 3" Schedule 40 PVC | 1,000 |
| 1.5"discharge line from pump to distribution piping | 110 |
| 3" Elbow fittings (45°) | 4 |
| 3" Couplings | 50 |
| 3" T fittings | 2 |
| 3/4 "electrical conduit | 1,000 |

**PORE VOLUME FLUSHING ANALYSIS - REMEDIATION TO BACKGROUND (ZONES E, H, J - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**Governing Equations:**

Single Pore Volume of Plume: $PV = BnA$

Number of Pore Volume Flushes: $NPV = -R_f \ln(\frac{C_f}{C_o})$

**PORE VOLUME FLUSHING AND REMEDIATION TIME**

| PARAMETER | UNIT | Strontium |
|---|---|---|
| Impacted Thickness | ft | |
| Porosity | unitless | 0.35 |
| Area of Plume | $ft^2$ | |
| Pore Volume | gal | 8,696,551 |
| Retardation Factor (Rf) | unitless | 1 |
| Target Concentration (Cf) | unitless | 0.57 |
| Initial Concentration (Co) | unitless | 1.98 |
| NPV | | 1.2 |
| Recovery volume to achieve remediation target | gal | 10,840,056 |
| Aquifer pumping rate (single well) | gpm | 1.70 |
| Number of recovery wells | ea | 1 |
| Depth of recovery wells | ft | 60 |
| GW Recovery Rate | gpd | 2,448 |
| Time to reach remedial target | years | 12.1 |

**COST FOR GROUNDWATER RECOVERY WITH OFFSITE DISPOSAL OF RETENTATE - REMEDIATION TO BACKGROUND (ZONES E, H, J - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 2 | | | $3,900 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 60 | | | $4,140 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 60 | | | $240 |
| Submersible recovery pump and installation | $1,331 | ea | 1 | | | $1,331 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $3,865 | unit | 1 | | | $3,865 |
| Well Surface Completions | $800 | ea | 1 | | | $800 |
| Electrical (equipment, labor & materials) | $4,049 | unit | 1 | | | $4,049 |
| | | | | | Capital Costs Subtotal | $41,425 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $2,071 |
| Construction Management (6% of capital costs) | | | 6% | | | $2,486 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $4,143 |
| | | | | | TOTAL CAPITAL COSTS | $50,125 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $175 | QTR | 49 | | | $8,492 |
| GW Laboratory Analysis | $1,250 | QTR | 49 | $12,132 | | $72,791 |
| GW Report | $2,500 | ea | 24 | | | $60,659 |
| | | | | | Subtotal | $141,943 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $1,331 | event | 2 | | | $2,662 |
| Electricity | $0.08 | kWh | 72,674 | | | $5,814 |
| Discharge Sampling | $1,950 | QTR | 49 | | | $94,628 |
| Discharge Lab Analysis | $750 | QTR | 49 | $7,279 | | $43,675 |
| | | | | | Subtotal | $146,779 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $288,722 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $5,774 |
| Project Management (5% of O&M costs) | | | 5% | | | $14,436 |
| | | | | | TOTAL O&M COSTS | $308,932 |
| | | | | | | |
| ***Offsite Disposal of Concentrated Wastewater From RO*** | | | | | | |
| Offsite Disposal | $6.00 | bbl | 129,048 | | | $774,290 |
| Transportation | $2.25 | bbl | 129,048 | | | $290,359 |
| | | | | | TOTAL DISPOSAL COSTS | $1,064,648 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$1,423,705** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**COST FOR GROUNDWATER RECOVERY WITH ONSITE INJECTION OF RETENTATE - REMEDIATION TO BACKGROUND (ZONES E, H, J - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 2 | | | $3,900 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 60 | | | $4,140 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 60 | | | $240 |
| Submersible recovery pump and installation | $1,331 | ea | 1 | | | $1,331 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $3,865 | unit | 1 | | | $3,865 |
| Well Surface Completions | $800 | ea | 1 | | | $800 |
| Electrical (equipment, labor & materials) | $4,049 | unit | 1 | | | $4,049 |
| | | | | | Capital Costs Subtotal | $41,425 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $2,071 |
| Construction Management (6% of capital costs) | | | 6% | | | $2,486 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $4,143 |
| | | | | | TOTAL CAPITAL COSTS | $50,125 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $175 | QTR | 49 | | | $8,492 |
| GW Laboratory Analysis | $1,250 | QTR | 49 | $12,132 | | $72,791 |
| GW Report | $2,500 | ea | 24 | | | $60,659 |
| | | | | | Subtotal | $141,943 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $1,331 | event | 2 | | | $2,662 |
| Electricity | $0.08 | kWh | 72,674 | | | $5,814 |
| Discharge Sampling | $1,950 | QTR | 49 | | | $94,628 |
| Discharge Lab Analysis | $750 | QTR | 49 | $7,279 | | $43,675 |
| | | | | | Subtotal | $146,779 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $288,722 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $5,774 |
| Project Management (5% of O&M costs) | | | 5% | | | $14,436 |
| | | | | | TOTAL O&M COSTS | $308,932 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$359,057** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**POWER CONSUMPTION CALCULATIONS - REMEDIATION TO BACKGROUND (ZONES E, H, J - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| | # of Units | Unit Rated Power (kW) | Duration of Daily Operation (hr) | Daily Energy Consumption (kWh/d) | Quarterly Energy Consumption (kWh) |
|---|---|---|---|---|---|
| **PUMPS** | | | | | |
| Submersible Pumps | 1 | 0.7 | 22 | 16 | **1,498** |
| | 1 | | | | **1,498** |

**PIPING CALCULATIONS - REMEDIATION TO BACKGROUND (ZONES E, H, J - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**PIPING, FITTINGS AND WIRING REQUIREMENTS**

| | |
|---|---|
| GW distribution pipe 3" Schedule 40 PVC | 500 |
| 1.5"discharge line from pump to distribution piping | 55 |
| 3" Elbow fittings (45°) | 2 |
| 3" Couplings | 25 |
| 3" T fittings | 1 |
| 3/4 "electrical conduit | 500 |

**PORE VOLUME FLUSHING ANALYSIS - REMEDIATION TO BACKGROUND (ZONE K - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**Governing Equations:**

Single Pore Volume of Plume: $PV = BnA$

Number of Pore Volume Flushes: $NPV = -R_f \ln(\frac{C_f}{C_o})$

**PORE VOLUME FLUSHING AND REMEDIATION TIME**

| PARAMETER | UNIT | Strontium |
|---|---|---|
| Impacted Thickness | ft | 1 |
| Porosity | unitless | 0.35 |
| Area of Plume | $ft^2$ | 110,624 |
| Pore Volume | gal | 289,614 |
| Retardation Factor (Rf) | unitless | 1 |
| Target Concentration (Cf) | unitless | 0.57 |
| Initial Concentration (Co) | unitless | 1.05 |
| NPV | | 0.6 |
| Recovery volume to achieve remediation target | gal | 176,928 |
| Aquifer pumping rate (single well) | gpm | 0.28 |
| Number of recovery wells | ea | 1 |
| Depth of recovery wells | ft | 50 |
| GW Recovery Rate | gpd | 403 |
| Time to reach remedial target | years | 1.2 |

**COST FOR GROUNDWATER RECOVERY WITH OFFSITE DISPOSAL OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE K - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 2 | | | $3,900 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 50 | | | $3,450 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 50 | | | $200 |
| Submersible recovery pump and installation | $1,331 | ea | 1 | | | $1,331 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $3,851 | unit | 1 | | | $3,851 |
| Well Surface Completions | $800 | ea | 1 | | | $800 |
| Electrical (equipment, labor & materials) | $4,049 | unit | 1 | | | $4,049 |
| | | | | | Capital Costs Subtotal | $40,681 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $2,034 |
| Construction Management (6% of capital costs) | | | 6% | | | $2,441 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $4,068 |
| | | | | | TOTAL CAPITAL COSTS | $49,225 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $175 | QTR | 5 | | | $842 |
| GW Laboratory Analysis | $1,250 | QTR | 5 | $1,202 | | $7,213 |
| GW Report | $2,500 | ea | 2 | | | $6,011 |
| | | | | | Subtotal | $14,066 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $1,331 | event | 0 | | | $0 |
| Electricity | $0.08 | kWh | 7,202 | | | $576 |
| Discharge Sampling | $1,950 | QTR | 5 | | | $9,377 |
| Discharge Lab Analysis | $750 | QTR | 5 | $721 | | $4,328 |
| | | | | | Subtotal | $14,281 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $28,347 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $567 |
| Project Management (5% of O&M costs) | | | 5% | | | $1,417 |
| | | | | | TOTAL O&M COSTS | $30,332 |
| | | | | | | |
| ***Offsite Disposal of Concentrated Wastewater From RO*** | | | | | | |
| Offsite Disposal | $6.00 | bbl | 2,106 | | | $12,638 |
| Transportation | $2.25 | bbl | 2,106 | | | $4,739 |
| | | | | | TOTAL DISPOSAL COSTS | $17,377 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$96,933** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**COST FOR GROUNDWATER RECOVERY WITH ONSITE INJECTION OF RETENTATE - REMEDIATION TO BACKGROUND (ZONE K - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Unit Cost | Unit | Quantity | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| GW Recovery Wells | | | | | | |
| Rig mobilization/demobilization | $2,500 | ea | 1 | | | $2,500 |
| Drill Rig and Crew | $1,950 | day | 2 | | | $3,900 |
| 4" PVC recovery well installation (labor & materials) | $69 | foot | 50 | | | $3,450 |
| 1" Piezometer installation (for monitoring; labor & materials) | $4 | foot | 50 | | | $200 |
| Submersible recovery pump and installation | $1,331 | ea | 1 | | | $1,331 |
| Storage Tanks | $20,600 | ea | 1 | | | $20,600 |
| Recovery piping and fittings (incl. labor & materials) | $3,851 | unit | 1 | | | $3,851 |
| Well Surface Completions | $800 | ea | 1 | | | $800 |
| Electrical (equipment, labor & materials) | $4,049 | unit | 1 | | | $4,049 |
| | | | | | Capital Costs Subtotal | $40,681 |
| | | | | | | |
| Engineering Design (5% of capital costs) | | | 5% | | | $2,034 |
| Construction Management (6% of capital costs) | | | 6% | | | $2,441 |
| Contingency for pilot testing and remediation system optimization (10% of capital costs ) | | | 10% | | | $4,068 |
| | | | | | TOTAL CAPITAL COSTS | $49,225 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| GW Monitoring | | | | | | |
| GW Sampling | $175 | QTR | 5 | | | $842 |
| GW Laboratory Analysis | $1,250 | QTR | 5 | $1,202 | | $7,213 |
| GW Report | $2,500 | ea | 2 | | | $6,011 |
| | | | | | Subtotal | $14,066 |
| Recovery/Injection Well O&M | | | | | | |
| Pump Replacement | $1,331 | event | 0 | | | $0 |
| Electricity | $0.08 | kWh | 7,202 | | | $576 |
| Discharge Sampling | $1,950 | QTR | 5 | | | $9,377 |
| Discharge Lab Analysis | $750 | QTR | 5 | $721 | | $4,328 |
| | | | | | Subtotal | $14,281 |
| | | | | | | |
| | | | | | O&M Costs Subtotal | $28,347 |
| | | | | | | |
| Technical Support (2% of O&M costs) | | | 2% | | | $567 |
| Project Management (5% of O&M costs) | | | 5% | | | $1,417 |
| | | | | | TOTAL O&M COSTS | $30,332 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE FOR PROJECT** | **$79,556** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles, LA = 84.6*

**POWER CONSUMPTION CALCULATIONS - REMEDIATION TO BACKGROUND (ZONE K - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| | # of Units | Unit Rated Power (kW) | Duration of Daily Operation (hr) | Daily Energy Consumption (kWh/d) | Quarterly Energy Consumption (kWh) |
|---|---|---|---|---|---|
| **PUMPS** | | | | | |
| Submersible Pumps | 1 | 0.7 | 22 | 16 | **1,498** |
| | 1 | | | | **1,498** |

**PIPING CALCULATIONS - REMEDIATION TO BACKGROUND (ZONES E, H, J - BED B)**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

**PIPING, FITTINGS AND WIRING REQUIREMENTS**

| | |
|---|---|
| GW distribution pipe 3" Schedule 40 PVC | 500 |
| 1.5"discharge line from pump to distribution piping | 45 |
| 3" Elbow fittings (45°) | 2 |
| 3" Couplings | 25 |
| 3" T fittings | 1 |
| 3/4 "electrical conduit | 500 |

**CAPITAL AND O&M COSTS FOR SEAWATER REVERSE OSMOSIS SYSTEM**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Quantity | Unit | Unit Cost | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| Reverse Osmosis System | | | | | | |
| Pre-treatment Unit (stripperator) | 1 | ea | $19,193 | | | $19,193 |
| RO Unit | 1 | ea | $105,080 | | | $105,080 |
| Remediation System Enclosure | 1 | ea | $13,182 | | | $13,182 |
| | | | | | Capital Costs Subtotal | $137,455 |
| | | | | | | |
| Engineering Design (5% of capital costs subtotal) | 5% | | | | | $6,873 |
| Construction Management (6% of capital costs subtotal) | 6% | | | | | $8,247 |
| Contingency for pilot testing and remediation system optimization (10% of project subtotal) | 10% | | | | | $13,746 |
| | | | | | TOTAL CAPITAL COSTS | $166,321 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| Reverse Osmosis System O&M | | | | | | |
| RO Membrane Replacement (every 2 years) | 5 | event | $3,500 | | | $17,500 |
| RO Filter Cartridge Replacement | 142 | ea | $25 | | | $3,540 |
| Electricity | 1,429,795 | kWh | $0.08 | | | $114,384 |
| | | | | | O&M Subtotal | $135,424 |
| | | | | | | |
| Technical Support (2% of O&M subtotal) | 2% | | | | | $2,708 |
| Project Management (5% of O&M subtotal) | 5% | | | | | $6,771 |
| | | | | | TOTAL O&M COSTS | $144,903 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE** | **$311,224** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles = 84.5*

**SEAWATER RO SYSTEM POWER CONSUMPTION CALCULATIONS**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| | # of Units | Unit Rated Power (kW) | Duration of Daily Operation (hr) | Daily Energy Consumption (kWh/d) | Quarterly Energy Consumption (kWh) |
|---|---|---|---|---|---|
| **TREATMENT SYSTEM** | | | | | |
| RO System | 1 | 11.2 | 22 | 246 | **22,464** |
| Feed Pump | 1 | 3.7 | 23 | 86 | **7,828** |
| | | | | | **30,292** |

**CAPITAL AND O&M COSTS FOR BRACKISH WATER REVERSE OSMOSIS SYSTEMS**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Quantity | Unit | Unit Cost | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| Reverse Osmosis System | | | | | | |
| Pre-treatment Unit (stripperator) | 1 | ea | $19,193 | | | $19,193 |
| RO Unit | 2 | ea | $84,067 | | | $168,134 |
| Remediation System Enclosure | 2 | ea | $13,182 | | | $26,364 |
| | | | | | Capital Costs Subtotal | $213,691 |
| | | | | | | |
| Engineering Design (5% of capital costs subtotal) | 5% | | | | | $10,685 |
| Construction Management (6% of capital costs subtotal) | 6% | | | | | $12,821 |
| Contingency for pilot testing and remediation system optimization (10% of project subtotal) | 10% | | | | | $21,369 |
| | | | | | TOTAL CAPITAL COSTS | $258,566 |
| | | | | | | |
| ***Operation and Maintenance*** | | | | | | |
| Reverse Osmosis System O&M | | | | | | |
| RO Membrane Replacement (every 2 years) | 6 | event | $9,600 | | | $57,600 |
| RO Filter Cartridge Replacement | 145 | ea | $50 | | | $7,260 |
| Electricity | 1,482,619 | kWh | $0.08 | | | $118,610 |
| | | | | | O&M Subtotal | $183,470 |
| | | | | | | |
| Technical Support (2% of O&M subtotal) | 2% | | | | | $3,669 |
| Project Management (5% of O&M subtotal) | 5% | | | | | $9,173 |
| | | | | | TOTAL O&M COSTS | $196,312 |
| | | | | | | |
| | | | | | **TOTAL ESTIMATE** | **$454,879** |
| | | | | | | |

Notes

*Heavy Construction Costs With RSMeans Data, 31st Edition, 2017*

*RS Means Location Factor for Lake Charles = 84.5*

**BRACKISH WATER RO SYSTEM POWER CONSUMPTION CALCULATIONS**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| | # of Units | Unit Rated Power (kW) | Duration of Daily Operation (hr) | Daily Energy Consumption (kWh/d) | Quarterly Energy Consumption (kWh) |
|---|---|---|---|---|---|
| **TREATMENT SYSTEM** | | | | | |
| RO System | 2 | 3.7 | 22 | 164 | **14,976** |
| Feed Pump | 2 | 3.7 | 23 | 172 | **15,657** |
| | | | | | **30,633** |

**CAPITAL AND O&M COSTS FOR SALTWATER DISPOSAL WELLS - REMEDIATION TO BACKGROUND**
**HENNING MANAGEMENT, LLC V CHEVRON USA, INC., ET AL; 31st JDC; DIV "C", DOCKET NO. 73318**
**HAYES FIELD, CALCASIEU AND JEFFERSON DAVIS PARISH, LA**
**PREPARED FOR MUDD, BRUCHAUS, & KEATING, LLC**

| Description | Quantity | Unit | Unit Cost | Markup (20%) | | Total |
|---|---|---|---|---|---|---|
| ***Capital Costs*** | | | | | | |
| Saltwater Disposal Wells (2) | | | | | | $6,100,000 |
| ***Operation and Maintenance*** | | | | | | |
| Annual O&M | 12.1 | event | $112,180 | | | $1,357,378 |
| | | | | | **TOTAL ESTIMATE** | **$7,457,378** |

**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone A Bed A** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 0.345 (ft/day) Sat thick (b): 2.5 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 0.8625 ($ft^2$/day)

t (time since pumping began) 90 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 28 (feet) / 9 (meters)

**Q =** 0.11 (gpm) 21 (cfd)

1,906 Cubic feet of water pumped in time

6,353 Cubic feet of aquifer drained in time

**3** Number of wells in Area

158.4 (gpd)

**5,718** Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| **0.1** | *(feet)* | 4.83E-06 | **11.66326** |
| **0.5** | *(feet)* | 1.21E-04 | **8.444503** |
| **1** | *(feet)* | 4.83E-04 | **7.058571** |
| **10** | *(feet)* | 4.83E-02 | **2.50065** |
| **20** | *(feet)* | 1.93E-01 | **1.250912** |
| **30** | *(feet)* | 4.35E-01 | **0.647435** |
| **40** | *(feet)* | 7.73E-01 | **0.326266** |
| **50** | *(feet)* | 1.21E+00 | **0.156482** |
| **100** | *(feet)* | 4.83E+00 | **0.001401** |
| **200** | *(feet)* | 1.93E+01 | **0** |
| **300** | *(feet)* | 4.35E+01 | **0** |
| **400** | *(feet)* | 7.73E+01 | **0** |
| **500** | *(feet)* | 1.21E+02 | **0** |
| **1000** | *(feet)* | 4.83E+02 | **0** |
| **1800** | *(feet)* | 1.57E+03 | **0** |

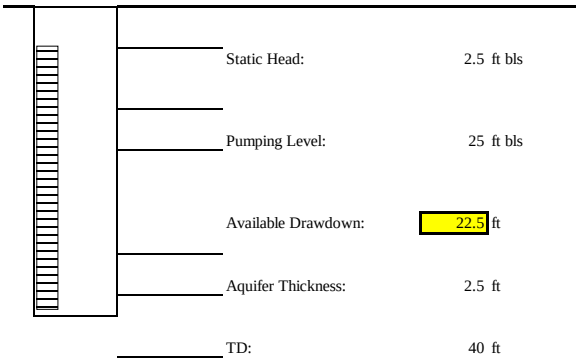
$ho\text{-}h = \frac{Q * W(u)}{4 \pi T}$

Q (discharge) 21.1765 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| **0.1** | *(feet)* | 22.79 |
| **0.5** | *(feet)* | 16.50 |
| **1** | *(feet)* | 13.79 |
| **10** | *(feet)* | 4.89 |
| **20** | *(feet)* | 2.44 |
| **30** | *(feet)* | 1.26 |
| **40** | *(feet)* | 0.64 |
| **50** | *(feet)* | 0.31 |
| **100** | *(feet)* | 0.00 |
| **200** | *(feet)* | 0 |
| **300** | *(feet)* | 0 |
| **400** | *(feet)* | 0 |
| **500** | *(feet)* | 0 |
| **1000** | *(feet)* | 0 |
| **1800** | *(feet)* | 0 |



**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone A Bed B** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 2.13 (ft/day) Sat thick (b): 5 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 10.65 ($ft^2$/day)

t (time since pumping began) 1080 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 282 (feet) / 86 (meters)

Q = 1.8 (gpm) 347 (cfd)

374,246 Cubic feet of water pumped in time

1,247,487 Cubic feet of aquifer drained in time

**3** Number of wells in Area

2592 (gpd)

**1,122,738** Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| **0.1** | *(feet)* | 3.26E-08 | **16.66165** |
| **0.5** | *(feet)* | 8.15E-07 | **13.44277** |
| **1** | *(feet)* | 3.26E-06 | **12.05648** |
| **10** | *(feet)* | 3.26E-04 | **7.451631** |
| **20** | *(feet)* | 1.30E-03 | **6.066314** |
| **30** | *(feet)* | 2.93E-03 | **5.257012** |
| **40** | *(feet)* | 5.22E-03 | **4.683926** |
| **50** | *(feet)* | 8.15E-03 | **4.240563** |
| **100** | *(feet)* | 3.26E-02 | **2.878474** |
| **200** | *(feet)* | 1.30E-01 | **1.586121** |
| **300** | *(feet)* | 2.93E-01 | **0.922142** |
| **400** | *(feet)* | 5.22E-01 | **0.53434** |
| **500** | *(feet)* | 8.15E-01 | **0.302271** |
| **1000** | *(feet)* | 3.26E+00 | **0.009394** |
| **1800** | *(feet)* | 1.06E+01 | **2.25E-06** |

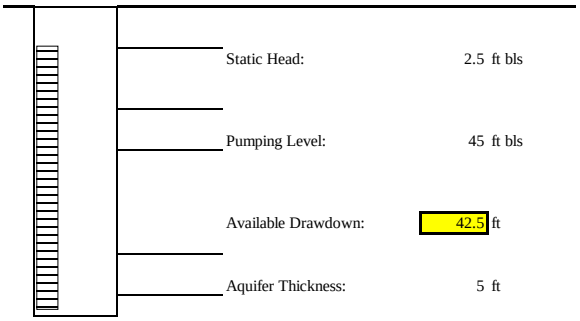
$ho\text{-}h = \frac{Q * W(u)}{4\pi T}$

Q (discharge) 346.524 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| **0.1** | *(feet)* | 43.14 |
| **0.5** | *(feet)* | 34.81 |
| **1** | *(feet)* | 31.22 |
| **10** | *(feet)* | 19.29 |
| **20** | *(feet)* | 15.71 |
| **30** | *(feet)* | 13.61 |
| **40** | *(feet)* | 12.13 |
| **50** | *(feet)* | 10.98 |
| **100** | *(feet)* | 7.45 |
| **200** | *(feet)* | 4.10686595 |
| **300** | *(feet)* | 2.38765815 |
| **400** | *(feet)* | 1.38354002 |
| **500** | *(feet)* | 0.78265494 |
| **1000** | *(feet)* | 0.02432451 |
| **1800** | *(feet)* | 5.8255E-06 |



**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone B Bed B** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 2.13 (ft/day) Sat thick (b): 6 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 12.78 ($ft^2$/day)

t (time since pumping began) 1080 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 275 (feet) / 84 (meters)

**Q =** 2.05 (gpm) 395 (cfd)

426,225 Cubic feet of water pumped in time

1,420,749 Cubic feet of aquifer drained in time

**3** Number of wells in Area

2952 (gpd)

**1,278,674** Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| **0.1** | *(feet)* | 2.72E-08 | **16.84397** |
| **0.5** | *(feet)* | 6.79E-07 | **13.62509** |
| **1** | *(feet)* | 2.72E-06 | **12.2388** |
| **10** | *(feet)* | 2.72E-04 | **7.633898** |
| **20** | *(feet)* | 1.09E-03 | **6.248418** |
| **30** | *(feet)* | 2.45E-03 | **5.438845** |
| **40** | *(feet)* | 4.35E-03 | **4.86538** |
| **50** | *(feet)* | 6.79E-03 | **4.421531** |
| **100** | *(feet)* | 2.72E-02 | **3.055442** |
| **200** | *(feet)* | 1.09E-01 | **1.747956** |
| **300** | *(feet)* | 2.45E-01 | **1.061583** |
| **400** | *(feet)* | 4.35E-01 | **0.647548** |
| **500** | *(feet)* | 6.79E-01 | **0.388884** |
| **1000** | *(feet)* | 2.72E+00 | **0.018766** |
| **1800** | *(feet)* | 8.80E+00 | **1.55E-05** |

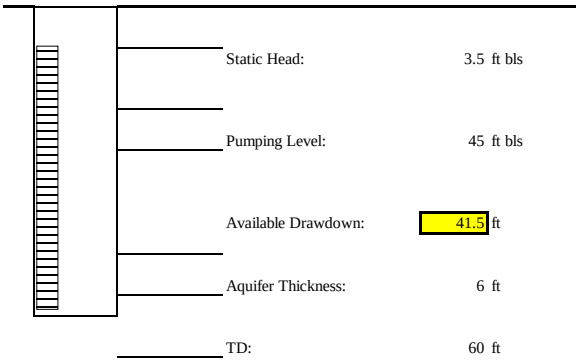
$ho\text{-}h = \frac{Q * W(u)}{4\pi T}$

Q (discharge) 394.652 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| **0.1** | *(feet)* | 41.39 |
| **0.5** | *(feet)* | 33.48 |
| **1** | *(feet)* | 30.08 |
| **10** | *(feet)* | 18.76 |
| **20** | *(feet)* | 15.35 |
| **30** | *(feet)* | 13.37 |
| **40** | *(feet)* | 11.96 |
| **50** | *(feet)* | 10.87 |
| **100** | *(feet)* | 7.51 |
| **200** | *(feet)* | 4.29541197 |
| **300** | *(feet)* | 2.60872478 |
| **400** | *(feet)* | 1.59127898 |
| **500** | *(feet)* | 0.95563957 |
| **1000** | *(feet)* | 0.0461144 |
| **1800** | *(feet)* | 3.8017E-05 |



**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone C Bed B** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 2.13 (ft/day) Sat thick (b): 2.5 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 5.325 ($ft^2$/day)

t (time since pumping began) 1080 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 257 (feet) / 78 (meters)

**Q =** 0.75 (gpm) 144 (cfd)

155,936 Cubic feet of water pumped in time

519,786 Cubic feet of aquifer drained in time

**3** Number of wells in Area

1080 (gpd)

**467,807** Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| **0.1** | *(feet)* | 6.52E-08 | **15.9685** |
| **0.5** | *(feet)* | 1.63E-06 | **12.74962** |
| **1** | *(feet)* | 6.52E-06 | **11.36333** |
| **10** | *(feet)* | 6.52E-04 | **6.758809** |
| **20** | *(feet)* | 2.61E-03 | **5.37447** |
| **30** | *(feet)* | 5.87E-03 | **4.566793** |
| **40** | *(feet)* | 1.04E-02 | **3.995975** |
| **50** | *(feet)* | 1.63E-02 | **3.555517** |
| **100** | *(feet)* | 6.52E-02 | **2.217146** |
| **200** | *(feet)* | 2.61E-01 | **1.011449** |
| **300** | *(feet)* | 5.87E-01 | **0.466618** |
| **400** | *(feet)* | 1.04E+00 | **0.204122** |
| **500** | *(feet)* | 1.63E+00 | **0.082595** |
| **1000** | *(feet)* | 6.52E+00 | **0.000199** |
| **1800** | *(feet)* | 2.11E+01 | **0** |

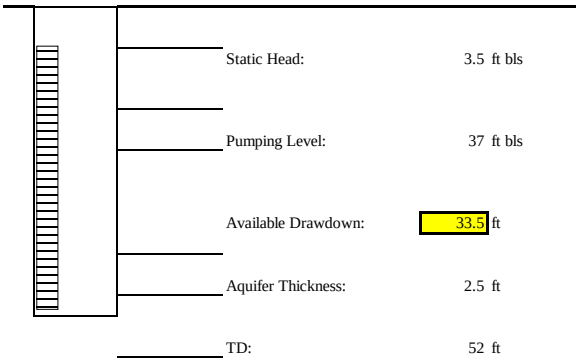
$ho\text{-}h = \frac{Q * W(u)}{4\pi T}$

Q (discharge) 144.385 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| **0.1** | *(feet)* | 34.46 |
| **0.5** | *(feet)* | 27.51 |
| **1** | *(feet)* | 24.52 |
| **10** | *(feet)* | 14.58 |
| **20** | *(feet)* | 11.60 |
| **30** | *(feet)* | 9.85 |
| **40** | *(feet)* | 8.62 |
| **50** | *(feet)* | 7.67 |
| **100** | *(feet)* | 4.78 |
| **200** | *(feet)* | 2.18241427 |
| **300** | *(feet)* | 1.00682579 |
| **400** | *(feet)* | 0.44043499 |
| **500** | *(feet)* | 0.17821642 |
| **1000** | *(feet)* | 0.00042878 |
| **1800** | *(feet)* | 0 |



Static Head: 3.5 ft bls

Pumping Level: 37 ft bls

Available Drawdown: 33.5 ft

Aquifer Thickness: 2.5 ft

TD: 52 ft

**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone D Bed B** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 2.13 (ft/day) Sat thick (b): 6 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 12.78 ($ft^2$/day)

t (time since pumping began) 1080 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 278 (feet) / 85 (meters)

**Q =** 2.1 (gpm) 404 (cfd) 3024 (gpd)

436,620 Cubic feet of water pumped in time

1,455,401 Cubic feet of aquifer drained in time

**3** Number of wells in Area

**1,309,861** Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| **0.1** | *(feet)* | 2.72E-08 | **16.84397** |
| **0.5** | *(feet)* | 6.79E-07 | **13.62509** |
| **1** | *(feet)* | 2.72E-06 | **12.2388** |
| **10** | *(feet)* | 2.72E-04 | **7.633898** |
| **20** | *(feet)* | 1.09E-03 | **6.248418** |
| **30** | *(feet)* | 2.45E-03 | **5.438845** |
| **40** | *(feet)* | 4.35E-03 | **4.86538** |
| **50** | *(feet)* | 6.79E-03 | **4.421531** |
| **100** | *(feet)* | 2.72E-02 | **3.055442** |
| **200** | *(feet)* | 1.09E-01 | **1.747956** |
| **300** | *(feet)* | 2.45E-01 | **1.061583** |
| **400** | *(feet)* | 4.35E-01 | **0.647548** |
| **500** | *(feet)* | 6.79E-01 | **0.388884** |
| **1000** | *(feet)* | 2.72E+00 | **0.018766** |
| **1800** | *(feet)* | 8.80E+00 | **1.55E-05** |

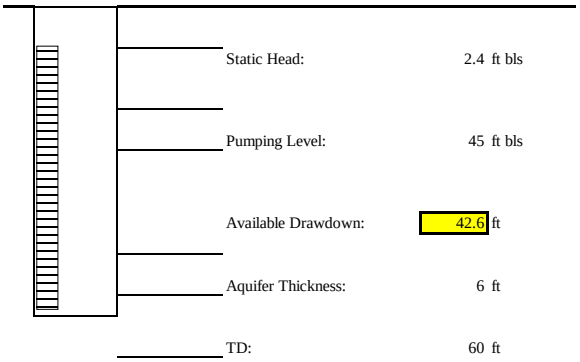
$ho\text{-}h = \frac{Q * W(u)}{4 \pi T}$

Q (discharge) 404.278 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| **0.1** | *(feet)* | 42.40 |
| **0.5** | *(feet)* | 34.30 |
| **1** | *(feet)* | 30.81 |
| **10** | *(feet)* | 19.22 |
| **20** | *(feet)* | 15.73 |
| **30** | *(feet)* | 13.69 |
| **40** | *(feet)* | 12.25 |
| **50** | *(feet)* | 11.13 |
| **100** | *(feet)* | 7.69 |
| **200** | *(feet)* | 4.40017812 |
| **300** | *(feet)* | 2.67235222 |
| **400** | *(feet)* | 1.63009066 |
| **500** | *(feet)* | 0.97894785 |
| **1000** | *(feet)* | 0.04723915 |
| **1800** | *(feet)* | 3.8944E-05 |



**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone E Bed A** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 0.345 (ft/day) Sat thick (b): 2.5 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 0.8625 ($ft^2$/day)

t (time since pumping began) 90 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 32 (feet) / 10 (meters)

Q = 0.14 (gpm) 27 (cfd)

2,426 Cubic feet of water pumped in time

8,086 Cubic feet of aquifer drained in time

**3** Number of wells in Area

201.6 (gpd)

**7,277** Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| **0.1** | *(feet)* | 4.83E-06 | **11.66326** |
| **0.5** | *(feet)* | 1.21E-04 | **8.444503** |
| **1** | *(feet)* | 4.83E-04 | **7.058571** |
| **10** | *(feet)* | 4.83E-02 | **2.50065** |
| **20** | *(feet)* | 1.93E-01 | **1.250912** |
| **30** | *(feet)* | 4.35E-01 | **0.647435** |
| **40** | *(feet)* | 7.73E-01 | **0.326266** |
| **50** | *(feet)* | 1.21E+00 | **0.156482** |
| **100** | *(feet)* | 4.83E+00 | **0.001401** |
| **200** | *(feet)* | 1.93E+01 | **0** |
| **300** | *(feet)* | 4.35E+01 | **0** |
| **400** | *(feet)* | 7.73E+01 | **0** |
| **500** | *(feet)* | 1.21E+02 | **0** |
| **1000** | *(feet)* | 4.83E+02 | **0** |
| **1800** | *(feet)* | 1.57E+03 | **0** |

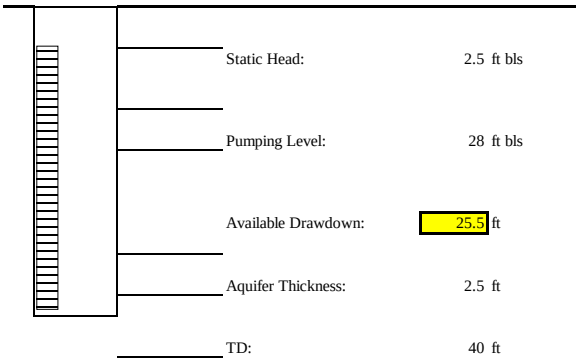
$ho\text{-}h = \frac{Q * W(u)}{4 \pi T}$

Q (discharge) 26.9519 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| **0.1** | *(feet)* | 29.00 |
| **0.5** | *(feet)* | 21.00 |
| **1** | *(feet)* | 17.55 |
| **10** | *(feet)* | 6.22 |
| **20** | *(feet)* | 3.11 |
| **30** | *(feet)* | 1.61 |
| **40** | *(feet)* | 0.81 |
| **50** | *(feet)* | 0.39 |
| **100** | *(feet)* | 0.00 |
| **200** | *(feet)* | 0 |
| **300** | *(feet)* | 0 |
| **400** | *(feet)* | 0 |
| **500** | *(feet)* | 0 |
| **1000** | *(feet)* | 0 |
| **1800** | *(feet)* | 0 |



**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone E Bed B** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 2.13 (ft/day) Sat thick (b): 4 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 8.52 ($ft^2$/day)

t (time since pumping began) 1080 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 268 (feet) / 82 (meters)

**Q =** 1.3 (gpm) 250 (cfd)

270,289 Cubic feet of water pumped in time

900,963 Cubic feet of aquifer drained in time

**3** Number of wells in Area

1872 (gpd)

**810,866** Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| **0.1** | *(feet)* | 4.08E-08 | **16.4385** |
| **0.5** | *(feet)* | 1.02E-06 | **13.21963** |
| **1** | *(feet)* | 4.08E-06 | **11.83334** |
| **10** | *(feet)* | 4.08E-04 | **7.228569** |
| **20** | *(feet)* | 1.63E-03 | **5.843496** |
| **30** | *(feet)* | 3.67E-03 | **5.034601** |
| **40** | *(feet)* | 6.52E-03 | **4.462082** |
| **50** | *(feet)* | 1.02E-02 | **4.019448** |
| **100** | *(feet)* | 4.08E-02 | **2.663333** |
| **200** | *(feet)* | 1.63E-01 | **1.393302** |
| **300** | *(feet)* | 3.67E-01 | **0.761481** |
| **400** | *(feet)* | 6.52E-01 | **0.409866** |
| **500** | *(feet)* | 1.02E+00 | **0.21258** |
| **1000** | *(feet)* | 4.08E+00 | **0.00345** |
| **1800** | *(feet)* | 1.32E+01 | **1.3E-07** |

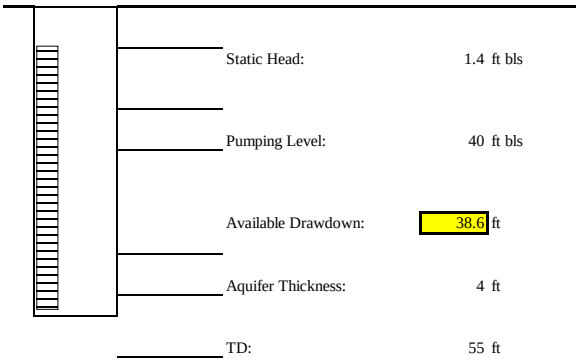
$ho\text{-}h = \frac{Q * W(u)}{4\pi T}$

Q (discharge) 250.267 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| **0.1** | *(feet)* | 38.43 |
| **0.5** | *(feet)* | 30.90 |
| **1** | *(feet)* | 27.66 |
| **10** | *(feet)* | 16.90 |
| **20** | *(feet)* | 13.66 |
| **30** | *(feet)* | 11.77 |
| **40** | *(feet)* | 10.43 |
| **50** | *(feet)* | 9.40 |
| **100** | *(feet)* | 6.23 |
| **200** | *(feet)* | 3.25686935 |
| **300** | *(feet)* | 1.77997658 |
| **400** | *(feet)* | 0.95807051 |
| **500** | *(feet)* | 0.49690987 |
| **1000** | *(feet)* | 0.00806431 |
| **1800** | *(feet)* | 3.0474E-07 |



**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone F Bed A** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 0.345 (ft/day) Sat thick (b): 7 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 2.415 ($ft^2$/day)

t (time since pumping began) 90 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 29 (feet) / 9 (meters)

Q = 0.33 (gpm) 64 (cfd)

5,718 Cubic feet of water pumped in time

19,059 Cubic feet of aquifer drained in time

**3** Number of wells in Area

475.2 (gpd)

**17,153** Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| **0.1** | *(feet)* | 1.73E-06 | **12.69288** |
| **0.5** | *(feet)* | 4.31E-05 | **9.474045** |
| **1** | *(feet)* | 1.73E-04 | **8.08788** |
| **10** | *(feet)* | 1.73E-02 | **3.499717** |
| **20** | *(feet)* | 6.90E-02 | **2.164084** |
| **30** | *(feet)* | 1.55E-01 | **1.434767** |
| **40** | *(feet)* | 2.76E-01 | **0.968061** |
| **50** | *(feet)* | 4.31E-01 | **0.652603** |
| **100** | *(feet)* | 1.73E+00 | **0.071987** |
| **200** | *(feet)* | 6.90E+00 | **0.000129** |
| **300** | *(feet)* | 1.55E+01 | **0** |
| **400** | *(feet)* | 2.76E+01 | **0** |
| **500** | *(feet)* | 4.31E+01 | **0** |
| **1000** | *(feet)* | 1.73E+02 | **0** |
| **1800** | *(feet)* | 5.59E+02 | **0** |

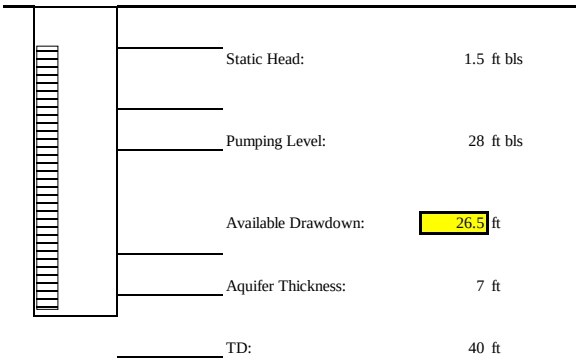
$ho\text{-}h = \frac{Q * W(u)}{4 \pi T}$

Q (discharge) 63.5294 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| **0.1** | *(feet)* | 26.57 |
| **0.5** | *(feet)* | 19.83 |
| **1** | *(feet)* | 16.93 |
| **10** | *(feet)* | 7.33 |
| **20** | *(feet)* | 4.53 |
| **30** | *(feet)* | 3.00 |
| **40** | *(feet)* | 2.03 |
| **50** | *(feet)* | 1.37 |
| **100** | *(feet)* | 0.15 |
| **200** | *(feet)* | 0.00027024 |
| **300** | *(feet)* | 0 |
| **400** | *(feet)* | 0 |
| **500** | *(feet)* | 0 |
| **1000** | *(feet)* | 0 |
| **1800** | *(feet)* | 0 |



**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone G Bed A** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 0.345 (ft/day) Sat thick (b): 6 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 2.07 ($ft^2$/day)

t (time since pumping began) 90 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 31 (feet) / 9 (meters)

**Q =** 0.31 (gpm) 60 (cfd)

5,371 Cubic feet of water pumped in time

17,904 Cubic feet of aquifer drained in time

**3** Number of wells in Area

446.4 (gpd)

**16,113** Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| **0.1** | *(feet)* | 2.01E-06 | **12.53873** |
| **0.5** | *(feet)* | 5.03E-05 | **9.319902** |
| **1** | *(feet)* | 2.01E-04 | **7.933758** |
| **10** | *(feet)* | 2.01E-02 | **3.348415** |
| **20** | *(feet)* | 8.05E-02 | **2.021016** |
| **30** | *(feet)* | 1.81E-01 | **1.304436** |
| **40** | *(feet)* | 3.22E-01 | **0.853678** |
| **50** | *(feet)* | 5.03E-01 | **0.555886** |
| **100** | *(feet)* | 2.01E+00 | **0.048037** |
| **200** | *(feet)* | 8.05E+00 | **3.56E-05** |
| **300** | *(feet)* | 1.81E+01 | **0** |
| **400** | *(feet)* | 3.22E+01 | **0** |
| **500** | *(feet)* | 5.03E+01 | **0** |
| **1000** | *(feet)* | 2.01E+02 | **0** |
| **1800** | *(feet)* | 6.52E+02 | **0** |

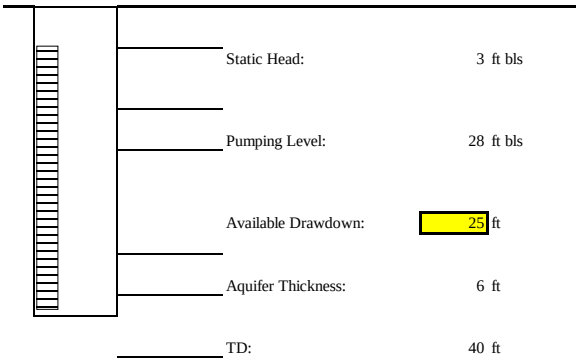
$ho\text{-}h = \frac{Q * W(u)}{4 \pi T}$

Q (discharge) 59.6791 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| **0.1** | *(feet)* | 28.77 |
| **0.5** | *(feet)* | 21.38 |
| **1** | *(feet)* | 18.20 |
| **10** | *(feet)* | 7.68 |
| **20** | *(feet)* | 4.64 |
| **30** | *(feet)* | 2.99 |
| **40** | *(feet)* | 1.96 |
| **50** | *(feet)* | 1.28 |
| **100** | *(feet)* | 0.11 |
| **200** | *(feet)* | 8.1598E-05 |
| **300** | *(feet)* | 0 |
| **400** | *(feet)* | 0 |
| **500** | *(feet)* | 0 |
| **1000** | *(feet)* | 0 |
| **1800** | *(feet)* | 0 |



**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone H Bed A** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 0.345 (ft/day) Sat thick (b): 4 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 1.38 ($ft^2$/day)

t (time since pumping began) 90 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 28 (feet) / 9 (meters)

Q = 0.17 (gpm) 33 (cfd)

2,945 Cubic feet of water pumped in time

9,818 Cubic feet of aquifer drained in time

**3** Number of wells in Area

244.8 (gpd)

**8,836** Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| **0.1** | *(feet)* | 3.02E-06 | **12.13327** |
| **0.5** | *(feet)* | 7.55E-05 | **8.914462** |
| **1** | *(feet)* | 3.02E-04 | **7.528394** |
| **10** | *(feet)* | 3.02E-02 | **2.952889** |
| **20** | *(feet)* | 1.21E-01 | **1.653849** |
| **30** | *(feet)* | 2.72E-01 | **0.980036** |
| **40** | *(feet)* | 4.83E-01 | **0.580818** |
| **50** | *(feet)* | 7.55E-01 | **0.337315** |
| **100** | *(feet)* | 3.02E+00 | **0.012732** |
| **200** | *(feet)* | 1.21E+01 | **4.37E-07** |
| **300** | *(feet)* | 2.72E+01 | **0** |
| **400** | *(feet)* | 4.83E+01 | **0** |
| **500** | *(feet)* | 7.55E+01 | **0** |
| **1000** | *(feet)* | 3.02E+02 | **0** |
| **1800** | *(feet)* | 9.78E+02 | **0** |

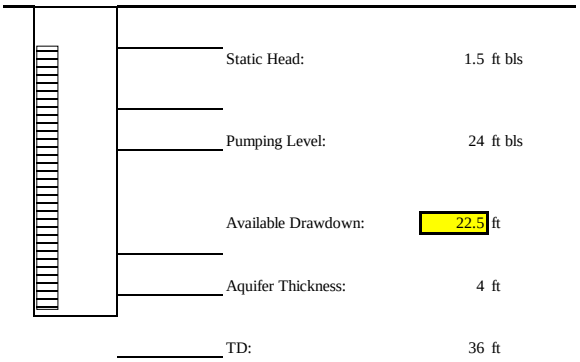
$ho\text{-}h = \frac{Q * W(u)}{4 \pi T}$

Q (discharge) 32.7273 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| **0.1** | *(feet)* | 22.90 |
| **0.5** | *(feet)* | 16.82 |
| **1** | *(feet)* | 14.21 |
| **10** | *(feet)* | 5.57 |
| **20** | *(feet)* | 3.12 |
| **30** | *(feet)* | 1.85 |
| **40** | *(feet)* | 1.10 |
| **50** | *(feet)* | 0.64 |
| **100** | *(feet)* | 0.02 |
| **200** | *(feet)* | 8.2534E-07 |
| **300** | *(feet)* | 0 |
| **400** | *(feet)* | 0 |
| **500** | *(feet)* | 0 |
| **1000** | *(feet)* | 0 |
| **1800** | *(feet)* | 0 |



**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone H Bed B** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 2.13 (ft/day) Sat thick (b): 2 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 4.26 ($ft^2$/day)

t (time since pumping began) 1080 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 257 (feet) / 78 (meters)

**Q =** 0.6 (gpm) 116 (cfd)

124,749 Cubic feet of water pumped in time

415,829 Cubic feet of aquifer drained in time

**3** Number of wells in Area

864 (gpd)

**374,246** Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| **0.1** | *(feet)* | 8.15E-08 | **15.74535** |
| **0.5** | *(feet)* | 2.04E-06 | **12.52648** |
| **1** | *(feet)* | 8.15E-06 | **11.14019** |
| **10** | *(feet)* | 8.15E-04 | **6.535829** |
| **20** | *(feet)* | 3.26E-03 | **5.151977** |
| **30** | *(feet)* | 7.34E-03 | **4.345112** |
| **40** | *(feet)* | 1.30E-02 | **3.775424** |
| **50** | *(feet)* | 2.04E-02 | **3.336412** |
| **100** | *(feet)* | 8.15E-02 | **2.00972** |
| **200** | *(feet)* | 3.26E-01 | **0.844819** |
| **300** | *(feet)* | 7.34E-01 | **0.350892** |
| **400** | *(feet)* | 1.30E+00 | **0.13459** |
| **500** | *(feet)* | 2.04E+00 | **0.046421** |
| **1000** | *(feet)* | 8.15E+00 | **3.19E-05** |
| **1800** | *(feet)* | 2.64E+01 | **0** |

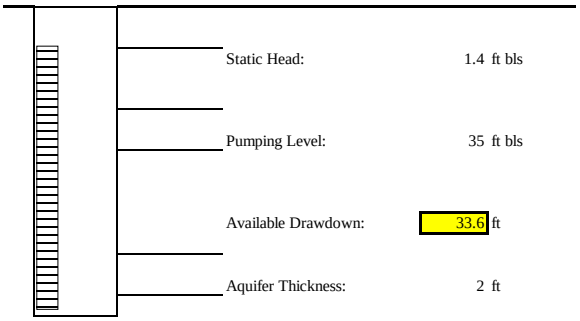
$ho\text{-}h = \frac{Q * W(u)}{4\pi T}$

Q (discharge) 115.508 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| **0.1** | *(feet)* | 33.97 |
| **0.5** | *(feet)* | 27.03 |
| **1** | *(feet)* | 24.04 |
| **10** | *(feet)* | 14.10 |
| **20** | *(feet)* | 11.12 |
| **30** | *(feet)* | 9.38 |
| **40** | *(feet)* | 8.15 |
| **50** | *(feet)* | 7.20 |
| **100** | *(feet)* | 4.34 |
| **200** | *(feet)* | 1.82287482 |
| **300** | *(feet)* | 0.75712275 |
| **400** | *(feet)* | 0.29040653 |
| **500** | *(feet)* | 0.10016259 |
| **1000** | *(feet)* | 6.8724E-05 |
| **1800** | *(feet)* | 0 |



Static Head: 1.4 ft bls

Pumping Level: 35 ft bls

Available Drawdown: 33.6 ft

Aquifer Thickness: 2 ft

TD: 50 ft

**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone I Bed A** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 0.345 (ft/day) Sat thick (b): 2 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 0.69 ($ft^2$/day)

t (time since pumping began) 90 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 30 (feet) / 9 (meters)

**Q =** 0.1 (gpm) 19 (cfd) 144 (gpd)

1,733 Cubic feet of water pumped in time

5,775 Cubic feet of aquifer drained in time

**3** Number of wells in Area

**5,198** Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| **0.1** | *(feet)* | 6.04E-06 | **11.44012** |
| **0.5** | *(feet)* | 1.51E-04 | **8.22139** |
| **1** | *(feet)* | 6.04E-04 | **6.835548** |
| **10** | *(feet)* | 6.04E-02 | **2.289261** |
| **20** | *(feet)* | 2.42E-01 | **1.071189** |
| **30** | *(feet)* | 5.43E-01 | **0.510269** |
| **40** | *(feet)* | 9.66E-01 | **0.232257** |
| **50** | *(feet)* | 1.51E+00 | **0.098594** |
| **100** | *(feet)* | 6.04E+00 | **0.000344** |
| **200** | *(feet)* | 2.42E+01 | **0** |
| **300** | *(feet)* | 5.43E+01 | **0** |
| **400** | *(feet)* | 9.66E+01 | **0** |
| **500** | *(feet)* | 1.51E+02 | **0** |
| **1000** | *(feet)* | 6.04E+02 | **0** |
| **1800** | *(feet)* | 1.96E+03 | **0** |

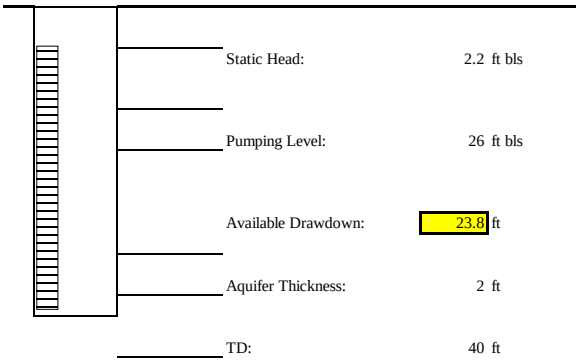
$ho\text{-}h = \frac{Q * W(u)}{4\pi T}$

Q (discharge) 19.2513 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| **0.1** | *(feet)* | 25.40 |
| **0.5** | *(feet)* | 18.25 |
| **1** | *(feet)* | 15.18 |
| **10** | *(feet)* | 5.08 |
| **20** | *(feet)* | 2.38 |
| **30** | *(feet)* | 1.13 |
| **40** | *(feet)* | 0.52 |
| **50** | *(feet)* | 0.22 |
| **100** | *(feet)* | 0.00 |
| **200** | *(feet)* | 0 |
| **300** | *(feet)* | 0 |
| **400** | *(feet)* | 0 |
| **500** | *(feet)* | 0 |
| **1000** | *(feet)* | 0 |
| **1800** | *(feet)* | 0 |



**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone J Bed A** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 0.345 (ft/day) Sat thick (b): 2.5 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 0.8625 ($ft^2$/day)

t (time since pumping began) 90 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 31 (feet) / 9 (meters)

Q = 0.13 (gpm) 25 (cfd)

2,252 Cubic feet of water pumped in time

7,508 Cubic feet of aquifer drained in time

3 Number of wells in Area

187.2 (gpd)

6,757 Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| 0.1 | *(feet)* | 4.83E-06 | 11.66326 |
| 0.5 | *(feet)* | 1.21E-04 | 8.444503 |
| 1 | *(feet)* | 4.83E-04 | 7.058571 |
| 10 | *(feet)* | 4.83E-02 | 2.50065 |
| 20 | *(feet)* | 1.93E-01 | 1.250912 |
| 30 | *(feet)* | 4.35E-01 | 0.647435 |
| 40 | *(feet)* | 7.73E-01 | 0.326266 |
| 50 | *(feet)* | 1.21E+00 | 0.156482 |
| 100 | *(feet)* | 4.83E+00 | 0.001401 |
| 200 | *(feet)* | 1.93E+01 | 0 |
| 300 | *(feet)* | 4.35E+01 | 0 |
| 400 | *(feet)* | 7.73E+01 | 0 |
| 500 | *(feet)* | 1.21E+02 | 0 |
| 1000 | *(feet)* | 4.83E+02 | 0 |
| 1800 | *(feet)* | 1.57E+03 | 0 |

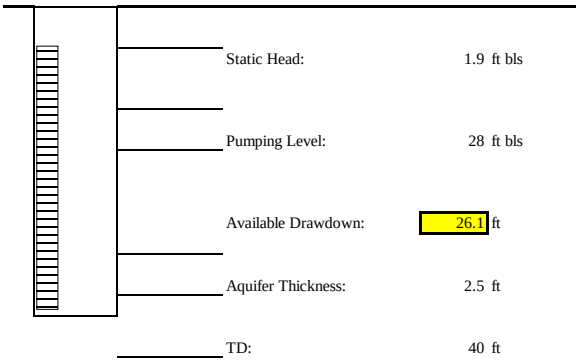
$ho\text{-}h = \frac{Q * W(u)}{4 \pi T}$

Q (discharge) 25.0267 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| 0.1 | *(feet)* | 26.93 |
| 0.5 | *(feet)* | 19.50 |
| 1 | *(feet)* | 16.30 |
| 10 | *(feet)* | 5.77 |
| 20 | *(feet)* | 2.89 |
| 30 | *(feet)* | 1.49 |
| 40 | *(feet)* | 0.75 |
| 50 | *(feet)* | 0.36 |
| 100 | *(feet)* | 0.00 |
| 200 | *(feet)* | 0 |
| 300 | *(feet)* | 0 |
| 400 | *(feet)* | 0 |
| 500 | *(feet)* | 0 |
| 1000 | *(feet)* | 0 |
| 1800 | *(feet)* | 0 |



Static Head: 1.9 ft bls

Pumping Level: 28 ft bls

Available Drawdown: 26.1 ft

Aquifer Thickness: 2.5 ft

TD: 40 ft

**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone J Bed B** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 2.13 (ft/day) Sat thick (b): 6 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 12.78 ($ft^2$/day)

t (time since pumping began) 1080 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 250 (feet) / 76 (meters)

Q = 1.7 (gpm) 327 (cfd)

353,455 Cubic feet of water pumped in time

1,178,182 Cubic feet of aquifer drained in time

**3** Number of wells in Area

2448 (gpd)

**1,060,364** Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| **0.1** | *(feet)* | 2.72E-08 | **16.84397** |
| **0.5** | *(feet)* | 6.79E-07 | **13.62509** |
| **1** | *(feet)* | 2.72E-06 | **12.2388** |
| **10** | *(feet)* | 2.72E-04 | **7.633898** |
| **20** | *(feet)* | 1.09E-03 | **6.248418** |
| **30** | *(feet)* | 2.45E-03 | **5.438845** |
| **40** | *(feet)* | 4.35E-03 | **4.86538** |
| **50** | *(feet)* | 6.79E-03 | **4.421531** |
| **100** | *(feet)* | 2.72E-02 | **3.055442** |
| **200** | *(feet)* | 1.09E-01 | **1.747956** |
| **300** | *(feet)* | 2.45E-01 | **1.061583** |
| **400** | *(feet)* | 4.35E-01 | **0.647548** |
| **500** | *(feet)* | 6.79E-01 | **0.388884** |
| **1000** | *(feet)* | 2.72E+00 | **0.018766** |
| **1800** | *(feet)* | 8.80E+00 | **1.55E-05** |

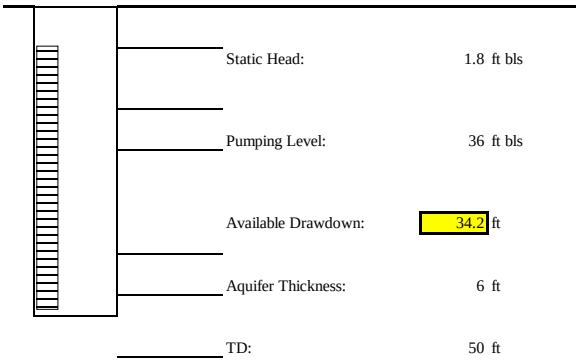
$ho\text{-}h = \frac{Q * W(u)}{4\pi T}$

Q (discharge) 327.273 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| **0.1** | *(feet)* | 34.33 |
| **0.5** | *(feet)* | 27.77 |
| **1** | *(feet)* | 24.94 |
| **10** | *(feet)* | 15.56 |
| **20** | *(feet)* | 12.73 |
| **30** | *(feet)* | 11.08 |
| **40** | *(feet)* | 9.91 |
| **50** | *(feet)* | 9.01 |
| **100** | *(feet)* | 6.23 |
| **200** | *(feet)* | 3.56204895 |
| **300** | *(feet)* | 2.16333275 |
| **400** | *(feet)* | 1.3195972 |
| **500** | *(feet)* | 0.7924816 |
| **1000** | *(feet)* | 0.03824121 |
| **1800** | *(feet)* | 3.1526E-05 |



**CALCULATION OF PREDICTED DRAWDOWN VS DISTANCE FROM PUMPING WELL**

**Method: Back-calculate drawdown using Theis nonequilibruim equation to predict a cone of depression around a pumping well assuming an initially flat wtr table, laterally extensive aquifer, no dewatering effects or aquifer/water compressibility. Then superimpose the cone of depression onto the highest observed potentiometric maps to predict zone of capture.**

Site: **Henning** **Zone K Bed B** **RS-50 [Bkgr]**

Pumping well: 4-inch Diameter Recovery well

Hydraulic Conductivity: 2.13 (ft/day) Sat thick (b): 1 (ft)

**Conversions**: 10690 (gpd) 7.42 (gpm)

$u = \frac{r^2 S}{4Tt}$

r (distance from well) *see values below*

S (storativity) 0.15

T (transmissivity) 2.13 ($ft^2$/day)

t (time since pumping began) 1080 (days)

u (well function exponential integral) *see values below*

Radius of drainage for RW in time: 249 (feet) / 76 (meters)

**Q =** 0.28 (gpm) 54 (cfd)

58,216 Cubic feet of water pumped in time

194,053 Cubic feet of aquifer drained in time

**3** Number of wells in Area

403.2 (gpd)

**174,648** Total volume of wtr in Area in time

| r | | u | W(u) |
|---|---|---|---|
| **0.1** | *(feet)* | 1.63E-07 | **15.05221** |
| **0.5** | *(feet)* | 4.08E-06 | **11.83334** |
| **1** | *(feet)* | 1.63E-05 | **10.44705** |
| **10** | *(feet)* | 1.63E-03 | **5.843496** |
| **20** | *(feet)* | 6.52E-03 | **4.462082** |
| **30** | *(feet)* | 1.47E-02 | **3.65926** |
| **40** | *(feet)* | 2.61E-02 | **3.095191** |
| **50** | *(feet)* | 4.08E-02 | **2.663333** |
| **100** | *(feet)* | 1.63E-01 | **1.393302** |
| **200** | *(feet)* | 6.52E-01 | **0.409866** |
| **300** | *(feet)* | 1.47E+00 | **0.105045** |
| **400** | *(feet)* | 2.61E+00 | **0.021616** |
| **500** | *(feet)* | 4.08E+00 | **0.00345** |
| **1000** | *(feet)* | 1.63E+01 | **0** |
| **1800** | *(feet)* | 5.28E+01 | **0** |

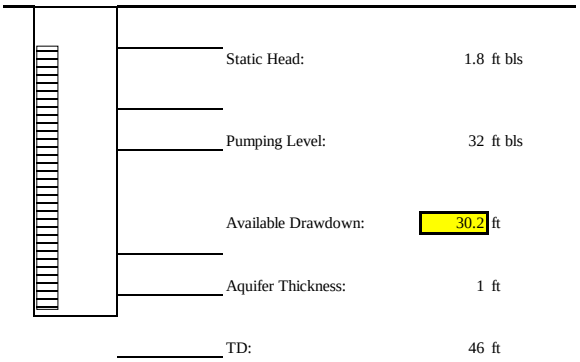
$ho\text{-}h = \frac{Q * W(u)}{4 \pi T}$

Q (discharge) 53.9037 ($ft^3$/day)

W(u) (well function value) from table

ho-h (drawdown)

| r | | ho-h (ft) |
|---|---|---|
| **0.1** | *(feet)* | 30.31 |
| **0.5** | *(feet)* | 23.83 |
| **1** | *(feet)* | 21.04 |
| **10** | *(feet)* | 11.77 |
| **20** | *(feet)* | 8.99 |
| **30** | *(feet)* | 7.37 |
| **40** | *(feet)* | 6.23 |
| **50** | *(feet)* | 5.36 |
| **100** | *(feet)* | 2.81 |
| **200** | *(feet)* | 0.82541459 |
| **300** | *(feet)* | 0.21154612 |
| **400** | *(feet)* | 0.04353188 |
| **500** | *(feet)* | 0.00694772 |
| **1000** | *(feet)* | 0 |
| **1800** | *(feet)* | 0 |



PURE AQUA, INC.®
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sales@pureaqua.com | www.pureaqua.com

# QUOTATION 137536-0

**April 20, 2022**
Prepared by: **May Higazy**

| | | | |
|---|---|---|---|
| **Company:** | Icon Environmental Services | **Address:** | 2049 Commercial Dr. Port Allen LA 70767 |
| **Name:** | Wayne Prejean, P.E. | **Country:** | United States |
| **Email:** | wprejean@iconenv.com | **Phone:** | 225-344-8490 |
| | | **Fax:** | |

| Qty | Part No. | Description | Unit Price ($) | Ext Price ($) |
|---|---|---|---|---|
| | | **10,000 GPD Sea Water Reverse Osmosis System** | | |
| | | **Recommended Pre-Treatment:** | | |
| 1 | CDS-36-G-15 | Prechlorination Dosing System, Adjustable metering pump, Polyethylene solution tank, Manual, 220V/1pH/60Hz | $795.00 | $795.00 |
| 1 | FP/BW | Filter Feed / Back Wash Pump, 460V/3pH/60Hz | $5,128.00 | $5,128.00 |
| 1 | CVP30150MM | 30" FRP Tank Multimedia Filter complete with media, Valve, 2" Pipe size, 220V/1pH/60Hz | $7,313.00 | $7,313.00 |
| 1 | CVP36210GS | 36" FRP Tank Green sand filter complete with media ,valve,2" pipe size 220V/1ph/60Hz | $10,400.00 | $10,400.00 |
| 1 | CDS-36-G-15-ORP-H | Dechlorination Dosing System, Adjustable Metering Pump, Polyethylene Solution Tank, Manual, ORP Monitor, 220V/1pH/60Hz | $1,195.00 | $1,195.00 |
| 1 | CDS-36-G-15 | Antiscalant Dosing System, Adjustable metering pump, Polyethylene solution tank, Manual, 220V/1pH/60Hz | $795.00 | $795.00 |
| 1 | PA0100-PLUS-5 | Antiscalant 5 gallon pail | $330.00 | $330.00 |
| | | **SWRO System:** | | |
| 1 | SW-10K-1004 | Sea Water Reverse Osmosis System to produce 10,000 GPD at maximum 11,000-35,000 PPM feed water TDS, 460V/3ph/60Hz | $77,449.00 | $77,449.00 |
| | | **Recommended Post-Treatment:** | | |
| 1 | CDS-36-G-15-pH-H | Post pH Dosing System, Adjustable Metering Pump, Polyethylene Solution Tank, Manual, pH Monitor, 220V/1pH/60Hz | $1,195.00 | $1,195.00 |
| 1 | Crate | Export Crate | $480.00 | $480.00 |

**Terms and Conditions**

| | |
|---|---|
| **Payment:** | 50% down/50% at shipping |
| **Lead Time:** | 12-14 weeks |
| **Validity:** | 30 days |
| **Freight Terms:** | **Exworks Santa Ana, CA – USA** |

| | |
|---|---|
| Sub Total: | $105,080.00 |
| Discount 0%: | $0.00 |
| Tax 0%: | $0.00 |
| Freight: | $0.00 |
| Total (USD): | $105,080.00 |

# TERMS AND CONDITIONS OF SALE

All products and services processed by Pure Aqua, Inc., its affiliates or subsidiaries shall be in accordance with the following terms and conditions

All products and services processed by Pure Aqua, Inc., its affiliates or subsidiaries shall be in accordance with the following terms and conditions.
ORDER ACCEPTANCE: Pure Aqua reserves the right to accept or reject an order request. Possession of a price sheet or a product catalog is not an offer to sell the product listed. Pure Aqua sells wholesale only and does not sell to end users. These terms and conditions shall be considered a part of all accepted orders and accepted purchase orders. No purported acceptance of any order on terms and conditions which modify, supersede, supplement or otherwise alter the accepted order shall be binding upon Pure Aqua and such terms and conditions shall be deemed rejected and replaced by the accepted order, notwithstanding Pure Aqua's acceptance of any money. In the event of a conflict between the accepted order and any prior or contemporaneous agreement or document exchanged between the partied, the accepted order governs. Some orders may require a down payment. If client approval is required for an order, client approval must be made within 14 days to proceed with the project. If 14 days have passed without client approval, then Pure Aqua may revise any pricing before proceeding with the project or accepting the order.

CANCELLATION OR CHANGE OF ORDER: Orders are processed as they are received. Buyer's add-ons or changes to orders are subject to Pure Aqua acceptance. Once an order is in process (or production), if as a consequence of an instruction from you regarding any change to the order including add-ons, we delay or suspend (but not cancel) an order or any part of an order, we may vary the price for the order and/or separate portions of the order. You may not cancel an order, or any part of it, without our written consent, which may be withheld in our absolute discretion. In addition, any cancellation of an order may incur a minimum 35% restocking fee. Without prejudice to our right to refuse consent for you to cancel an order, as a condition of giving such consent we may require that you pay any and all costs reasonably incurred by us in relation to the cancelled order or the cancelled part of the order plus a reasonable profit to the date of cancellation. Pure Aqua may delay or cancel an order or delivery of an order at any time if: a) we reasonably form the opinion that you are insolvent or at material risk of insolvency; b) you fail to pay any amount on the due date; c) where an account is found delinquent and no arrangements have been made with the Credit Department to settle the account; or d) we reasonably form the opinion that fulfilling the order to you may have a negative impact upon our business or commercial reputation or image.

STANDARDS: The Pure Aqua system is designed to Pure Aqua's standards and is not NSF or UL listed. Pure Aqua makes no claim or guarantee that the system meets NSF or any other standards. NSF components are supplied where applicable. It is your obligation to determine if any components meet installation requirements and the legal requirements. Component data sheets are supplied from the respective manufacturers for various components as is.

CUSTOM EQUIPMENT: Custom equipment is subject to the terms and conditions detailed on the separate Pure Aqua quote form and will require a minimum 35% down payment.

PRICES: Products are sold at prices currently in effect at time of order, together with any applicable taxes, charges and delivery costs in relation to the products and are exworks Santa Ana, CA-USA unless otherwise specified. Prices generally coincide with dated Pure Aqua printed price sheets and website information, exclusive of any applicable taxes, charges and delivery costs in relation to the order. However, Pure Aqua reserves the right to change prices at any time, without notice and without updating published material on our website or in print. Freight costs are for the customer's account.

DELIVERY: Stock items distributed by Pure Aqua are generally shipped within 1 to 4 working days after our acceptance of an order. We may require additional time on special orders, large orders, or items not stocked. The risk in the order shall pass to you upon placement of the order onto transport for delivery to you. If your shipment is delayed, lost, weathered or damaged in transit, Pure Aqua is not responsible for any liability for any loss, damage, consequence or expense. Pure Aqua is not responsible for delays due to conditions beyond our control.

SHIPPING CHARGES: All shipments are exworks Santa Ana, CA-USA, unless otherwise specified and shipping costs are the customer's responsibility.

TERMS OF PAYMENT:
1. Via Wire Transfers
2. Via Letter of Credit (L/C)
   - Letter of credit must be irrevocable, advised and confirmed by any MAJOR financial institution in the United States with draft payable at sight.
   - Letter of Credit must state that all bank charges inside and outside the United states are to be borne by the opener. Payment terms apply as per contract and include penalties for late payment. A minimum purchase requirement of $250 is necessary to help defer handling.

OPEN ACCOUNT: To establish an open account, we will conduct a complete credit analysis. This requires correspondence with you, your suppliers, and your bank or financial institution. The time involved depends on the response time from the references you give us. You will be notified when your credit is approved. In the interim, all orders must be prepaid. No open account terms for customers outside of the United States.

DAMAGED MERCHANDISE: The risk in the order shall pass to you upon placement of the order onto transport for delivery to you. If your shipment is delayed, lost, weathered or damaged in transit, Pure Aqua is not responsible for any liability for any loss, damage, consequence or expense. It is your responsibility to check shipments for damage before acceptance or note on freight bill "Subject to inspection for concealed damage." Consignee is responsible for filing a claim with the freight carrier for any and all damages or losses. Return of Damaged Goods will not be authorized.We will not accept Return of Damaged Goods.

ERRORS AND RETURN GOODS AUTHORIZATION: No returns will be accepted without prior authorization. Call Pure Aqua to request an RGA number. You must prepay all freight/shipping charges. An RGA not used in 30 days will expire. We will refuse a return 30 days after an RGA is issued and any invoice will be payable within terms. Special order goods are not returnable. All authorized returns are subject to a 35% restocking fee.

DEFECTIVE GOODS & WARRANTY PROCESSING: An item returned for warranty consideration without prior authorization will be refused. Call Pure Aqua to obtain an RGA number. Pure Aqua and its manufacturers reserve the right to repair or replace defective merchandise. If pre- warranty replacement merchandise has been sent and the warranted goods are repairable, the repaired product will be returned to you at our expense and the pre-warranty invoice will be for your account. If the warranted product is not repairable, an offsetting credit invoice will be issued to your account. If the warranty consideration is denied, all expenses are for your account.
PROPRIETARY RIGHTS: Any and all of Pure Aqua's designs, trademarks, trade names specifications, patents, copyrights, formulas and manufacturing information are its intellectual property and proprietary data and shall be utilized for purposes intended in the order only.

LIMITED WARRANTY: This limited warranty and the remedies set for are exclusive and in lieu of all other warranties, remedies and conditions, whether oral, written, statutory, express or implied. Pure Aqua disclaims all statutory and implied warranties, including without limitation, warranties of merchantability and fitness for a particular purpose and warranties against hidden or latent defects, to the extent permitted by law. In so far as such warranties cannot be disclaimed, Pure Aqua limits the duration and remedies of such warranties to the duration of this express warranty and, at Pura Aqua's option, the repair or replacement services described below. Products manufactured by Pure Aqua are warranted to be free of defects in material and workmanship for a period of one year from the system start up and commissioning, or fourteen months from the ship date, whichever comes first. Pure Aqua's responsibility and liability shall be limited solely and exclusively to the replacement or the repair of parts manufactured by Pure Aqua and will not be liable for any cost arising from removal, installation, transportation or any other charges that may arise in connection with the warranty claim. Products and/or system components sold by Pure Aqua and manufactured by others are subject to the warranty provided by the manufacturer of said products and/or components and not by Pure Aqua's warranty. Pure Aqua will not be liable for damage to products caused by incorrect operation, misuse, abuse, unauthorized alteration, repair, accident or if products were not installed and operated in accordance to the Pure Aqua operation and installation manual. Pure Aqua will not be liable for any incidental or consequential damages, losses, or expenses arising from installation, use or any other causes.

# Chemical Dosing Systems

## Capacity: 6 to 120 GPD

**CDS SERIES**

Pure Aqua supplies a comprehensive selection of dosing pump systems for small to large-scale applications within disinfection, flocculation, and pH adjustment. Our engineers have expertise in proposals regarding "plug and pump" including complete packages. We manufacture chemical dosing systems with custom-made solutions that are intended to produce available dosing technology in complete packages. The Pure Aqua CDS series chemical dosing systems offer a wide range of capacities to meet various chemical treatment applications. Each system includes the chemical metering pump and polyethylene chemical tank, along with the necessary hoses and fitting for the pump.

## Standard Features

### Diaphragm Metering

- Fully adjustable output capacity from 6-120 GPD
- Manual function control for stroke rate & length
- Highly reliable timing circuit
- EMI resistant
- Thermally protected solenoid with auto-reset
- Bleed valve assembly
- Plastic pvc head/fittings and polyethylene tank for a wide range of corrosion resistance to such chemicals as mild acid, chlorine, and caustic solution

### Digital Metering

- Maximum turn-down ratio of 1:1000
- Dosing rate is set using a logarithmic scale that runs from 0.1-100%


## Available Options

- 230V/1ph/50Hz or 60Hz
- Epoxy coated stainless steel mixer
- pH controller
- ORP controller
- Stand-by pump
- Skid mounted unit
- Custom built unit
- Pump maintenance spare kit
- Level switch
- Local control panel

## Applications

- Water purification and pollution control
- Iron, hydrogen sulfide & manganese removal
- Scale prevention
- Acid water neutralization
- Coagulation and turbidity removal
- Waste water treatment
- Food Processing
- Detergent and wetting agent metering
- Swimming pool treatment
- Liquid fertilizer treatment
- Hydroponics nutrient treatment
- Municipal water treatment
- Algae control
- Livestock water treatment

# Chemical Dosing Systems

## Capacity: 6 to 120 GPD

**CDS SERIES**

Pure Aqua CDS series provides chemical dosing pumps that comprise a complete package with fully custom engineering, corrosion-resistance, and pre-packaging. This package consists of the capacity to utilize specific pump technology best suited for your intended use. The CDS series allows engineers and specialists in this field to outline the most effective chemical feed system for their water treatment application. The specialized features of our chemical feed system give it further advantages that separate it from similar systems in the market. These features include a compact and transportable preorganized skid with great security, corrosion resistance, and alternative choices of metering pumps available.

### Water Treatment Applications and Uses:

- pH neutralization
- Disinfection
- Coagulation and flocculation
- Sodium hydroxide feed
- Sulfuric acid dosing
- Fluoride treatment
- Potassium permanganate dosing
- Dispersant polymer dosing
- Alum feed
- Antiscalant addition
- Hydrochloric acid metering
- Sodium hypochlorite systems
- Dechlorination SMBS


| Model # | Output Capacity | | Max Pressure (PSI) | Pump Material | | | Tubing Connection | Electrical Data | | NSF Rating | Tank Size |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | GPD | LPD | | Dosing Head | Valve Ball | Gasket | | Watts | Enclosure Class | | |
| **Diaphragm Metering** | | | | | | | | | | | |
| CDS-6 | 6 | 23 | 100 | PVC | Ceramic | Teflon | 3/8" OD | 130 | IP41/NEMA3 | 125 | 15 |
| CDS-12 | 12 | 45 | | | | | | | | | 15 |
| CDS-22 | 22 | 83 | | | | | | | | | 15 |
| CDS-30 | 30 | 114 | | | | | | | | | 35 |
| CDS-48 | 48 | 182 | | | | | | | | | 50 |
| CDS-76 | 76 | 284 | | | | | 1/2" OD | | | | 100 |
| CDS-96 | 96 | 356 | | | | | | | | | 100 |
| CDS-120 | 120 | 454 | | | | | | | | | 150 |
| **Digital Metering** | | | | | | | | | | | |
| CDS-36-G-15 | 36 | 136 | 145 | PVC | Ceramic | EPDM | 1/4" OD | 19 | IP65/ NEMA 4X | Yes | 15 |
| CDS-36-G-35 | | | | | | | | | | | 35 |
| CDS-96-G-55 | 96 | 356 | 60 | | | | 3/8" OD | | | | 55 |
| CDS-96-G-100 | | | | | | | | | | | 100 |

Pure Aqua also supplies: Custom Engineered Solutions, Multimedia Pretreatment, Activated Carbon Pretreatment, Water Conditioning, Chemical Dosing Systems, Ultraviolet (UV) Sterilizers and Ozonation Systems.


**PURE AQUA, INC.®**

Water Treatment and Reverse Osmosis Systems

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ISO 9001:2015

AWWA MEMBER

Water Quality

Authorized Dealer:

# Commercial Media Filters

## FRP Tanks: 14" to 36" Diameter

# MF-500 SERIES

Pure Aqua's pressure filters clarify water by removing sediment, turbidity, iron, unpleasant tastes, odors, suspended particles, and unwanted color, all of which are commonly found in surface water. They can be used in a variety of services including: industrial, municipal, and institutional applications.

## Standard Features

- High performance FRP tank
- Automatic backwash valve
- Glass filled Noryl valve
- Time controller for automatic backwash cycle
- Flow controller to limit backwash flow
- All internals are plastic materials


## Available Options

- Duplex systems
- Tanks according to ASME code
- Stainless steel tanks
- Epoxy coated steel tanks
- 240V/1ph/50Hz power supply
- Vacuum breaker
- Pressure relief valve
- Inlet/outlet sample valves
- Inlet/outlet pressure gauges
- Differential pressure switch and gauge
- Filters using diaphragm valves
- Auxiliary switch for backwash pump start

## Media Filtration Operating Cycles

### Service Cycle

Water flows downward through the media while solids accumulate in the media bed. The purified water passes through to downstream processes.

### Backwash Cycle

When the filter begins to clog or when the head loss (pressure drop) through the bed increases, flow rates are reduced. To prevent degradation of water quality, the flow is reversed. This is directed by the control valve(s) to drain, carrying with it, the particulate matter that has built up during service.

The required flow is specific to the media and is essential to effective cleaning of the media bed. For media filters, the backwash flow is always higher than the service flow rate.

PURE AQUA, INC.®

Water Treatment & Reverse Osmosis Systems

# Commercial Media Filters

## FRP Tanks: 14" to 36" Diameter

# MF-500 SERIES

### Pressure Gauges

Pre and post filter pressure gauges are important to monitor the filter pressure and determine the backwash frequency.


### DP Switch

The differential pressure gauge and switch are used to automatically initiate backwash based on the differential pressure.

### Auxiliary Switch

Auxiliary switches are used to provide a signal to start a backwash pump or to provide a status signal to a BMS system or interlock with an RO system.

## Filter Media Types

Pure Aqua supplies a wide range of quality filter media that meet industry standards for efficient and effective filtration.

Coarse Gravel | Fine Gravel | Coconut Carbon Media | Silica Sand | Anthracite Media

### Sand

Graded in various ranges, Pure Aqua's sand can be used as filtration media or underbedding depending on particle size and application.

### Calcite

Calcite media is specially graded calcium carbonate compound for neutralizing acid with consistent dissolving rates for water treatment.

### Manganese Greensand

Manganese Greensand media is treated siliceous material for treating water containing iron, manganese and hydrogen sulfide.

### Anthracite

Anthracite is recommended as a filter media where additional silica in the water is not desirable and removes lighter weight turbidity.

### Activated Carbon

Activated carbon media is used to remove taste, odor and chlorine and used in many drinking water applications.

### ProSand

ProSand is based on a rare natural mineral. Its unique properties radically improve the performance and cost of media filtration.

PURE AQUA, INC.®

Water Treatment & Reverse Osmosis Systems

# Commercial Media Filters

## FRP Tanks: 14" to 36" Diameter

# MF-500 SERIES

## Advantages of Multimedia Filtration

- Relatively inexpensive, no recurring cost of consumables
- Proven process and most tested forms of water treatment
- Systems are robust with no moving parts inside the tanks
- Modular control valves designed for operational flexibility
- Filtration media is inexpensive and long-lasting
- Easily cleaned and maintained
- Resistant to fouling (clogging)

## Operation Specifications

- Operating pressure: 2-6.8 bar (30-100 psi)
- Electrical supply: 115V/1ph/60Hz
- Operating temperature: 2-38°C (35-100°F)
- Filters can be supplied in 240V/1ph/50Hz

| Model # | Max Flow (GPM) | | | | | | | | Tank Size D"xH" | Media Qty. ($ft^3$) | Pipe Size | Approx Weight (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Minimum | | Average | | Peak | | Backwash | | | | | |
| | GPM | $M^3/H$ | GPM | $M^3/H$ | GPM | $M^3/H$ | GPM | $M^3/H$ | | | | |
| **Multi Layer Filters: Anthracite, Sand and Gravel (Turbidity Removal)** | | | | | | | | | | | | |
| CVP1435MM | 10.7 | 2.4 | 16.1 | 3.6 | 21.4 | 4.9 | 16.1 | 3.6 | 14x65 | 3.5 | 2" | 366 |
| CVP1645MM | 13.9 | 3.2 | 20.9 | 4.8 | 27.8 | 6.3 | 20.9 | 4.8 | 16x65 | 4.5 | 2" | 462 |
| CVP1855MM | 17.7 | 4.0 | 26.6 | 6.0 | 35.4 | 8.0 | 26.6 | 6.0 | 18x65 | 5.5 | 2" | 577 |
| CVP2160MM | 24.1 | 5.5 | 36.2 | 8.3 | 48.2 | 11.0 | 36.2 | 8.3 | 21x62 | 6 | 2" | 761 |
| CVP24100MM | 31.4 | 7.1 | 47.1 | 10.7 | 62.8 | 14.3 | 47.1 | 10.7 | 24x72 | 10 | 2" | 981 |
| CVP30150MM | 49.1 | 11.2 | 73.7 | 16.8 | 98.2 | 22.3 | 73.7 | 16.8 | 30x72 | 15 | 2" | 1,544 |
| CVP36210MM | 70.7 | 16.1 | 106.1 | 24.2 | 116.2 | 26.4 | 106.1 | 24.2 | 36x72 | 21 | 2" | 1,900 |
| **AG Filters: Non Hydrous Silicon Dioxide (Turbidity Removal)** | | | | | | | | | | | | |
| CVP1435AG | 10.7 | 2.4 | 16.1 | 3.6 | 21.4 | 4.9 | 16.1 | 3.6 | 14x65 | 3.5 | 2" | 156 |
| CVP1645AG | 13.9 | 3.2 | 20.9 | 4.8 | 27.8 | 6.3 | 20.9 | 4.8 | 16x65 | 4.5 | 2" | 200 |
| CVP1855AG | 17.7 | 4.0 | 26.6 | 6.0 | 35.4 | 8.0 | 26.6 | 6.0 | 18x65 | 5.5 | 2" | 284 |
| CVP2160AG | 24.1 | 5.5 | 36.2 | 8.3 | 48.2 | 11.0 | 36.2 | 8.3 | 21x62 | 6 | 2" | 360 |
| CVP24100AG | 31.4 | 7.1 | 47.1 | 10.7 | 62.8 | 14.3 | 47.1 | 10.7 | 24x72 | 10 | 2" | 480 |
| CVP30150AG | 49.1 | 11.2 | 73.7 | 16.8 | 98.2 | 22.3 | 73.7 | 16.8 | 30x72 | 15 | 2" | 770 |
| CVP36210AG | 70.7 | 16.1 | 106.1 | 24.2 | 116.2 | 26.4 | 106.1 | 24.2 | 36x72 | 21 | 2" | 1,050 |
| **Activated Carbon Filters: Guanular Form with High Degree of Porosity (Taste, Odor and Color Removal)** | | | | | | | | | | | | |
| CVP1435AC | 7.5 | 1.7 | 8.6 | 1.9 | 12.8 | 2.9 | 12.8 | 2.9 | 14x65 | 3.5 | 2" | 156 |
| CVP1645AC | 9.7 | 2.2 | 11.1 | 2.5 | 16.7 | 3.8 | 16.7 | 3.8 | 16x65 | 4.5 | 2" | 200 |
| CVP1855AC | 12.4 | 2.8 | 14.2 | 3.2 | 21.2 | 4.8 | 21.2 | 4.8 | 18x65 | 5.5 | 2" | 284 |
| CVP2160AC | 16.9 | 3.8 | 19.3 | 4.4 | 28.9 | 6.6 | 28.9 | 6.6 | 21x62 | 6 | 2" | 360 |
| CVP24100AC | 22.0 | 5.0 | 25.1 | 5.7 | 37.7 | 8.6 | 37.7 | 8.6 | 24x72 | 10 | 2" | 480 |
| CVP30150AC | 34.4 | 7.8 | 39.3 | 8.9 | 58.9 | 13.4 | 58.9 | 13.4 | 30x72 | 15 | 2" | 770 |
| CVP36210AC | 49.5 | 11.2 | 56.6 | 12.9 | 84.8 | 19.3 | 84.8 | 19.3 | 36x72 | 21 | 2" | 1,050 |

*All filters require periodic backwashing to dispose of the accumulated debris. This is accomplished by backwashing clean water through the unit and then disposing of the effluent. During this phase, the different sizes of media separate into layers, preparing the filter bed for service. Because backwashing generally occurs at higher flow rates than those seen in service, oftentimes a proper backwash flow rate is not possible because the systems are designed for required service flow rates. However, by utilizing smaller double or triple unit systems, the optimum backwash flow rate is lower; therefore, these systems operate at higher service flow rates.

PURE AQUA, INC.®

Water Treatment & Reverse Osmosis Systems

# Commercial Media Filters

## FRP Tanks: 14" to 36" Diameter

# MF-500 SERIES

| Model # | Max Flow (GPM) | | | | | | | | Tank Size D"xH" | Media Qty. ($ft^3$) | Pipe Size | Approx Weight (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Minimum | | Average | | Peak | | Backwash | | | | | |
| | GPM | $M^3/H$ | GPM | $M^3/H$ | GPM | $M^3/H$ | GPM | $M^3/H$ | | | | |
| **Birm Filters: (Fe, Mn, $H_2S$ Reduction)** | | | | | | | | | | | | |
| CVP1435BM | 7.5 | 1.7 | 8.6 | 1.9 | 12.8 | 2.9 | 12.8 | 2.9 | 14x65 | 3.5 | 1-1/2" | 164 |
| CVP1645BM | 9.7 | 2.2 | 11.1 | 2.5 | 16.7 | 3.8 | 16.7 | 3.8 | 16x65 | 4.5 | 1-1/2" | 230 |
| CVP1855BM | 12.4 | 2.8 | 14.2 | 3.2 | 21.2 | 4.8 | 21.2 | 4.8 | 18x65 | 5.5 | 1-1/2" | 315 |
| CVP2160BM | 16.9 | 3.8 | 19.3 | 4.4 | 28.9 | 6.6 | 28.9 | 6.6 | 21x62 | 6 | 1-1/2" | 448 |
| CVP24100BM | 22.0 | 5.0 | 25.1 | 5.7 | 37.7 | 8.6 | 37.7 | 8.6 | 24x72 | 10 | 1-1/2" | 594 |
| CVP30150BM | 34.4 | 7.8 | 39.3 | 8.9 | 58.9 | 13.4 | 58.9 | 13.4 | 30x72 | 15 | 2" | 957 |
| CVP36210BM | 49.5 | 11.2 | 56.6 | 12.9 | 84.8 | 19.3 | 84.8 | 19.3 | 36x72 | 21 | 2" | 1,250 |
| **Calcite Filters: (pH Neutralization)** | | | | | | | | | | | | |
| CVP1435CF | 7.5 | 1.7 | 8.6 | 1.9 | 12.8 | 2.9 | 12.8 | 2.9 | 14x65 | 3.5 | 1-1/2" | 440 |
| CVP1645CF | 9.7 | 2.2 | 11.1 | 2.5 | 16.7 | 3.8 | 16.7 | 3.8 | 16x65 | 4.5 | 1-1/2" | 550 |
| CVP1855CF | 12.4 | 2.8 | 14.2 | 3.2 | 21.2 | 4.8 | 21.2 | 4.8 | 18x65 | 5.5 | 1-1/2" | 693 |
| CVP2160CF | 16.9 | 3.8 | 19.3 | 4.4 | 28.9 | 6.6 | 28.9 | 6.6 | 21x62 | 6 | 1-1/2" | 910 |
| CVP24100CF | 22.0 | 5.0 | 25.1 | 5.7 | 37.7 | 8.6 | 37.7 | 8.6 | 24x72 | 10 | 1-1/2" | 1,180 |
| CVP30150CF | 34.4 | 7.8 | 39.3 | 8.9 | 58.9 | 13.4 | 58.9 | 13.4 | 30x72 | 15 | 2" | 1,850 |
| CVP36210CF | 49.5 | 11.2 | 56.6 | 12.9 | 84.8 | 19.3 | 84.8 | 19.3 | 36x72 | 21 | 2" | 2,280 |

## Applications:

- Water features (fountains, etc.)
- Wastewater
- Cooling water
- Suspended solids reduction
- Commercial process water
- Storm water
- Irrigation water
- Iron and manganese removal
- Swimming pool water
- Potable (drinking) water

Pure Aqua also supplies: Custom Engineered Solutions, Multimedia Pretreatment, Activated Carbon Pretreatment, Water Conditioning, Chemical Dosing Systems, Ultraviolet (UV) Sterilizers and Ozonation Systems.


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Water Treatment & Reverse Osmosis Systems
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www.pureaqua.com Fax: +1.714.432.9898


Authorized Dealer:

# Commercial Seawater RO Systems

## Capacity: 380 to 10,000 GPD

**SWC SERIES**

Pure Aqua, Inc. manufactures a full line of seawater desalinators designed for heavy duty service in marine applications where quality and dependable performance are key. Our SWC series is available with capacities ranging from 380 GPD to 10,000 GPD.


SW-3.0K-304


SW-6.0K-604

## Standard Features

- Powder coated carbon steel frame
- 2-1/2" or 4" TFC spiral wound membranes
- Stainless steel multi-stage pump with TEFC motor
- FRP membrane housings
- 5 micron cartridge prefilter
- 460V/3ph/60Hz power requirement
- Microprocessor control panel
- Programmable time delay and set points
- LCD screen
- Motor starter
- NEMA 12 enclosure
- Low pressure switch
- High pressure switch
- Liquid filled pressure gauges
- Permeate conductivity monitor
- Permeate & concentrate flow meters

## Available Options

- Feed booster pump
- Remote monitoring
- Feed water conductivity monitor
- Membrane cleaning skid
- Fresh water flush
- Permeate diversion
- Export crating
- 220V or 380-415V/3ph/50 or 60Hz
- Product tank level switch
- Feed pH controller with sensor
- Feed ORP controller with sensor
- Water and hour meters
- Chemical dosing systems
- Media prefiltration systems
- Calcite post filter
- Ozonation and UV sterilization systems
- Skid mounted with pre and post treatment

PURE AQUA, INC.®

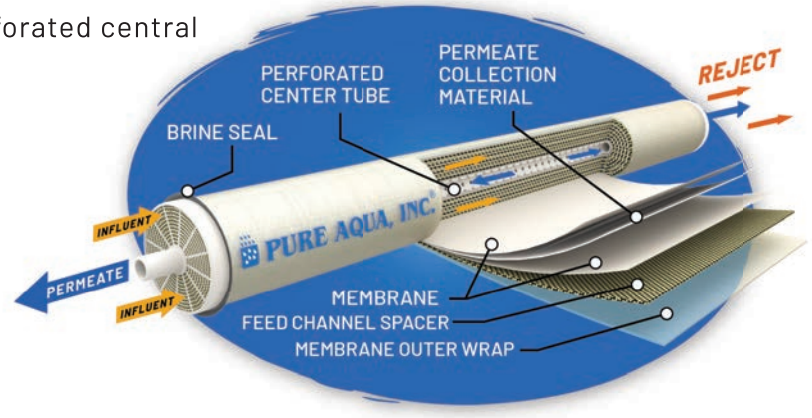
# Commercial Seawater RO Systems

## Capacity: 380 to 10,000 GPD

**SWC SERIES**

The spiral membrane is constructed from one or more membrane envelopes wound around a perforated central tube. The permeate passes through the membrane into the envelope and spirals inward to the central tube for collection.

The layers of the membrane envelope are detailed in the diagram to the right.




## Operation Specifications

- Max. feed water temperature: 42°C
- Feed water pressure: 40 to 80 psi
- Operating pressure: 700 to 1,000 psi
- Hydrogen Sulfide must be removed
- Turbidity must be removed
- Max. iron content: 0.05 ppm
- Feed water TDS: 10,000-42,000 ppm
- Equipment upgrade for TDS up to 50,000 ppm
- Antiscalant dosing is required
- pH tolerance range: 3-11
- Biological or organic content must be removed

| Model # | Permeate Flow Rate | | Membranes | | Motor Rating HP at 42,000 ppm | | Approx. Weight (lbs) | Dimensions L"xW"xH" |
|---|---|---|---|---|---|---|---|---|
| | GPD | M³/D | Size | Qty | 60Hz | 50Hz | | |
| SW-0.38K-125 | 380 | 1.4 | 2.5"x40" | 1 | 2 | 2 | 220 | 51x21x30 |
| SW-0.75K-225 | 750 | 2.8 | 2.5"x40" | 2 | 2 | 2 | 230 | 51x21x30 |
| SW-1.1K-325 | 1,100 | 4.2 | 2.5"x40" | 3 | 2 | 2 | 250 | 51x21x30 |
| SW-1.5K-425 | 1,500 | 5.7 | 2.5"x40" | 4 | 3 | 3 | 290 | 51x21x30 |
| SW-1.0K-104 | 1,000 | 3.8 | 4"x40" | 1 | 3 | 5 | 395 | 61x34x42 |
| SW-2.0K-204 | 2,000 | 7.8 | 4"x40" | 2 | 5 | 5 | 450 | 61x34x42 |
| SW-3.0K-304 | 3,000 | 11.3 | 4"x40" | 3 | 5 | 5 | 550 | 61x34x42 |
| SW-4.0K-404 | 4,000 | 15.1 | 4"x40" | 4 | 7.5 | 7.5 | 650 | 61x34x42 |
| SW-5.0K-504 | 5,000 | 18.9 | 4"x40" | 5 | 7.5 | 7.5 | 750 | 61x34x42 |
| SW-6.0K-604 | 6,000 | 22.7 | 4"x40" | 6 | 7.5 | 7.5 | 850 | 61x34x56 |
| SW-7.0K-704 | 7,000 | 26.5 | 4"x40" | 7 | 10 | 10 | 950 | 61x34x56 |
| SW-8.0K-804 | 8,000 | 30.3 | 4"x40" | 8 | 10 | 10 | 1,050 | 61x34x61 |
| SW-10K-1004 | 10,000 | 37.9 | 4"x40" | 10 | 15 | 15 | 1,150 | 61x34x61 |

Pure Aqua also supplies: Custom Engineered Solutions, Multimedia Pretreatment, Activated Carbon Pretreatment, Water Conditioning, Chemical Dosing Systems, Ultraviolet (UV) Sterilizers and Ozonation Systems.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ISO 9001:2015

AWWA MEMBER

Water Quality Association MEMBER

Authorized Dealer:

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Toll Free: +1 (844) 309-7501
sales@pureaqua.com | www.pureaqua.com

# QUOTATION 137542-0

**April 20, 2022**
Prepared by: **May Higazy**

| | | | |
|---|---|---|---|
| **Company:** | Icon Environmental Services | **Address:** | 2049 Commercial Dr. Port Allen LA 70767 |
| **Name:** | Wayne Prejean, P.E. | **Country:** | United States |
| **Email:** | wprejean@iconenv.com | **Phone:** | 225-344-8490 |
| | | **Fax:** | |

| Qty | Part No. | Description | Unit Price ($) | Ext Price ($) |
|---|---|---|---|---|
| | | **20,000 GPD Brackish Water Reverse Osmosis System** | | |
| | | **Recommended Pre-Treatment:** | | |
| 1 | CDS-36-G-15 | Prechlorination Dosing System, Adjustable metering pump, Polyethylene solution tank, Manual, 220V/1pH/60Hz | $795.00 | $795.00 |
| 1 | FP/BW | Filter Feed / Back Wash Pump, 460V/3pH/60Hz | $6,443.00 | $6,443.00 |
| 1 | 31F30150MM | 30" FRP Tank Multimedia Filter complete with media, 3150 Fleck valve, 2" Pipe size, 220V/1pH/60Hz | $7,150.00 | $7,150.00 |
| 1 | 31F36210GS | 36" FRP Tank Greensand Filter complete with media, 3150 Fleck valve, 2" Pipe size, 220V/1pH/60Hz | $9,950.00 | $9,950.00 |
| 1 | 31F30150AC | 30" FRP Tank Activated Carbon Filter complete with media, 3150 Fleck valve, 2" Pipe size, 220V/1pH/60Hz | $7,709.00 | $7,709.00 |
| 1 | CDS-36-G-15 | Antiscalant Dosing System, Adjustable metering pump, Polyethylene solution tank, Manual, 220V/1pH/60Hz | $795.00 | $795.00 |
| 1 | PA0100-PLUS-5 | Antiscalant 5 gallon pail | $330.00 | $330.00 |
| | | **BWRO System:** | | |
| 1 | BW-24K-8240 | Brackish Reverse Osmosis System modified to produce 20,000 GPD at maximum 10,000 ppm feed water TDS, 460V/3ph/60Hz, with powder coated carbon steel frame, (8) FRP pressure vessels, (16) 4" TFC spiral wound membranes (Filmtec or Hydranautics), pressure gauges, pressure switches, flow meters, high pressure pump (Grundfos or equal), microprocessor control panel. | $49,700.00 | $49,700.00 |
| | | **Recommended Post-Treatment:** | | |
| 1 | CDS-36-G-15-pH-H | Post pH Dosing System, Adjustable Metering Pump, Polyethylene Solution Tank, Manual, pH Monitor, 220V/1pH/60Hz | $1,195.00 | $1,195.00 |

# QUOTATION 137542-0

**April 20, 2022**

Prepared by: **May Higazy**

| Qty | Part No. | Description | Unit Price ($) | Ext Price ($) |
|---|---|---|---|---|

| Terms and Conditions | |
|---|---|
| **Payment:** | 50% down/50% at shipping |
| **Lead Time:** | 12-14 weeks |
| **Validity:** | 30 days |
| **Freight Terms:** | **Factory USA** |

| | |
|---|---|
| Sub Total: | $84,067.00 |
| Discount 0%: | $0.00 |
| Tax 0%: | $0.00 |
| Freight: | $0.00 |
| Total (USD): | $84,067.00 |

Shipping is not included

# TERMS AND CONDITIONS OF SALE

All products and services processed by Pure Aqua, Inc., its affiliates or subsidiaries shall be in accordance with the following terms and conditions

All products and services processed by Pure Aqua, Inc., its affiliates or subsidiaries shall be in accordance with the following terms and conditions.
ORDER ACCEPTANCE: Pure Aqua reserves the right to accept or reject an order request. Possession of a price sheet or a product catalog is not an offer to sell the product listed. Pure Aqua sells wholesale only and does not sell to end users. These terms and conditions shall be considered a part of all accepted orders and accepted purchase orders. No purported acceptance of any order on terms and conditions which modify, supersede, supplement or otherwise alter the accepted order shall be binding upon Pure Aqua and such terms and conditions shall be deemed rejected and replaced by the accepted order, notwithstanding Pure Aqua's acceptance of any money. In the event of a conflict between the accepted order and any prior or contemporaneous agreement or document exchanged between the partied, the accepted order governs. Some orders may require a down payment. If client approval is required for an order, client approval must be made within 14 days to proceed with the project. If 14 days have passed without client approval, then Pure Aqua may revise any pricing before proceeding with the project or accepting the order.

CANCELLATION OR CHANGE OF ORDER: Orders are processed as they are received. Buyer's add-ons or changes to orders are subject to Pure Aqua acceptance. Once an order is in process (or production), if as a consequence of an instruction from you regarding any change to the order including add-ons, we delay or suspend (but not cancel) an order or any part of an order, we may vary the price for the order and/or separate portions of the order. You may not cancel an order, or any part of it, without our written consent, which may be withheld in our absolute discretion. In addition, any cancellation of an order may incur a minimum 35% restocking fee. Without prejudice to our right to refuse consent for you to cancel an order, as a condition of giving such consent we may require that you pay any and all costs reasonably incurred by us in relation to the cancelled order or the cancelled part of the order plus a reasonable profit to the date of cancellation. Pure Aqua may delay or cancel an order or delivery of an order at any time if: a) we reasonably form the opinion that you are insolvent or at material risk of insolvency; b) you fail to pay any amount on the due date; c) where an account is found delinquent and no arrangements have been made with the Credit Department to settle the account; or d) we reasonably form the opinion that fulfilling the order to you may have a negative impact upon our business or commercial reputation or image.

STANDARDS: The Pure Aqua system is designed to Pure Aqua's standards and is not NSF or UL listed. Pure Aqua makes no claim or guarantee that the system meets NSF or any other standards. NSF components are supplied where applicable. It is your obligation to determine if any components meet installation requirements and the legal requirements. Component data sheets are supplied from the respective manufacturers for various components as is.

CUSTOM EQUIPMENT: Custom equipment is subject to the terms and conditions detailed on the separate Pure Aqua quote form and will require a minimum 35% down payment.

PRICES: Products are sold at prices currently in effect at time of order, together with any applicable taxes, charges and delivery costs in relation to the products and are exworks Santa Ana, CA-USA unless otherwise specified. Prices generally coincide with dated Pure Aqua printed price sheets and website information, exclusive of any applicable taxes, charges and delivery costs in relation to the order. However, Pure Aqua reserves the right to change prices at any time, without notice and without updating published material on our website or in print. Freight costs are for the customer's account.

DELIVERY: Stock items distributed by Pure Aqua are generally shipped within 1 to 4 working days after our acceptance of an order. We may require additional time on special orders, large orders, or items not stocked. The risk in the order shall pass to you upon placement of the order onto transport for delivery to you. If your shipment is delayed, lost, weathered or damaged in transit, Pure Aqua is not responsible for any liability for any loss, damage, consequence or expense. Pure Aqua is not responsible for delays due to conditions beyond our control.

SHIPPING CHARGES: All shipments are exworks Santa Ana, CA-USA, unless otherwise specified and shipping costs are the customer's responsibility.

TERMS OF PAYMENT:
1. Via Wire Transfers
2. Via Letter of Credit (L/C)
   - Letter of credit must be irrevocable, advised and confirmed by any MAJOR financial institution in the United States with draft payable at sight.
   - Letter of Credit must state that all bank charges inside and outside the United states are to be borne by the opener. Payment terms apply as per contract and include penalties for late payment. A minimum purchase requirement of $250 is necessary to help defer handling.

OPEN ACCOUNT: To establish an open account, we will conduct a complete credit analysis. This requires correspondence with you, your suppliers, and your bank or financial institution. The time involved depends on the response time from the references you give us. You will be notified when your credit is approved. In the interim, all orders must be prepaid. No open account terms for customers outside of the United States.

DAMAGED MERCHANDISE: The risk in the order shall pass to you upon placement of the order onto transport for delivery to you. If your shipment is delayed, lost, weathered or damaged in transit, Pure Aqua is not responsible for any liability for any loss, damage, consequence or expense. It is your responsibility to check shipments for damage before acceptance or note on freight bill "Subject to inspection for concealed damage." Consignee is responsible for filing a claim with the freight carrier for any and all damages or losses. Return of Damaged Goods will not be authorized.We will not accept Return of Damaged Goods.

ERRORS AND RETURN GOODS AUTHORIZATION: No returns will be accepted without prior authorization. Call Pure Aqua to request an RGA number. You must prepay all freight/shipping charges. An RGA not used in 30 days will expire. We will refuse a return 30 days after an RGA is issued and any invoice will be payable within terms. Special order goods are not returnable. All authorized returns are subject to a 35% restocking fee.

DEFECTIVE GOODS & WARRANTY PROCESSING: An item returned for warranty consideration without prior authorization will be refused. Call Pure Aqua to obtain an RGA number. Pure Aqua and its manufacturers reserve the right to repair or replace defective merchandise. If pre- warranty replacement merchandise has been sent and the warranted goods are repairable, the repaired product will be returned to you at our expense and the pre-warranty invoice will be for your account. If the warranted product is not repairable, an offsetting credit invoice will be issued to your account. If the warranty consideration is denied, all expenses are for your account.
PROPRIETARY RIGHTS: Any and all of Pure Aqua's designs, trademarks, trade names specifications, patents, copyrights, formulas and manufacturing information are its intellectual property and proprietary data and shall be utilized for purposes intended in the order only.

LIMITED WARRANTY: This limited warranty and the remedies set for are exclusive and in lieu of all other warranties, remedies and conditions, whether oral, written, statutory, express or implied. Pure Aqua disclaims all statutory and implied warranties, including without limitation, warranties of merchantability and fitness for a particular purpose and warranties against hidden or latent defects, to the extent permitted by law. In so far as such warranties cannot be disclaimed, Pure Aqua limits the duration and remedies of such warranties to the duration of this express warranty and, at Pura Aqua's option, the repair or replacement services described below. Products manufactured by Pure Aqua are warranted to be free of defects in material and workmanship for a period of one year from the system start up and commissioning, or fourteen months from the ship date, whichever comes first. Pure Aqua's responsibility and liability shall be limited solely and exclusively to the replacement or the repair of parts manufactured by Pure Aqua and will not be liable for any cost arising from removal, installation, transportation or any other charges that may arise in connection with the warranty claim. Products and/or system components sold by Pure Aqua and manufactured by others are subject to the warranty provided by the manufacturer of said products and/or components and not by Pure Aqua's warranty. Pure Aqua will not be liable for damage to products caused by incorrect operation, misuse, abuse, unauthorized alteration, repair, accident or if products were not installed and operated in accordance to the Pure Aqua operation and installation manual. Pure Aqua will not be liable for any incidental or consequential damages, losses, or expenses arising from installation, use or any other causes.

# Chemical Dosing Systems

## Capacity: 6 to 120 GPD

**CDS SERIES**

Pure Aqua supplies a comprehensive selection of dosing pump systems for small to large-scale applications within disinfection, flocculation, and pH adjustment. Our engineers have expertise in proposals regarding "plug and pump" including complete packages. We manufacture chemical dosing systems with custom-made solutions that are intended to produce available dosing technology in complete packages. The Pure Aqua CDS series chemical dosing systems offer a wide range of capacities to meet various chemical treatment applications. Each system includes the chemical metering pump and polyethylene chemical tank, along with the necessary hoses and fitting for the pump.

## Standard Features

### Diaphragm Metering

- Fully adjustable output capacity from 6-120 GPD
- Manual function control for stroke rate & length
- Highly reliable timing circuit
- EMI resistant
- Thermally protected solenoid with auto-reset
- Bleed valve assembly
- Plastic pvc head/fittings and polyethylene tank for a wide range of corrosion resistance to such chemicals as mild acid, chlorine, and caustic solution

### Digital Metering

- Maximum turn-down ratio of 1:1000
- Dosing rate is set using a logarithmic scale that runs from 0.1-100%


## Available Options

- 230V/1ph/50Hz or 60Hz
- Epoxy coated stainless steel mixer
- pH controller
- ORP controller
- Stand-by pump
- Skid mounted unit
- Custom built unit
- Pump maintenance spare kit
- Level switch
- Local control panel

## Applications

- Water purification and pollution control
- Iron, hydrogen sulfide & manganese removal
- Scale prevention
- Acid water neutralization
- Coagulation and turbidity removal
- Waste water treatment
- Food Processing
- Detergent and wetting agent metering
- Swimming pool treatment
- Liquid fertilizer treatment
- Hydroponics nutrient treatment
- Municipal water treatment
- Algae control
- Livestock water treatment

# Chemical Dosing Systems

## Capacity: 6 to 120 GPD

**CDS SERIES**

Pure Aqua CDS series provides chemical dosing pumps that comprise a complete package with fully custom engineering, corrosion-resistance, and pre-packaging. This package consists of the capacity to utilize specific pump technology best suited for your intended use. The CDS series allows engineers and specialists in this field to outline the most effective chemical feed system for their water treatment application. The specialized features of our chemical feed system give it further advantages that separate it from similar systems in the market. These features include a compact and transportable preorganized skid with great security, corrosion resistance, and alternative choices of metering pumps available.

### Water Treatment Applications and Uses:

- pH neutralization
- Disinfection
- Coagulation and flocculation
- Sodium hydroxide feed
- Sulfuric acid dosing
- Fluoride treatment
- Potassium permanganate dosing
- Dispersant polymer dosing
- Alum feed
- Antiscalant addition
- Hydrochloric acid metering
- Sodium hypochlorite systems
- Dechlorination SMBS


| Model # | Output Capacity | | Max Pressure (PSI) | Pump Material | | | Tubing Connection | Electrical Data | | NSF Rating | Tank Size |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | GPD | LPD | | Dosing Head | Valve Ball | Gasket | | Watts | Enclosure Class | | |
| **Diaphragm Metering** | | | | | | | | | | | |
| CDS-6 | 6 | 23 | 100 | PVC | Ceramic | Teflon | 3/8" OD | 130 | IP41/NEMA3 | 125 | 15 |
| CDS-12 | 12 | 45 | | | | | | | | | 15 |
| CDS-22 | 22 | 83 | | | | | | | | | 15 |
| CDS-30 | 30 | 114 | | | | | | | | | 35 |
| CDS-48 | 48 | 182 | | | | | | | | | 50 |
| CDS-76 | 76 | 284 | | | | | 1/2" OD | | | | 100 |
| CDS-96 | 96 | 356 | | | | | | | | | 100 |
| CDS-120 | 120 | 454 | | | | | | | | | 150 |
| **Digital Metering** | | | | | | | | | | | |
| CDS-36-G-15 | 36 | 136 | 145 | PVC | Ceramic | EPDM | 1/4" OD | 19 | IP65/ NEMA 4X | Yes | 15 |
| CDS-36-G-35 | | | | | | | | | | | 35 |
| CDS-96-G-55 | 96 | 356 | 60 | | | | 3/8" OD | | | | 55 |
| CDS-96-G-100 | | | | | | | | | | | 100 |

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ISO 9001:2015

AWWA MEMBER

Water Quality

Authorized Dealer:

# Commercial Media Filters

## FRP Tanks: 7” to 42” Diameter

**MF-400 SERIES**

Pure Aqua’s pressure filters clarify water by removing sediment, turbidity, iron, unpleasant tastes, odors, suspended particles, and unwanted color, all of which are commonly found in surface water. They can be used in a variety of services including: industrial, municipal, and institutional applications.

## Standard Features

- High performance FRP tank
- 115V/1ph/60Hz power supply
- Automatic backwash valve
- Top mounted Fleck valve
- Time controller for scheduled backwash cycle
- Flow controller to limit backwash flow
- All internals are plastic materials

## Available Options

- Duplex systems
- Tanks according to ASME code for 18” and larger
- Stainless steel tanks
- Epoxy coated steel tanks
- 240V/1ph/50Hz power supply
- Vacuum breaker
- Pressure relief valve
- Inlet/outlet sample valves
- Inlet/outlet pressure gauges
- Differential pressure switch and gauge
- Filters using diaphragm valves
- Auxiliary switch for backwash pump start

## Operation Specifications

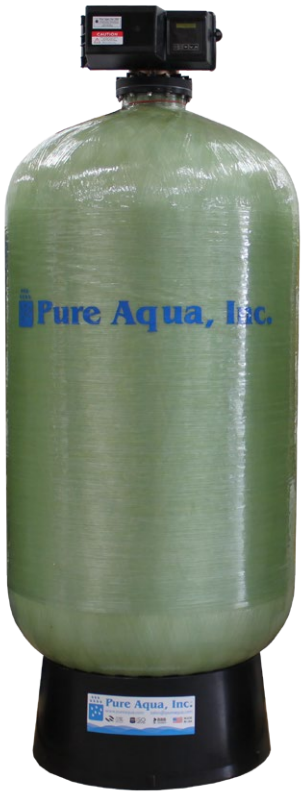
- Operating pressure: 25-100 psi (1.73-6.9 bar)
- Electrical supply: 115V/1ph/60Hz
- Operating temperature: 41-110°F (5-43°C)

FLECK 3150

FLECK 2850

FLECK 5800


58F1220MM




31F36210MM

## Media Filtration Operating Cycles

### Service Cycle

Water flows downward through the media while solids accumulate in the
media bed. The purified water passes through to downstream processes.

### Backwash Cycle

When the filter begins to clog or when the head loss (pressure drop) through the bed increases, flow rates are reduced. To prevent degradation of water quality, the flow is reversed. This is directed by the control valve(s) to drain, carrying with it, the particulate matter that has built up during service. The required flow is specific to the media and is essential to proper cleaning of the media bed. For media filters, the backwash flow is always higher than the service flow rate.


28F2175MM
and 28F2175AC on a skid

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### Pressure Gauges

Pre and post filter pressure gauges are important to monitor the filter pressure and determine the backwash frequency


### DP Switch

The differential pressure gauge and switch are used to automatically initiate backwash based on the differenential pressure.

### Auxiliary Switch

Auxiliary switches are used to provide a signal to start a backwash pump or to provide a status signal to a BMS system or interlock with an RO system.

## Filter Media Types

Pure Aqua supplies a wide range of quality filter media that meet industry standards for efficient and effective filtration.

Coarse Gravel | Fine Gravel | Coconut Carbon Media | Silica Sand | Anthracite Media

### Sand

Graded in various ranges, Pure Aqua’s sand can be used as filtration media or underbedding depending on particle size and application.

### Anthracite

Anthracite is recommended as a filter media where additional silica in the water is not desirable and removes lighter weight turbidity.

### Calcite

Calcite media is specially graded calcium carbonate compound for neutralizing acid with consistent dissolving rates for water treatment.

### Activated Carbon

Activated carbon media is used to remove taste, odor and chlorine and used in many drinking water applications.

### Manganese Greensand

Manganese Greensand media is treated siliceous material for treating water containing iron, manganese and hydrogen sulfide.

### ProSand

ProSand is based on a rare natural mineral. Its unique properties radically improve the performance and cost of media filtration.

Pure Aqua, Inc.®

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**MF-400 SERIES**

## Advantages of Multimedia Filtration

- Proven process and most tested forms of water treatment
- Modular control valves designed for operational flexibility
- Filtration media is inexpensive and long-lasting
- Resistant to fouling (clogging)
- Faster flow rates
- Produces high quality filtered water

Hub and laterals

| Model # | | Flow Rate | | | | | | | | Tank Size D”xH” | Media Qty ($ft^3$) | Pipe Size | | Approx. Weight (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Minimum | | Average | | Peak | | Backwash | | | | | | |
| Option 1 | Option 2 | GPM | $M^3/H$ | GPM | $M^3/H$ | GPM | $M^3/H$ | GPM | $M^3/H$ | | | | | |
| **Multi Layer Filters: Anthracite, Sand and Gravel (Turbidity Removal)** | | | | | | | | | | | | | | |
| 56F705MM | 58F705MM | 2.7 | 0.6 | 4.0 | 0.9 | 5.3 | 1.2 | 4.0 | 0.9 | 7x44 | 0.5 | 0.75” | 1” | 64 |
| 56F8075MM | 58F8075MM | 3.5 | 0.8 | 5.4 | 1.2 | 7.0 | 1.6 | 5.4 | 1.2 | 8x44 | 0.75 | 0.75” | 1” | 79 |
| 56F910MM | 58F910MM | 4.4 | 1.0 | 6.6 | 1.5 | 8.8 | 2.0 | 6.6 | 1.5 | 9x48 | 1 | 0.75” | 1” | 110 |
| 56F1015MM | 58F1015MM | 5.4 | 1.2 | 8.1 | 1.8 | 10.8 | 2.5 | 8.1 | 1.8 | 10x54 | 1.5 | 0.75” | 1” | 141 |
| 58F1220MM | | 7.8 | 1.8 | 11.7 | 2.7 | 15.6 | 3.5 | 11.7 | 2.7 | 12x52 | 2 | 1” | | 200 |
| 58F1325MM | | 9.2 | 2.1 | 13.8 | 3.1 | 18.4 | 4.2 | 13.8 | 3.1 | 13x54 | 2.5 | 1” | | 236 |
| 58F1435MM | 28F1435MM | 10.7 | 2.4 | 16.1 | 3.7 | 21.4 | 4.9 | 16.1 | 3.7 | 14x65 | 3.5 | 1 .25“ | 1.5” | 344 |
| 58F1645MM | 28F1645MM | 13.9 | 3.2 | 20.9 | 4.8 | 27.8 | 6.3 | 20.9 | 4.8 | 16x65 | 4.5 | 1 .25“ | 1.5” | 430 |
| 58F1855MM | 28F1855MM | 17.7 | 4.0 | 26.6 | 6.0 | 35.4 | 8.0 | 26.6 | 6.0 | 18x65 | 5.5 | 1 .25“ | 1.5” | 650 |
| 28F2175MM | | 24.1 | 5.5 | 36.2 | 8.2 | 48.2 | 11.0 | 36.2 | 8.2 | 21x62 | 7.5 | 1.5” | | 805 |
| 28F24100MM | | 31.4 | 7.1 | 47.1 | 10.7 | 62.8 | 14.3 | 47.1 | 10.7 | 24x72 | 10 | 1.5” | | 1067 |
| 31F30150MM | | 49.1 | 11.2 | 73.7 | 16.8 | 98.2 | 22.3 | 73.7 | 16.8 | 30x72 | 15 | 2” | | 1693 |
| 31F36210MM | | 70.7 | 16.1 | 106.1 | 24.1 | 116.2 | 26.4 | 106.1 | 24.1 | 36x72 | 21 | 2” | | 2555 |
| 31F42280MM | | 96.2 | 21.9 | 116.2 | 26.4 | 125.0 | 28.4 | 116.2 | 26.4 | 42x72 | 28 | 2” | | 3801 |
| **AG Filters: Non-Hydrous Silicon Dioxide (Turbidity Removal)** | | | | | | | | | | | | | | |
| 56F705AG | 58F705AG | 1.9 | 0.4 | 2.7 | 0.6 | 3.2 | 0.7 | 2.7 | 0.6 | 7x44 | 0.5 | 0.75” | 1” | 39 |
| 56F8075AG | 58F8075AG | 2.5 | 0.6 | 3.5 | 0.8 | 4.2 | 1.0 | 3.5 | 0.8 | 8x44 | 0.75 | 0.75” | 1” | 46 |
| 56F910AG | 58F910AG | 3.1 | 0.7 | 4.4 | 1.0 | 5.3 | 1.2 | 4.4 | 1.0 | 9x48 | 1 | 0.75” | 1” | 58 |
| 56F1015AG | 58F1015AG | 3.8 | 0.9 | 5.4 | 1.2 | 6.5 | 1.5 | 5.4 | 1.2 | 10x54 | 1.5 | 0.75” | 1” | 72 |
| 58F1220AG | | 5.5 | 1.2 | 7.8 | 1.8 | 9.4 | 2.1 | 7.8 | 1.8 | 12x52 | 2 | 1” | | 92 |
| 58F1325AG | | 6.4 | 1.5 | 9.2 | 2.1 | 11.0 | 2.5 | 9.2 | 2.1 | 13x54 | 2.5 | 1” | | 105 |
| 58F1435AG | 28F1435AG | 7.5 | 1.7 | 10.7 | 2.4 | 12.8 | 2.9 | 10.7 | 2.4 | 14x65 | 3.5 | 1.25” | 1.5” | 155 |
| 58F1645AG | 28F1645AG | 9.7 | 2.2 | 13.9 | 3.2 | 16.7 | 3.8 | 13.9 | 3.2 | 16x65 | 4.5 | 1.25” | 1.5” | 185 |
| 58F1855AG | 28F1855AG | 12.4 | 2.8 | 17.7 | 4.0 | 21.2 | 4.8 | 17.7 | 4.0 | 18x65 | 5.5 | 1.25” | 1.5” | 241 |
| 28F2175AG | | 16.9 | 3.8 | 24.1 | 5.5 | 28.9 | 6.6 | 24.1 | 5.5 | 21x62 | 7.5 | 1.5” | | 354 |
| 28F24100AG | | 22.0 | 5.0 | 31.4 | 7.1 | 37.7 | 8.6 | 31.4 | 7.1 | 24x72 | 10 | 1.5” | | 455 |
| 31F30150AG | | 34.4 | 7.8 | 49.1 | 11.2 | 58.9 | 13.4 | 49.1 | 11.2 | 30x72 | 15 | 2” | | 761 |
| 31F36210AG | | 49.5 | 11.2 | 70.7 | 16.1 | 84.8 | 19.3 | 70.7 | 16.1 | 36x72 | 21 | 2” | | 1137 |
| 31F42280AG | | 67.3 | 15.3 | 96.2 | 21.9 | 115.4 | 26.2 | 96.2 | 21.9 | 42x72 | 28 | 2” | | 1638 |
| **Activated Carbon Filters: Granular Form with High Degree of Porosity (Taste, Odor and Color Removal)** | | | | | | | | | | | | | | |
| 56F705AC | 58F705AC | 1.9 | 0.4 | 2.7 | 0.6 | 3.2 | 0.7 | 3.2 | 0.7 | 7x44 | 0.5 | 0.75” | 1” | 40 |
| 56F8075AC | 58F8075AC | 2.5 | 0.6 | 3.5 | 0.8 | 4.2 | 1.0 | 4.2 | 1.0 | 8x44 | 0.75 | 0.75” | 1” | 48 |
| 56F910AC | 58F910AC | 3.1 | 0.7 | 4.4 | 1.0 | 5.3 | 1.2 | 5.3 | 1.2 | 9x48 | 1 | 0.75” | 1” | 61 |
| 56F1015AC | 58F1015AC | 3.8 | 0.9 | 5.4 | 1.2 | 6.5 | 1.5 | 6.5 | 1.5 | 10x54 | 1.5 | 0.75” | 1” | 76 |
| 58F1220AC | | 5.5 | 1.2 | 7.8 | 1.8 | 9.4 | 2.1 | 9.4 | 2.1 | 12x52 | 2 | 1” | | 97 |
| 58F1325AC | | 6.4 | 1.5 | 9.2 | 2.1 | 11.0 | 2.5 | 11.0 | 2.5 | 13x54 | 2.5 | 1” | | 111 |
| 58F1435AC | 28F1435AC | 7.5 | 1.7 | 10.7 | 2.4 | 12.8 | 2.9 | 12.8 | 2.9 | 14x65 | 3.5 | 1.25” | 1.5” | 164 |
| 58F1645AC | 28F1645AC | 9.7 | 2.2 | 13.9 | 3.2 | 16.7 | 3.8 | 16.7 | 3.8 | 16x65 | 4.5 | 1.25” | 1.5” | 196 |
| 58F1855AC | 28F1855AC | 12.4 | 2.8 | 17.7 | 4.0 | 21.2 | 4.8 | 21.2 | 4.8 | 18x65 | 5.5 | 1.25” | 1.5” | 254 |
| 58F2175AC | 28F2175AC | 16.9 | 3.8 | 24.1 | 5.5 | 28.9 | 6.6 | 28.9 | 6.6 | 21x62 | 7.5 | 1.25” | 1.5” | 465 |
| 28F24100AC | | 22.0 | 5.0 | 31.4 | 7.1 | 37.7 | 8.6 | 37.7 | 8.6 | 24x72 | 10 | 1.5” | | 630 |
| 31F30150AC | | 34.4 | 7.8 | 49.1 | 11.2 | 58.9 | 13.4 | 58.9 | 13.4 | 30x72 | 15 | 2” | | 1038 |
| 31F36210AC | | 49.5 | 11.2 | 70.7 | 16.1 | 84.8 | 19.3 | 84.8 | 19.3 | 36x72 | 21 | 2” | | 1487 |
| 31F42280AC | | 67.3 | 15.3 | 96.2 | 21.9 | 115.4 | 26.2 | 115.4 | 26.2 | 42x72 | 28 | 2” | | 2393 |

Pure Aqua, Inc.®

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**MF-400 SERIES**

| Model # | | Flow Rate | | | | | | | | Tank Size D"xH" | Media Qty ($ft^3$) | Pipe Size | | Approx. Weight (lbs) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Minimum | | Average | | Peak | | Backwash | | | | | | |
| Option 1 | Option 2 | GPM | $M^3/H$ | GPM | $M^3/H$ | GPM | $M^3/H$ | GPM | $M^3/H$ | | | | | |
| **Birm Filters: Insoluble Catalyst (Fe and Mn Reduction)** | | | | | | | | | | | | | | |
| 56F705BM | 58F705BM | 1.9 | 0.4 | 2.7 | 0.6 | 3.2 | 0.7 | 3.2 | 0.7 | 7x44 | 0.5 | 0.75" | 1" | 48 |
| 56F8075BM | 58F8075BM | 2.5 | 0.6 | 3.5 | 0.8 | 4.2 | 1.0 | 4.2 | 1.0 | 8x44 | 0.75 | 0.75" | 1" | 60 |
| 56F910BM | 58F910BM | 3.1 | 0.7 | 4.4 | 1.0 | 5.3 | 1.2 | 5.3 | 1.2 | 9x48 | 1 | 0.75" | 1" | 77 |
| 56F1015BM | 58F1015BM | 3.8 | 0.9 | 5.4 | 1.2 | 6.5 | 1.5 | 6.5 | 1.5 | 10x54 | 1.5 | 0.75" | 1" | 100 |
| 58F1220BM | | 5.5 | 1.2 | 7.8 | 1.8 | 9.4 | 2.1 | 9.4 | 2.1 | 12x52 | 2 | 1" | | 130 |
| 58F1325BM | | 6.4 | 1.5 | 9.2 | 2.1 | 11.0 | 2.5 | 11.0 | 2.5 | 13x54 | 2.5 | 1" | | 153 |
| 58F1435BM | 28F1435BM | 7.5 | 1.7 | 10.7 | 2.4 | 12.8 | 2.9 | 12.8 | 2.9 | 14x65 | 3.5 | 1.25" | 1.5" | 222 |
| 58F1645BM | 28F1645BM | 9.7 | 2.2 | 13.9 | 3.2 | 16.7 | 3.8 | 16.7 | 3.8 | 16x65 | 4.5 | 1.25" | 1.5" | 270 |
| 58F1855BM | 28F1855BM | 12.4 | 2.8 | 17.7 | 4.0 | 21.2 | 4.8 | 21.2 | 4.8 | 18x65 | 5.5 | 1.25" | 1.5" | 345 |
| 28F2175BM | | 16.9 | 3.8 | 24.1 | 5.5 | 28.9 | 6.6 | 28.9 | 6.6 | 21x62 | 7.5 | 1.5" | | 597 |
| 28F24100BM | | 22.0 | 5.0 | 31.4 | 7.1 | 37.7 | 8.6 | 37.7 | 8.6 | 24x72 | 10 | 1.5" | | 795 |
| 31F30150BM | | 34.4 | 7.8 | 49.1 | 11.2 | 58.9 | 13.4 | 58.9 | 13.4 | 30x72 | 15 | 2" | | 1285 |
| 31F36210BM | | 49.5 | 11.2 | 70.7 | 16.1 | 84.8 | 19.3 | 84.8 | 19.3 | 36x72 | 21 | 2" | | 1883 |
| 31F42280BM | | 67.3 | 15.3 | 96.2 | 21.9 | 115.4 | 26.2 | 115.4 | 26.2 | 42x72 | 28 | 2" | | 2921 |
| **Calcite Filters : pH Neutralization** | | | | | | | | | | | | | | |
| 56F705CF | 58F705CF | 1.9 | 0.4 | 2.7 | 0.6 | 3.2 | 0.7 | 3.2 | 0.7 | 7x44 | 0.5 | 0.75" | 1" | 51 |
| 56F8075CF | 58F8075CF | 2.5 | 0.6 | 3.5 | 0.8 | 4.2 | 1.0 | 4.2 | 1.0 | 8x44 | 0.75 | 0.75" | 1" | 65 |
| 56F910CF | 58F910CF | 3.1 | 0.7 | 4.4 | 1.0 | 5.3 | 1.2 | 5.3 | 1.2 | 9x48 | 1 | 0.75" | 1" | 83 |
| 56F1015CF | 58F1015CF | 3.8 | 0.9 | 5.4 | 1.2 | 6.5 | 1.5 | 6.5 | 1.5 | 10x54 | 1.5 | 0.75" | 1" | 109 |
| 58F1220CF | | 5.5 | 1.2 | 7.8 | 1.8 | 9.4 | 2.1 | 9.4 | 2.1 | 12x52 | 2 | 1" | | 142 |
| 58F1325CF | | 6.4 | 1.5 | 9.2 | 2.1 | 11.0 | 2.5 | 11.0 | 2.5 | 13x54 | 2.5 | 1" | | 168 |
| 58F1435CF | 28F1435CF | 7.5 | 1.7 | 10.7 | 2.4 | 12.8 | 2.9 | 12.8 | 2.9 | 14x65 | 3.5 | 1.25" | 1.5" | 243 |
| 58F1645CF | 28F1645CF | 9.7 | 2.2 | 13.9 | 3.2 | 16.7 | 3.8 | 16.7 | 3.8 | 16x65 | 4.5 | 1.25" | 1.5" | 297 |
| 58F1855CF | 28F1855CF | 12.4 | 2.8 | 17.7 | 4.0 | 21.2 | 4.8 | 21.2 | 4.8 | 18x65 | 5.5 | 1.25" | 1.5" | 378 |
| 28F2175CF | | 16.9 | 3.8 | 24.1 | 5.5 | 28.9 | 6.6 | 28.9 | 6.6 | 21x62 | 7.5 | 1.5" | | 645 |
| 28F24100CF | | 22.0 | 5.0 | 31.4 | 7.1 | 37.7 | 8.6 | 37.7 | 8.6 | 24x72 | 10 | 1.5" | | 855 |
| 31F30150CF | | 34.4 | 7.8 | 49.1 | 11.2 | 58.9 | 13.4 | 58.9 | 13.4 | 30x72 | 15 | 2" | | 1375 |
| 31F36210CF | | 49.5 | 11.2 | 70.7 | 16.1 | 84.8 | 19.3 | 84.8 | 19.3 | 36x72 | 21 | 2" | | 2027 |
| 31F42280CF | | 67.3 | 15.3 | 96.2 | 21.9 | 115.4 | 26.2 | 115.4 | 26.2 | 42x72 | 28 | 2" | | 3113 |
| **Manganese Greensand Filters: Enriched Quality with High Catalytic Capacity (Fe, Mn and $H_2S$ Reduction)** | | | | | | | | | | | | | | |
| 56F705GS | 58F705GS | 1.9 | 0.4 | 2.7 | 0.6 | 3.2 | 0.7 | 3.2 | 0.7 | 7x44 | 0.5 | 0.75" | 1" | 71 |
| 56F8075GS | 58F8075GS | 2.5 | 0.6 | 3.5 | 0.8 | 4.2 | 1.0 | 4.2 | 1.0 | 8x44 | 0.75 | 0.75" | 1" | 94 |
| 56F910GS | 58F910GS | 3.1 | 0.7 | 4.4 | 1.0 | 5.3 | 1.2 | 5.3 | 1.2 | 9x48 | 1 | 0.75" | 1" | 122 |
| 56F1015GS | 58F1015GS | 3.8 | 0.9 | 5.4 | 1.2 | 6.5 | 1.5 | 6.5 | 1.5 | 10x54 | 1.5 | 0.75" | 1" | 168 |
| 58F1220GS | | 5.5 | 1.2 | 7.8 | 1.8 | 9.4 | 2.1 | 9.4 | 2.1 | 12x52 | 2 | 1" | | 220 |
| 58F1325GS | | 6.4 | 1.5 | 9.2 | 2.1 | 11.0 | 2.5 | 11.0 | 2.5 | 13x54 | 2.5 | 1" | | 265 |
| 58F1435GS | 28F1435GS | 7.5 | 1.7 | 10.7 | 2.4 | 12.8 | 2.9 | 12.8 | 2.9 | 14x65 | 3.5 | 1.25" | 1.5" | 379 |
| 58F1645GS | 28F1645GS | 9.7 | 2.2 | 13.9 | 3.2 | 16.7 | 3.8 | 16.7 | 3.8 | 16x65 | 4.5 | 1.25" | 1.5" | 473 |
| 58F1855GS | 28F1855GS | 12.4 | 2.8 | 17.7 | 4.0 | 21.2 | 4.8 | 21.2 | 4.8 | 18x65 | 5.5 | 1.25" | 1.5" | 593 |
| 28F2175GS | | 16.9 | 3.8 | 24.1 | 5.5 | 28.9 | 6.6 | 28.9 | 6.6 | 21x62 | 7.5 | 1.5" | | 957 |
| 28F24100GS | | 22.0 | 5.0 | 31.4 | 7.1 | 37.7 | 8.6 | 37.7 | 8.6 | 24x72 | 10 | 1.5" | | 1245 |
| 31F30150GS | | 34.4 | 7.8 | 49.1 | 11.2 | 58.9 | 13.4 | 58.9 | 13.4 | 30x72 | 15 | 2" | | 1960 |
| 31F36210GS | | 49.5 | 11.2 | 70.7 | 16.1 | 84.8 | 19.3 | 84.8 | 19.3 | 36x72 | 21 | 2" | | 2963 |
| 31F42280GS | | 67.3 | 15.3 | 96.2 | 21.9 | 115.4 | 26.2 | 115.4 | 26.2 | 42x72 | 28 | 2" | | 4361 |

*All filters require periodic backwashing to dispose of the accumulated debris. This is accomplished by backwashing clean water through the unit and then disposing of the effluent.


**Pure Aqua, Inc.®**

Water Treatment and Reverse Osmosis Systems

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ISO 9001:2008 CERTIFIED

BBB ACCREDITED BUSINESS

MEMBER Water Quality Association

Authorized Dealer:

# Commercial Brackish RO Systems

## Capacity: 13,000 to 32,000 GPD

**RO-300 SERIES**

Pure Aqua's reverse osmosis systems are capable of removing salts, as well as other impurities such as bacteria, sugars, proteins, dyes and constituents having a molecular weight greater than 150-250 Daltons. Our commercial BWRO systems are strategically designed to be energy efficient and environmentally friendly while producing high-quality water.


BW-32K-7340-5

Pure Aqua supplies a full line of standard and fully customizable reverse osmosis systems, all of which are engineered using advanced 3D computer modeling and process design software for accurate and customized solutions.

## Standard Features

- Powder coated carbon steel frame
- 4" TFC spiral wound membranes
- Stainless steel multi-stage pump with TEFC motor
- FRP membrane housings
- 5 micron cartridge prefilter
- 460V/3ph/60Hz power requirement
- Microprocessor based control panel
- Programmable time delay and set points
- LCD screen
- Motor starter
- NEMA 12 enclosure
- Low pressure switch
- High pressure switch
- Liquid filled pressure gauges
- Permeate conductivity monitor
- Permeate & concentrate flow meters

## Available Options

- Feed water conductivity monitor
- Membrane cleaning skid
- Automatic hourly flush
- Feed/Permeate blending
- Export crating
- 220V or 380-415V/3ph/50 or 60Hz
- Product tank level switch
- Feed pH monitor with sensor
- Feed ORP monitor with sensor
- Water and hour meters
- Chemical dosing systems
- Media prefiltration systems
- Ozonation and UV sterilization systems
- Water softeners
- Post deionization polishers
- Skid mounted with pre or post treatment
- Containerized RO systems

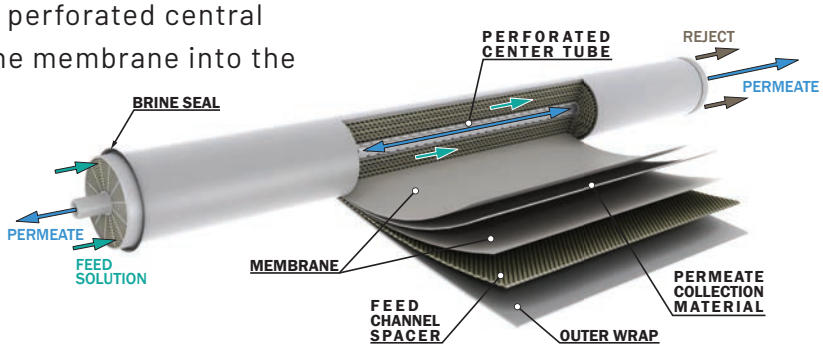
PURE AQUA, INC.®

# Commercial Brackish RO Systems

## Capacity: 13,000 to 32,000 GPD

**RO-300 SERIES**

The spiral membrane is constructed from one or more membrane envelopes wound around a perforated central tube. The permeate passes through the membrane into the envelope and spirals inward to the central tube for collection.
The layers of the membrane envelope are detailed in the diagram to the right.




## Operation Specifications

- Max. feed water temperature: 42°C
- Feed water pressure: 20 to 80 psi
- Operating pressure: 150 to 250 psi
- Hydrogen Sulfide must be removed
- Turbidity must be removed
- Max. iron content: 0.05 ppm
- Feed water TDS: 0 to (1,000 or 3,000 or 5,000 ppm)
- Equipment upgrade for TDS over 5,000 ppm
- Hardness over 1 GPG requires antiscalant dosing
- pH tolerance range: 3-11
- Max. Silica Tolerance: 60 ppm @ 60% recovery
- Operate at higher TDS by lowering recovery

| Model # | Permeate Flow Rate | | Quantity of 4" Membranes | Motor Rating at 1,000 ppm | | Approx. Weight (lbs) | Dimensions L"xW"xH" |
|---|---|---|---|---|---|---|---|
| | GPD | $M^3/D$ | | 60Hz (hp) | 50Hz (kw) | | |
| TW-13K-3340 | 13,000 | 49 | 9 | 2 | 2 | 750 | 145x35x60 |
| TW-15K-5240 | 15,000 | 57 | 10 | 3 | 3 | 850 | 105x35x70 |
| TW-18K-4340 | 18,000 | 68 | 12 | 5 | 3 | 875 | 145x35x70 |
| TW-22K-5340 | 22,000 | 83 | 15 | 5 | 3 | 900 | 145x35x70 |
| TW-24K-8240 | 24,000 | 91 | 16 | 5 | 4 | 950 | 105x35x75 |
| TW-27K-6340 | 27,000 | 102 | 18 | 5 | 4 | 990 | 145x35x70 |
| TW-32K-7340 | 32,000 | 121 | 21 | 5 | 4 | 1,025 | 145x35x75 |

Note: If the feed water TDS exceeds 1,000 ppm, the system model number changes to BW-XXK-XXXX, and a suffix is added to the end of the model number: "-3" is added if the TDS is 3,000 ppm or less, and "-5" is added if the TDS is 5,000 ppm or less. Example: Required system to produce 27,000 GPD with a feed water TDS of 5,000 ppm, the corresponding model number is: "BW-27K-6340-5".

Pure Aqua also supplies: Custom Engineered Solutions, Multimedia Pretreatment, Activated Carbon Pretreatment, Water Conditioning, Chemical Dosing Systems, Ultraviolet (UV) Sterilizers and Ozonation Systems.


PURE AQUA, INC.®

Water Treatment and Reverse Osmosis Systems

sales@pureaqua.com
www.pureaqua.com

Tel: +1-714-432-9996
Fax: +1-714-432-9898


ISO 9001:2015

AWWA MEMBER

Water Quality Association MEMBER

Authorized Dealer:

# MK ENVIRONMENTAL INC

765 Springer Dr
Lombard, IL 60148

etung@mkenv.com

## QUOTATION



Quotation valid for 90 days

| | |
|---|---|
| Date | 4/25/2019 |
| Quote No. | 219519 |
| Reference | Iron removal |
| Terms | Net 30 |
| Freight | included |
| Ship Via | FLATBED |
| F.O.B. | Factory |

| SOLD TO: | SHIP TO: |
|---|---|
| Jason Sills<br>ICON Environmental Services, Inc.<br>2049 Commercial Drive<br>Port Allen, Louisiana 70767<br>(225) 344-8490 | ICON Environmental Services, Inc.<br>2049 Commercial Drive<br>Port Allen, Louisiana 70767 |

| QTY | DESCRIPTION | UNIT PRICE | AMOUNT |
|---|---|---|---|
| | 30 amp 120/240 volt 3 phase, 4 wire plus ground electrical service<br>Brought to NEMA 3R control Panel<br>Motors will be TEFC construction | | |
| 1 | MKE Model SA15H Stripperator<br>15 GPM capacity Oil/Water Separator and air stripper treatment system<br>Coalescing separator with product skimming weir<br>Polypropylene coalescing pack with 1/2" spacing for efficient oil removal<br>Low profile air stripper with 2 hp AMCA aluminum blower<br>Nylon tube aeration air stripper for high mass removal rates with low maintenance<br>Low, high, and high-high sump conductivity probes<br>Clean out hatch<br>Low blower pressure alarm<br>Sump level sight glass | 16,760.00 | $16,760.00 |
| 1 | Centrifugal 1.5 hp transfer pump, 3450 rpm, TEFC motor<br>Cast Iron housing with composite impeller, anti air lock design | | |
| 1 | Bag Filter, size 2<br>Bag filters constructed of stainless steel with quick release bolts.<br>Includes (20) 25-micron filter bags. Optional 5 or 10 micron | | |
| 1 | Master Control Panel System, Including:<br>NEMA 3R control panel<br>IEC Magnetic motor starters, thermal overloads, safety switches, H-O-A controls<br>Fused control transformer<br>intrinsically safe relays, alarm indicator LED's, output channels<br>Hard wired relay logic<br>(1) exterior GFCI utility outlet<br>Blower low pressure alarm<br>Anti-falsing alarm circuit to prevent nuisance tripping | | |

| | | | |
|---|---|---|---|
| EQUIPMENT SUB TOTAL | | | $16,760.00 |
| EQUIP. SALES TAX | | 9.450% | $1,583.82 |
| FREIGHT | | | $850.00 |
| | | | |
| | | | |
| NET TOTAL | | | $19,193.82 |

Does not include permits, fees, etc.…
Offloading & placement by others.

# April 2022 South Louisiana Gate Pricing

| Disposal Products | | Mermentau | Bourg | Marine Transfer Stations | Unit |
|---|---|---|---|---|---|
| Saltwater | <1% solids | $ 6.00 | $ 6.00 | NA | bbl |
| Saltwater | ≥1%<5% solids | $ 13.00 | $ 13.00 | NA | bbl |
| Oil Base Drilling waste | | $ 19.00 | $ 25.00 | $ 39.00 | bbl |
| Water Base Drilling waste | 20,000 ppm Chlorides & <5% oil | $ 18.00 | $ 25.00 | $ 39.00 | bbl |
| Water Base Drilling waste - elevated levels of CL or oils | 20,000 ppm Chlorides or ≥5% oil | $ 19.00 | $ 25.00 | $ 39.00 | bbl |
| Flowback Water (injectable) | <1% solids | job specific | job specific | job specific | bbl |
| Flowback Water (non-injectable) | >1% solids | job specific | job specific | job specific | bbl |
| Completion Fluids | | $ 25.00 | $ 25.00 | $ 39.00 | bbl |
| Production Pit Sludges | | $ 22.00 | $ 25.00 | $ 39.00 | bbl |
| Storage Tank Sludges | | $ 22.00 | $ 25.00 | $ 39.00 | bbl |
| Production Sands and Solids | | $ 22.00 | $ 25.00 | $ 39.00 | bbl |
| (NORM pricing may apply to any product) | NORM ≥5 pci/gr | Gate plus $1.50 per pci/gr over 5 | Gate plus $1.50 per pci/gr over 5 | Gate plus $1.50 per pci/gr over 5 | bbl |
| Freshwater | < 20,000 ppm Cl & <5% solids | $ 13.00 | $ 25.00 | $ 39.00 | bbl |
| Washout Water | < 20,000 ppm Cl & <5% solids | $ 13.00 | $ 25.00 | $ 39.00 | bbl |
| Washout Pit Water | < 20,000 ppm Cl & <5% solids | $ 13.00 | $ 25.00 | $ 39.00 | bbl |
| Pipeline water/waste | <20,000 ppm Cl & <5% solids | $ 13.00 | $ 25.00 | $ 39.00 | bbl |
| Rainwater | < 20,000 ppm Cl & <5% solids | $ 13.00 | $ 25.00 | $ 39.00 | bbl |
| Freshwater | ≥20,000 ppm Cl or ≥5% solids | $ 19.00 | $ 25.00 | $ 39.00 | bbl |
| Washout Water | ≥20,000 ppm Cl or ≥5% solids | $ 19.00 | $ 25.00 | $ 39.00 | bbl |
| Washout Pit Water | ≥20,000 ppm Cl or ≥5% solids | $ 19.00 | $ 25.00 | $ 39.00 | bbl |
| Pipeline water/waste | ≥20,000 ppm Cl or ≥5% solids | $ 19.00 | $ 25.00 | $ 39.00 | bbl |
| Rainwater | ≥20,000 ppm Cl or ≥5% solids | $ 19.00 | $ 25.00 | $ 39.00 | bbl |
| Washout Water | R360 Facility Water | $ 13.00 | $ 25.00 | $ 39.00 | bbl |
| Commercial Facility Waste | | $ 22.00 | $ 25.00 | $ 39.00 | bbl |
| Oil Spill Waste | (True oil spill waste, not remediation) | $ 24.00 | $ 25.00 | $ 39.00 | bbl |
| Wash Rack and Pumping Equipment | | $ 185.00 | $ 185.00 | $ 185.00 | hr |
| | | | | | |
| | | | | | |

**Marine deliveries to Mermentau will be billed at $25/bbl**

**Facility Services and Extras quoted seperately**