Technical Memorandum

PCE Treatment - Phase II
Conceptual Design

Prepared for
City of Las Cruces - Utilities Department
680 North Motel Boulevard
Las Cruces, New Mexico 88004
May 2007
Purpose

The purpose of this technical memorandum (TM) is to prepare a conceptual design and recommendations for implementation of a new treatment facility for the City of Las Cruces (City). This treatment facility will target removal of tetrachloroethylene (PCE) from two existing groundwater wells (Wells No. 18 and 27), and a possible future well. This TM provides information on the treatment equipment, facility layout, opinion of construction cost, and implementation of the system.

Background

The Phase I evaluation entitled, “Uranium and PCE Treatment – Phase I Evaluation of Treatment Technologies” completed June 26, 2006, by CH2M HILL selected a treatment system (tray aeration) for the PCE occurring at the City’s groundwater wells. This TM provides the next stages of costs and layout for this facility.

Implementation Phasing

The City plans to implement this project in selected phases. This phasing was developed in conjunction with a groundwater modeling effort showing how the contamination plume could be contained using this phasing. A review of this recommended project phasing with the City produced the following steps.

2. Phase II – Conceptual Design: Described herein.
3. Phase III – Design and construction of a facility to treat PCE from Wells No. 18 and 27. Provide space for a future expansion of a third groundwater well.
4. Phase IV – Design and construction of a new groundwater well, piping, and third treatment unit in the existing facility.
Treatment Process

The selected treatment process, tray aeration, was developed by NEEP Systems™. There are three other manufacturers who produce similar systems: Carbonair, Carbtrol, and EPG Companies. There are minor differences in the manufacture and options of each equipment supplier. Appendix A presents basic manufacturer’s literature from each of these suppliers.

Tray aeration operates by forcing counter-current air through horizontally extended trays to strip volatile organic carbon (VOC) compounds such as PCE from water. Tray aeration systems are designed to provide an adequate residence time for a given flow rate of water and a given contaminant. The size of the units and the number of aeration trays may vary for different contaminants and flow rates. Tray aeration systems designed for PCE removal are expected to achieve removal rates in excess of 95 percent. Figure 1 presents a process flow diagram of the tray aeration process.

![Tray Aeration System](image)

*Source of Tray Aeration graphic: Shallow Tray™ presentation.*

Figure 1- Tray Aeration Treatment

The groundwater from the well is pumped to an inlet chamber where it flows over distribution weirs and along the aeration trays. Filtered air from the outside is blown into the process with sufficient pressure to push it up through holes in the aeration trays. As the air flows upward through the water bubbles create a froth. This froth increases the surface area of the water which allows mass transfer, or volatization, of the PCE from the water to the air. The stripped gas and air continues upward and is blown out the top of the treatment unit for discharge to the atmosphere. Additional treatment can be added to collect the air and remove the PCE, but is not expected at this facility. The finished water flows down to the bottom of the treatment unit where it is collected and pumped to the distribution system.
Operation of the tray aeration system also may cause oxidation of metals and formation of scaling from hardness. The concentration of this depends on the groundwater supplied to the treatment system. Once formed, the metals formation and scaling eventually cause fouling of the trays and require periodic cleaning. Periodic cleaning of the trays is accomplished by accessing ports on the system with a washing wand or high-pressure washer. More thorough cleaning requires that the trays be removed completely. Spare trays can be provided to allow continued operation during cleaning.

A preliminary evaluation of the City’s water shows that fouling should not be a significant concern. However, provisions have been included so that an automated chemical washing system could be installed in the future. This automated system consists of providing a chemical feed system, such as sulfuric acid, to the water before it flows into the tray aeration system. This acid continually cleans the trays and prevents formation of scaling.

Figure 2 presents a proposed process flow diagram for the PCE treatment system.

![Figure 2 – Process Flow Diagram](image)

**Equipment Selection**

CH2M HILL evaluated the flow from Wells No. 18 and 27 and selected treatment units as provided by NEEP Systems™. Table 1 presents the selection of the treatment units. Well No. 27 requires a slightly larger treatment unit. CH2M HILL recommends that both units be provided with the same size to provide interchangeable parts and operational redundancy.
### TABLE 1
**Equipment Selection – Las Cruces PCE Treatment**

<table>
<thead>
<tr>
<th>Well No.</th>
<th>Flow Rate (gpm)</th>
<th>Model Selection (1)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>500</td>
<td>41241</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>650</td>
<td>61221</td>
<td></td>
</tr>
<tr>
<td>Both</td>
<td>650</td>
<td>61221</td>
<td>Provide two units of the same size.</td>
</tr>
</tbody>
</table>

(1) Selection based on NEEP Systems™.

An evaluation of the City’s water supply indicates that the units should be constructed of stainless steel (SST 316L). The elevated levels of sulfides in the water indicate that some corrosion could occur over time. Provision of stainless steel will reduce this corrosion and provide for an easily cleanable system.

The treatment units would be provided with the following optional items:

- A pump to re-pressurize the treated water for discharge to the distribution system.
- Disconnect switches for the system
- Alarms for low air pressure and high water level
- Spare trays to provide continued operation and cleaning. Two for each unit.
- Controls to allow remote operation from the City’s existing SCADA system.
- A flow meter to measure the discharge from the treatment unit.

Appendix B presents manufacturer’s data sheets from NEEP Systems™ on these selected units.

### Treatment Facility Layout

The treatment plant would be located in proximity to existing Well No. 18. This well is situated inside an existing repair facility near the intersection of Griggs Street and Hadley Avenue. Figure 3 shows an aerial photograph with the approximate facility location.

This facility would need 480 volt, 3 phase power, connection to natural gas, connection to a sanitary sewer and connection of potable water piping from Well No. 18 and Well No. 27. A pipeline of approximately 3,000 feet is needed to bring water from Well No. 27. Treated water can be discharged directly to the potable water distribution system.

A layout of the treatment facility provides space for three treatment units. The first two would be provided immediately and space left for a third. Access to the units would be from overhead roll-up doors for maintenance and personnel access would be provided separately.
Potential Site Location, Las Cruces PCE Treatment Plant

Figure 3 – Site Layout
Included is an electrical room where the power and control system for the facility would be located. Heating, ventilation, and air conditioning should be provided and suspended in the treatment area.

A chemical room was sized to house up to 2 chemical totes (each of 300 gallons) and four chemical metering pumps. This configuration would allow a feed of 27 mg/L of sulfuric acid and provide 30 days worth of storage. This chemical room will be included in the initial construction; however, the equipment would only be added at a later phase if warranted.

Figure 4 shows the interior layout plan of the treatment facility.

**Opinion of Costs**

Costs for Phase III of the facility were developed and are described below. Capital costs for the project were developed using CH2M HILL’s Parametric Cost Estimating System (CPES). Based on this conceptual development, the opinion of cost should be considered a Class 4 cost estimate as defined by the Association for the Advancement of Cost Engineering (AACE International).

This opinion of cost was prepared based on the information where preliminary engineering is from 1 to 5 percent complete and detailed strategic planning, business development, project screening, alternative scheme analysis, confirmation of economic and/or technical feasibility and preliminary budgetary approval are necessary to proceed. Examples of estimating methods used to include equipment and/or system process factors, scale-up factors, and parametric and modeling techniques. The typical expected accuracy range for this class of estimate is minus 20 percent on the low side and plus 30 percent on the high side. The final costs of the project will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, continuity of personnel and engineering, and other variable factors. Therefore, the final project costs will likely vary from the estimate presented.

Costs are presented in 2007 dollars (current to February 2007) for the proposed treatment project. Capital costs include construction, engineering, engineering services during construction, permitting, commissioning and startup, and legal services. Costs for raw water development and land purchase are not included in this estimate.

The estimate includes the following contractor markups and allowances:

- Mobilization, bonds, insurance 3%
- Contractor’s overheads 10%
- Contractor’s profit 7%

The estimate also includes a 30-percent contingency, which is appropriate for this level of project definition and completion. The estimated cost has been escalated to the approximate midpoint of construction, assumed as July 2008. Including all of these assumptions, the estimated construction cost for the PCE Treatment System project is presented in Table 2.
Figure 4 – Treatment Plant Plan

PLAN VIEW
Not to Scale

North

INFLUENT (FUTURE WELL)

INFLUENT (WELL 27)

INFLUENT (WELL 18)

ELECTRICAL ROOM
(20'x12'-6")

CHEMICAL ROOM
(20'x20')

FUTURE

OVERHEAD DOOR

OVERHEAD DOOR

PROCESS ROOM
(76"x32'-6")

Shallow Tray™
Model 61221
(9'-10"x12'-6")

Shallow Tray™
Model 61221
(9'-10"x12'-6")

Shallow Tray™
Model 61221
(9'-10"x12'-6")

INFLUENT
(WELL 18)

INFLUENT
(WELL 27)

INFLUENT
(FUTURE WELL)
TABLE 2
Capital Costs – Las Cruces PCE Treatment

<table>
<thead>
<tr>
<th>Phase</th>
<th>Items</th>
<th>Construction Costs</th>
<th>Non-Construction Costs</th>
<th>Capital Costs</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>III</td>
<td>Treatment for Wells No. 18 and 27, complete, expandable for 3rd well.</td>
<td>$2,410,700</td>
<td>$650,900</td>
<td>$3,061,600</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Pipeline from Well No. 27 to the treatment plant (3,000 ft, 8” diameter).</td>
<td>$691,800</td>
<td>$186,800</td>
<td>$878,600</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Additional treatment unit for future well. Assumes same model size required for existing wells.</td>
<td>$374,800</td>
<td>$101,200</td>
<td>$476,000</td>
<td>Excludes well costs.</td>
</tr>
<tr>
<td>Future</td>
<td>Chemical feed system, complete</td>
<td>$103,400</td>
<td>$27,900</td>
<td>$131,300</td>
<td>Completed if required.</td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td><strong>$4,547,500</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Appendix C presents a detailed breakdown of costs for these items.

**Implementation – Contracting Processes**

Listed above are four manufacturers of tray aeration systems. Each of these manufacturers can likely provide water treatment equipment that will meet the need of the City of Las Cruces. The project could be implemented using a typical contracting process consisting of design, bidding and construction process. This process has been previously used with success by the City of Las Cruces.

**Qualifications Based Selection of Equipment**

A second alternative to the contracting process that has been previously utilized consists of selection of equipment manufacturers using a request for proposal process. Design would be completed using a normal process. During the design the equipment selection could be completed using a qualifications based process. The selected equipment would then be incorporated into the construction contract to ensure that the facility is coordinated and constructed completely.

This qualifications based equipment selection process would proceed as follows:

1. Set preliminary design parameters for the equipment and develop advertisement and request for proposal. Develop a list of equipment suppliers.

2. Send advertisement to equipment suppliers requesting written proposal, an interview, a list of recent completed projects, and references. Other specific items can also be required.

3. Written proposals received and reviewed by a City selection committee.
4. Interviews completed by equipment suppliers. This is optional but allows interaction and questions for proposals that may be less complete in some areas. Also includes a way for the suppliers to bring equipment or demonstrations to the presentation.

5. Selection committee visits other installation or, at a minimum, calls the references of the equipment suppliers. Selection committee meets and picks the best-qualified equipment supplier.

6. Notification of short-listed status sent to the selected equipment supplier. Letter includes a request to provide costs for the installation. Design parameters are finalized and included to the equipment supplier at this time.

7. Costs received by the selection committee. The engineering consultant provides an evaluation of the costs based on engineering judgment and compared to previous projects awarded in the last 5 years.

8. If costs are acceptable, the contract is awarded to the selected equipment supplier. An agreement is completed that can be inserted into a construction contract. If costs are not acceptable the supplier can either adjust the costs to an agreed upon level or the selection committee can move to the second ranked equipment supplier and negotiate costs with this company.

9. The design of the system is finalized including bidding documents. The bidding documents include the agreement with the equipment supplier and the bid form includes a fixed cost listed as a line item for the equipment. The construction contractor adds a lump sum amount for work in addition to the supplied equipment.

10. Bidding is finalized using the City’s normal procedure for construction contracts. Bids for the construction contract are awarded based on lowest responsive bid.

11. Construction of the system proceeds with the construction contractor contracted to the equipment supplier for the installation. The construction contractor provides needed manpower for the installation and startup of the system. The construction contract is completed using the City’s standard procedures.

Design-Build

Finally, the construction duration could be shortened using a design-build process. There are many variations to this type of contracting process and a review of the best alternatives should be completed with firms regularly engaged in this type of work.

Temporary Treatment Unit

The installation of a temporary treatment unit was investigated to allow treatment of PCE to begin as soon as possible. The contacted firms do not have full sized equipment available for this purpose. Smaller units, typically used for pilot testing, with flow rates of up to 15 gpm are available immediately. Larger units would be available as soon as 6 weeks after submittal approval. This unit could be provided on a skid with local controls. The size of the unit prevents it from being installed on a trailer; a concrete pad would be required.

Concerns of using a temporary unit include damage to the unit by cold weather or by moving the unit a second time after construction is completed. Provision of a temporary
unit adds construction costs for all temporary connections such as a concrete slab, electrical power connection and piping. These costs would likely be saved by implementing an alternative delivery process such as design-build rather than installing a specially built temporary treatment unit. Alternative delivery methods could allow construction of the unit in-place while the building could be constructed around the operating unit.
Appendix A - List of Manufacturers
Appendix A

List of Equipment Manufacturers

Equipment manufacturers for low profile air strippers.

1. Carbonair, Inc.
   4889 Hunter Road, Building 1-C
   San Marcos, Texas 78666
   Telephone: (800) 893-5937
   Web: www.carbonair.com

2. Carbtrol Corporation
   955 Connecticut Avenue, Suite 5202
   Bridgeport, Connecticut 06607
   Telephone: (800) 242-1150
   Web: www.carbtrol.com

3. EPG Companies
   19900 County Road 81
   Maple Grove, Minnesota 55311
   Telephone: (612) 424-2613
   Web www.epgco.com

4. North East Environmental Products, Inc. (NEEP)
   7 Commerce Avenue
   West Lebanon, New Hampshire 03784
   Telephone: (603) 298-7061
   Web: www.neepsystems.com

Nearby Installations of low profile air strippers.

1. Sandia National Laboratories
   White Sands Test Facility
   Contact: Don Minnick or Troy Wiebe
   Telephone: (505) 524-5202

2. City of Albuquerque
   Los Angeles Landfill
   Contact: Rhonda Methvin
   Telephone (505) 768-2833
Appendix B - Equipment Details
System Performance Estimate

Client and Proposal Information:

CH2M: Jason Curl
City of Las Cruces, NM
#406914-2
Well #27 Treatment

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Untreated Influent</th>
<th>Effluent Target</th>
<th>Model 61211 Effluent</th>
<th>Model 61221 Effluent</th>
<th>Model 61231 Effluent</th>
<th>Model 61241 Effluent</th>
<th>Model 61251 Effluent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lbs/hr PPMv %removal</td>
<td>lbs/hr PPMv %removal</td>
<td>lbs/hr PPMv %removal</td>
<td>lbs/hr PPMv %removal</td>
<td>lbs/hr PPMv %removal</td>
<td>lbs/hr PPMv %removal</td>
<td>lbs/hr PPMv %removal</td>
</tr>
<tr>
<td>Tetrachloroethylene</td>
<td>8 ppb</td>
<td>2 ppb</td>
<td>&lt;1 ppb</td>
<td>&lt;1 ppb</td>
<td>&lt;1 ppb</td>
<td>&lt;1 ppb</td>
<td>&lt;1 ppb</td>
</tr>
<tr>
<td>Solubility 150 ppm</td>
<td>1 ppb</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>&lt;1 ppb</td>
</tr>
<tr>
<td>Mwt 165.83</td>
<td></td>
<td></td>
<td>73.6395%</td>
<td>93.0513%</td>
<td>98.1683%</td>
<td>99.5171%</td>
<td>99.8727%</td>
</tr>
</tbody>
</table>

This report has been generated by ShallowTray Modeler software version Ev2.2. This software is designed to assist a skilled operator in predicting the performance of a ShallowTray air stripping system. North East Environmental Products, Inc. (NEEP) is not responsible for incidental or consequential damages resulting from the improper operation of either the software or the air stripping equipment.

Report Generated: 1/16/07 Modeler Ev2.3 ppmv
To: Jason Curl  
CH2M  
E: jason.curl@ch2m.com  
from: Don Shearouse  
NEEP

One (1) 316L SS Model 61221 ShallowTray, with controls, skid, 20 HP pump, VFD w/logic, & 40 HP 3600 scfm blower  
Budgetary Price: $98,000  
Two (2) shelf-spare 316L SS trays: $30,000

MINIMUM CLEARANCE

FRONT 1.5 ft.
TOP 12 in.
REAR N/A
LEFT 6.5 ft.
RIGHT 6.5 ft.

OPTIONAL ITEMS:
- SKID & STANCHION
- GRAVITY DISCHARGE PIPING
- DISCHARGE PUMP
- FEED PUMP
- ADDITIONAL BLOWER
- EXPLOSION-PROOF MOTORS
- LOCAL DISCONNECT NEMA 7
- CONTROL PANEL
- MAIN DISCONNECT SWITCH
- L.S. COMPONENTS/REMOTE MOUNT
- INTERMITTENT OPERATION
- STROBE LIGHT
- ALARM HORN
- POWER LAPSE INDICATOR
- LOW AIR PRESSURE ALARM SWITCH(ES)
- HIGH WATER LEVEL ALARM SWITCH
- DISCHARGE PUMP LEVEL SWITCH
- WATER PRESSURE GAUGE(ES)
- DIGITAL WATER FLOW INDICATOR
- AIR FLOW METER
- TEMPERATURE GAUGE(ES)
- LINE SAMPLING PORT(S)
- AIR BLOWER SILENCER
- WASHER WAND
- AUTO DIALER

NOTE: This drawing is representative of a standard ShallowTray configuration, and is not intended for engineering design or layout. Actual arrangement and dimensions may vary depending on blower selection or other accessories. Please contact NEEP for detailed design information.

BASIC SYSTEM
- SUMP TANK
- STRIPPER TRAYS
- BLOWER
- MIST ELIMINATOR
- PIPING
- SPRAY NOZZLE
- WATER LEVEL SIGHT TUBE
- GASKETS
- LATCHES

CONNECTION INFORMATION

ITEM | SIZE
--- | ---
GRAVITY DISCHARGE | 12"Ø FLANGED
DISCHARGE PUMP | 8"Ø FLANGED
WATER INLET | 8"Ø FLANGED
AIR EXHAUST NOZZLE | 18"Ø STUB w/18" CPLG

STRIPPER CONSTRUCTION:
316L STAINLESS STEEL

POWER:
3Ø, 460 volt, 3 WIRE + GROUND, 60 Hz
*consult N.E.E.P. for ampacities and other voltage options

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ShallowTray® Model 61221

Proposal #406914-2

CH2M: Well #27, Las Cruces, NM

Date: 01/16/07
Scale: NTS
Size: A
 SHEET: 1 OF: 1
### System Performance Estimate

**Client and Proposal Information:**

- **CH2M:** Jason Curl
- **City of Las Cruces,** NM
- **#406914-2**
- **Well #18 Treatment**

**Series chosen:** 41200

- **Water Flow Rate:** 500.0 gpm
- **Air Flow Rate:** 2400 scfm
- **Water Temp:** 65 °F
- **Air Temp:** 40 °F
- **A/W Ratio:** 36
- **Safety Factor:** None

### Contaminant Performance

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Untreated Influent Effluent</th>
<th>Model 41211 Effluent</th>
<th>Model 41221 Effluent</th>
<th>Model 41231 Effluent</th>
<th>Model 41241 Effluent</th>
<th>Model 41251 Effluent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lbs/hr</td>
<td>PPMv</td>
<td>%removal</td>
<td>lbs/hr</td>
<td>PPMv</td>
<td>%removal</td>
</tr>
<tr>
<td>Tetrachloroethylene</td>
<td>51 ppb</td>
<td>19 ppb</td>
<td>0.1</td>
<td>7 ppb</td>
<td>0.2</td>
<td>2 ppb</td>
</tr>
<tr>
<td>Solubility 150 ppm</td>
<td>1 ppb</td>
<td>0.01</td>
<td>0.1</td>
<td>0.2</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Mwt 165.83</td>
<td></td>
<td>63.4669%</td>
<td>86.6533%</td>
<td>95.1240%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Modeler:** Ev2.3 ppmv

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To: Jason Curl  
CH2M  
E: jason.curl@ch2m.com  
from: Don Shearouse  
NEEP

One (1) 316L SS Model 41241 ShallowTray, with controls, skid, 15 HP pump, VFD w/logic, & 25 HP 2400 scfm blower
Budgetary Price: $62,000
Four (4) shelf-spare 316L SS trays: $36,000

BASIC SYSTEM
- SUMP TANK
- STRIPPER TRAYS
- BLOWER
- MIST ELIMINATOR
- PIPING
- SPRAY NOZZLE
- WATER LEVEL SIGHT TUBE
- GASKETS
- LATCHES

OPTIONAL ITEMS
- SKID & STANCHION
- AIR PRESSURE GAUGE
- GRAVITY DISCHARGE PIPING
- DISCHARGE PUMP
- FEED PUMP
- ADDITIONAL BLOWER
- EXPLOSION-PROOF MOTOR(S)
- LOCAL DISCONNECT NEMA 7
- CONTROL PANEL
- MAIN DISCONNECT SWITCH
- I.S. COMPONENTS/REMOTE MOUNT
- INTERMITTENT OPERATION
- STROBE LIGHT
- ALARM Horn
- POWER LOSS INDICATOR
- LOW AIR PRESSURE ALARM SWITCH(ES)
- HIGH WATER LEVEL ALARM SWITCH
- DISCHARGE PUMP LEVEL SWITCH
- WATER PRESSURE GAUGES
- DIGITAL WATER FLOW INDICATOR
- AIR FLOW METER
- TEMPERATURE GAUGE(S)
- LINE SAMPLING PORT(S)
- AIR BLOWER SILENCER
- WASHER WAND
- AUTO DIALER

NOTE: THIS DRAWING IS REPRESENTATIVE OF A STANDARD SHALLOWTRAY CONFIGURATION, AND IS NOT INTENDED FOR ENGINEERING DESIGN OR LAYOUT. ACTUAL ARRANGEMENT AND DIMENSIONS MAY VARY DEPENDING ON BLOWER SELECTION OR OTHER ACCESSORIES. PLEASE CONTACT NEEP FOR DETAILED DESIGN INFORMATION.

CONNECTION INFORMATION

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRAVITY DISCHARGE</td>
<td>10'0&quot; SOCKET, PVC80</td>
</tr>
<tr>
<td>DISCHARGE PUMP</td>
<td>4&quot;Ø FNPT</td>
</tr>
<tr>
<td>WATER INLET</td>
<td>6&quot;Ø FNPT</td>
</tr>
<tr>
<td>AIR EXHAUST NOZZLE</td>
<td>18&quot; Ø STUB W/18&quot; CPLG</td>
</tr>
</tbody>
</table>

POWER:
- 3Ø, 460 Volt, 3 WIRE + GROUND 60 Hz
*CONSULT N.E.E.P. FOR AMPACITIES AND OTHER VOLTAGE OPTIONS

STRIPPER CONSTRUCTION:
316L STAINLESS STEEL

TOLERANCES: UNLESS OTHERWISE SPECIFIED: ± 1 INCH

© 2002 NEEP

To: Jason Curl  
CH2M  
E: jason.curl@ch2m.com  
from: Don Shearouse  
NEEP

DRAWING NAME: ShallowTray® Model 41241  
DRAWING #: Proposal #406914-2  
CUSTOMER: CH2M: Well #18; Las Cruces, NM  
DATE: 01/16/07  
SCALE: NTS  
SIZE: A  
SHEET: 1 Of : 1

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.  
7 COMMERCE AVENUE  
WEST LEBANON, NEW HAMPSHIRE 03784  
PHONE: 603-296-7061  
FAX: 603-296-7063  
http://www.neepsystems.com
**Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>STAT 15</th>
<th>STAT 30</th>
<th>STAT 80</th>
<th>STAT 180</th>
<th>STAT 400</th>
<th>STAT 720</th>
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</thead>
<tbody>
<tr>
<td>Liquid Flow Range (gpm)</td>
<td>0.5 - 12</td>
<td>1 - 35</td>
<td>5 - 80</td>
<td>10 - 200</td>
<td>20 - 400</td>
<td>40 - 1000</td>
</tr>
<tr>
<td>Minimum Airflow (cfm)</td>
<td>60</td>
<td>100</td>
<td>300</td>
<td>650</td>
<td>1800</td>
<td>3000</td>
</tr>
<tr>
<td>Maximum Airflow (cfm)</td>
<td>80</td>
<td>150</td>
<td>350</td>
<td>900</td>
<td>2100</td>
<td>4000</td>
</tr>
<tr>
<td>Blower HP</td>
<td>1.0, 1.5</td>
<td>2, 3</td>
<td>5, 7.5, 10</td>
<td>10</td>
<td>20, 25</td>
<td>40, 50</td>
</tr>
<tr>
<td>Tray Dimensions (LxWxH, in)</td>
<td>24x10x10</td>
<td>36x14x10</td>
<td>48x24x10</td>
<td>72x36x11 5/8</td>
<td>120x48x12</td>
<td>144x72x12</td>
</tr>
<tr>
<td>Assembly Height (Approx.)</td>
<td>7'-7 1/4&quot;</td>
<td>7'-9 3/4&quot;</td>
<td>7'-10 1/4&quot;</td>
<td>9'-6&quot;</td>
<td>10'-2 1/4&quot;</td>
<td>10'-11 3/4&quot;</td>
</tr>
<tr>
<td>Optional Skid Footprint (LxWxH, in)</td>
<td>47x29x4</td>
<td>64x34x6</td>
<td>66x60x6</td>
<td>88x86x6</td>
<td>138x102x6</td>
<td>--</td>
</tr>
<tr>
<td>Empty Tray Weight, Each (lb)</td>
<td>20</td>
<td>40</td>
<td>65</td>
<td>150</td>
<td>350</td>
<td>550</td>
</tr>
<tr>
<td>Assembly Weight (lb)</td>
<td>360</td>
<td>560</td>
<td>1000</td>
<td>2040</td>
<td>4110</td>
<td>6820</td>
</tr>
<tr>
<td>Assembly Operating Weight (lb)</td>
<td>610</td>
<td>940</td>
<td>2230</td>
<td>5550</td>
<td>11,820</td>
<td>21,850</td>
</tr>
<tr>
<td>Sump Holding Capacity (gal)</td>
<td>16</td>
<td>30</td>
<td>60</td>
<td>225</td>
<td>500</td>
<td>1000</td>
</tr>
<tr>
<td>Influent Connection (NPS)</td>
<td>1.5&quot; FPT</td>
<td>2&quot;</td>
<td>3&quot;</td>
<td>4&quot;</td>
<td>6&quot;</td>
<td>8&quot;</td>
</tr>
<tr>
<td>Effluent Connection (NPS)</td>
<td>2&quot;</td>
<td>3&quot;</td>
<td>3&quot;</td>
<td>6&quot;</td>
<td>8&quot;</td>
<td>10&quot;</td>
</tr>
<tr>
<td>Off-Gas Discharge OD</td>
<td>4 3/8&quot;</td>
<td>6 3/8&quot;</td>
<td>8 1/2&quot;</td>
<td>12 19/32&quot;</td>
<td>18&quot;</td>
<td>24&quot;</td>
</tr>
</tbody>
</table>

**Design Features**
- 304 stainless steel welded construction
- Gasoline-resistant neoprene gaskets
- Anti-bypass valve (no priming required)
- Polypropylene demister (99.5% removal efficiency 10 microns and larger)
- Direct coupled blowers
- Clean-out ports (STAT 180-720)

**Options**
- Pump-down capability with discharge pump
- Pressure gauges and switches
- Water/air flow and temperature monitoring
- Explosion-proof controls and motors
- Off-gas carbon filtration
- Sample taps
- Control panel packages
- 316 SS construction
- Skid Mounted

**Service Centers**

**FLORIDA**
4710 Dignan Street
Jacksonville, FL 32254
800.241.7833
904.387.4465
904.387.5058 Fax

**MINNESOTA**
2731 Nevada Ave. No.
New Hope, MN 55427
800.526.4999
763.544.2154
763.544.2151 Fax

**TEXAS**
4889 Hunter Rd. Bldg 1-C
San Marcos, TX 78666
800.893.5937
512.392.0085
512.392.0066 Fax

**VIRGINIA**
4328 West Main Street
Salem, VA 24153
800.204.0324
540.380.5913
540.380.5920 Fax

1. Specifications subject to change without notice
2. Blower HP depends on flow requirements. Single phase motors available up to 5 HP.
3. 6-tray unit without optional skid.
4. Includes approximate blower and ducting weight.
5. 150# flange pattern, unless noted. Effluent size is for gravity drain sumps.

Dwg # 217355
EPG offers low-profile tray air strippers for removal of volatile organic compounds (VOCs) from liquids. They are used effectively for treatment of contaminated groundwater and process water.

- 304L stainless steel construction
- Compact size
- Flow rates up to 350 gpm
- Removal efficiencies up to 99.99%
- Integrated UL listed control panels, influent/effluent pumps, and other accessories available
- Skid mounted
Appendix C - Opinion of Costs Detail
Estimate of Probable Capital Costs
PCE Treatment - Phase II Conceptual Design
City of Las Cruces

PROJECT SCOPE
Treatment for Well No. 18 and 27, complete. Expandable for 3rd well.

<table>
<thead>
<tr>
<th>PROJECT ITEMS</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Costs</strong></td>
<td></td>
</tr>
<tr>
<td>Treatment Equipment</td>
<td></td>
</tr>
<tr>
<td>Tray Aeration, 2 units</td>
<td>$ 235,200</td>
</tr>
<tr>
<td>Spare Trays, 4 trays</td>
<td>$ 60,000</td>
</tr>
<tr>
<td>Magnetic flow meter, 2 units</td>
<td>$ 14,400</td>
</tr>
<tr>
<td>Miscellaneous items</td>
<td>$ 15,680</td>
</tr>
<tr>
<td>Equipment Delivery to Las Cruces</td>
<td>$ 4,000</td>
</tr>
<tr>
<td><strong>Treatment Building</strong></td>
<td></td>
</tr>
<tr>
<td>Building, 2320 square feet</td>
<td>$ 459,457</td>
</tr>
<tr>
<td>Process Piping</td>
<td>$ 62,543</td>
</tr>
<tr>
<td>Finishes</td>
<td>$ 34,332</td>
</tr>
<tr>
<td>Instrumentation and Controls</td>
<td>$ 42,915</td>
</tr>
<tr>
<td>Mechanical Systems (HVAC &amp; Plumbing)</td>
<td>$ 85,830</td>
</tr>
<tr>
<td>Electrical Systems</td>
<td>$ 42,915</td>
</tr>
<tr>
<td><strong>Site Work</strong></td>
<td></td>
</tr>
<tr>
<td>Site Civil (earthwork)</td>
<td>$ 107,116</td>
</tr>
<tr>
<td>Plant Computer (RTU and Controls)</td>
<td>$ 83,793</td>
</tr>
<tr>
<td>Site Electrical (Service)</td>
<td>$ 65,162</td>
</tr>
<tr>
<td>Yard Piping</td>
<td>$ 89,263</td>
</tr>
<tr>
<td><strong>Contractor Markups</strong></td>
<td></td>
</tr>
<tr>
<td>Overhead</td>
<td>10.0% $ 140,261</td>
</tr>
<tr>
<td>Profit</td>
<td>7.0% $ 108,001</td>
</tr>
<tr>
<td>Mobilization/Bonds/Insurance</td>
<td>3.0% $ 49,526</td>
</tr>
<tr>
<td><strong>Adjustments</strong></td>
<td></td>
</tr>
<tr>
<td>Contingency</td>
<td>30% $ 510,118</td>
</tr>
<tr>
<td>Escalation (to Mid-Point of Construction)</td>
<td>18.45% $ 407,839</td>
</tr>
<tr>
<td>Location Adjustment Factor (Las Cruces) Deduct</td>
<td>83.70% $ (426,791)</td>
</tr>
<tr>
<td>Market Adjustment Factor</td>
<td>10% $ 219,156</td>
</tr>
<tr>
<td><strong>CONSTRUCTION COSTS - SUBTOTAL</strong></td>
<td>$ 2,410,715</td>
</tr>
<tr>
<td><strong>Non-Construction Costs</strong></td>
<td></td>
</tr>
<tr>
<td>Permitting</td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
<td></td>
</tr>
<tr>
<td>Engineering Services During Construction</td>
<td></td>
</tr>
<tr>
<td>Commissioning and Startup</td>
<td></td>
</tr>
<tr>
<td>Legal and Administrative</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>27% $ 650,893</td>
</tr>
<tr>
<td><strong>NON-CONSTRUCTION COSTS - SUBTOTAL</strong></td>
<td>$ 650,893</td>
</tr>
<tr>
<td><strong>CAPITAL COSTS - TOTAL</strong></td>
<td>$ 3,061,609</td>
</tr>
</tbody>
</table>
Estimate of Probable Capital Costs
PCE Treatment - Phase II Conceptual Design
City of Las Cruces

PROJECT SCOPE
Pipeline from Well No. 27 to the treatment plant, (3,000 feet, 8 inch diameter).

<table>
<thead>
<tr>
<th>CONSTRUCTION ITEMS</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Costs</strong></td>
<td></td>
</tr>
<tr>
<td>Pipeline</td>
<td></td>
</tr>
<tr>
<td>3000 feet, 8 inch diameter</td>
<td>$344,300</td>
</tr>
<tr>
<td>Miscellaneous items</td>
<td>$58,200</td>
</tr>
<tr>
<td><strong>Contractor Markups</strong></td>
<td></td>
</tr>
<tr>
<td>Overhead</td>
<td>10.0% $40,250</td>
</tr>
<tr>
<td>Profit</td>
<td>7.0%  $30,993</td>
</tr>
<tr>
<td>Mobilization/Bonds/Insurance</td>
<td>3.0%  $14,212</td>
</tr>
<tr>
<td><strong>Adjustments</strong></td>
<td></td>
</tr>
<tr>
<td>Contingency</td>
<td>30%   $146,386</td>
</tr>
<tr>
<td>Escalation (to Mid-Point of Construction)</td>
<td>18.45% $117,036</td>
</tr>
<tr>
<td>Location Adjustment Factor (Las Cruces) Deduct</td>
<td>83.70% $(122,474)</td>
</tr>
<tr>
<td>Market Adjustment Factor</td>
<td>10%   $62,890</td>
</tr>
<tr>
<td><strong>CONSTRUCTION COSTS - SUBTOTAL</strong></td>
<td>$691,793</td>
</tr>
</tbody>
</table>

Non-Construction Costs

<table>
<thead>
<tr>
<th>ENGINEERING SERVICES DURING CONSTRUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permitting</td>
</tr>
<tr>
<td>Engineering</td>
</tr>
<tr>
<td>Commissioning and Startup</td>
</tr>
<tr>
<td>Legal and Administrative</td>
</tr>
<tr>
<td>Subtotal</td>
</tr>
</tbody>
</table>

**NON-CONSTRUCTION COSTS - SUBTOTAL**  $186,784

**CAPITAL COSTS - TOTAL**  $878,577
## Estimate of Probable Capital Costs

### PCE Treatment - Phase II Conceptual Design

**City of Las Cruces**

### PROJECT SCOPE

Additional treatment for future well. Assumes same model size required for existing wells.

### PROJECT ITEMS

<table>
<thead>
<tr>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Costs</strong></td>
</tr>
<tr>
<td><strong>Treatment Equipment</strong></td>
</tr>
<tr>
<td>Tray Aeration, 1 unit</td>
</tr>
<tr>
<td>Spare Trays, 2 trays</td>
</tr>
<tr>
<td>Magnetic flow meter, 1 unit</td>
</tr>
<tr>
<td>Miscellaneous Items</td>
</tr>
<tr>
<td>Equipment Delivery to Las Cruces</td>
</tr>
<tr>
<td><strong>Treatment Building Additions</strong></td>
</tr>
<tr>
<td>Process Piping</td>
</tr>
<tr>
<td>Instrumentation and Controls</td>
</tr>
<tr>
<td>Electrical Systems</td>
</tr>
<tr>
<td><strong>Contractor Markups</strong></td>
</tr>
<tr>
<td>Overhead</td>
</tr>
<tr>
<td>Profit</td>
</tr>
<tr>
<td>Mobilization/Bonds/Insurance</td>
</tr>
<tr>
<td><strong>Adjustments</strong></td>
</tr>
<tr>
<td>Contingency</td>
</tr>
<tr>
<td>Escalation (to Mid-Point of Construction)</td>
</tr>
<tr>
<td>Location Adjustment Factor (Las Cruces) Deduct</td>
</tr>
<tr>
<td>Market Adjustment Factor</td>
</tr>
<tr>
<td><strong>CONSTRUCTION COSTS - SUBTOTAL</strong></td>
</tr>
</tbody>
</table>

### Non-Construction Costs

<table>
<thead>
<tr>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permitting</td>
</tr>
<tr>
<td>Engineering</td>
</tr>
<tr>
<td>Engineering Services During Construction</td>
</tr>
<tr>
<td>Commissioning and Startup</td>
</tr>
<tr>
<td>Legal and Administrative</td>
</tr>
<tr>
<td>Subtotal</td>
</tr>
</tbody>
</table>

### NON-CONSTRUCTION COSTS - SUBTOTAL | $101,182

### CAPITAL COSTS - TOTAL | $475,931

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Appendix C
Estimate of Probable Capital Costs  
PCE Treatment - Phase II Conceptual Design  
*City of Las Cruces*

**PROJECT SCOPE**  
Chemical feed system, complete. Added to existing building.

**PROJECT ITEMS**

<table>
<thead>
<tr>
<th>COST</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction Costs</strong></td>
<td></td>
</tr>
<tr>
<td>$29,620</td>
<td>Chemical metering pumps, 4 pumps</td>
</tr>
<tr>
<td>$13,016</td>
<td>Miscellaneous items</td>
</tr>
<tr>
<td><strong>Treatment Building Additions</strong></td>
<td></td>
</tr>
<tr>
<td>$5,491</td>
<td>Process Piping</td>
</tr>
<tr>
<td>$6,822</td>
<td>Instrumentation and Controls</td>
</tr>
<tr>
<td>$5,200</td>
<td>Electrical Systems</td>
</tr>
<tr>
<td><strong>Contractor Markups</strong></td>
<td></td>
</tr>
<tr>
<td>10.0%</td>
<td>Overhead $6,015</td>
</tr>
<tr>
<td>7.0%</td>
<td>Profit $4,631</td>
</tr>
<tr>
<td>3.0%</td>
<td>Mobilization/Bonds/Insurance $2,124</td>
</tr>
<tr>
<td><strong>Adjustments</strong></td>
<td></td>
</tr>
<tr>
<td>30%</td>
<td>Contingency $21,876</td>
</tr>
<tr>
<td>18.45%</td>
<td>Escalation (to Mid-Point of Construction) $17,490</td>
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<tr>
<td>83.70%</td>
<td>Location Adjustment Factor (Las Cruces) Deduct $(18,302)</td>
</tr>
<tr>
<td>10%</td>
<td>Market Adjustment Factor $9,398</td>
</tr>
</tbody>
</table>

**CONSTRUCTION COSTS - SUBTOTAL** | $103,381

**Non-Construction Costs**

<table>
<thead>
<tr>
<th>Cost</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$27,913</td>
<td>Permitting, Engineering Services During Construction, Commissioning and Startup, Legal and Administrative</td>
</tr>
</tbody>
</table>

**NON-CONSTRUCTION COSTS - SUBTOTAL** | $27,913

**CAPITAL COSTS - TOTAL** | $131,293

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