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MCAS EL TORO
SSIC # 5090.3

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CLEAN II TRANSMITTAL/DELIVERABLE RECEIPT

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Naval Facilities Engineering Command
Southwest Division
Mr. Paul Kennedy, Code 0233.PK (O)
Building 128
1220 Pacific Highway
San Diego, CA 92132-5187

DATE: 5/9/96
CTO #: 0076
LOCATION: MCAS El Toro

FROM: D. K. Cowser, Project Manager; J. W. Kluesener, Operations Manager

DESCRIPTION: Regulatory Compliance and Permit Exemption for Conducting a Vacuum Enhanced Groundwater Extraction Pilot Test at Site 2 (Magazine Road Landfill) DTD 5/7/96

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IN REPLY REFERENCE: CTO-0076/0181

May 7, 1996

Mr. Don Hopps
Air Quality ACS
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765

Subject: Regulatory Compliance and Permit Exemption for Conducting a Vacuum Enhanced Groundwater Extraction Pilot Test at Site 2 (Magazine Road Landfill), Marine Corps Air Station, El Toro, Orange County, California

Dear Mr. Hopps:

This letter presents our review of South Coast Air Quality Management District (SCAQMD) Rules for a vacuum-enhanced groundwater extraction pilot test at Marine Corps Air Station (MCAS) El Toro. The purpose of the review was to determine whether the system will be in compliance with the substantive portions of applicable or relevant and appropriate requirements (ARARs). This letter presents a basis for an exemption from the SCAQMD permitting process for the pilot testing equipment.

Background

Section 121(d) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 states that remedial actions on CERCLA sites must attain (or document the decision to justify the waiver of) any federal or more stringent state environmental standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate.

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address the situation at a CERCLA site. The requirement is applicable if the jurisdictional prerequisites of the standard show a direct correspondence when objectively compared to the conditions at the site. If the requirement is not legally applicable, the requirement is evaluated to determine whether it is relevant and appropriate. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law, that while not applicable, address problems or situations sufficiently similar to the circumstances of the proposed response action and are well-suited to the conditions of the site.

In order to constitute an ARAR, a requirement must be substantive. Therefore, only substantive provisions of requirements identified as ARARs in this analysis shall be considered ARARs. Section 121(e)(1) of CERCLA states that "No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely on-site, where such remedial action is selected and carried out in compliance with this section." Permits are considered procedural or administrative requirements. Provisions of generally relevant federal and state statutes and regulations that were determined to be procedural or nonenvironmental, including permit requirements, are not considered ARARs.

To summarize, under CERCLA Section 121, the vacuum enhanced groundwater extraction pilot testing to be conducted as part of a remedial action at Site 2 - MCAS El Toro does not need a SCAQMD permit (procedural or administrative requirements), but does need to be in compliance with the substantive portions of ARARs.

The pilot testing at Site 2 - MCAS El Toro will be conducted as part of a CERCLA remedial action. The system will consist of groundwater extraction wells, a blower, and carbon adsorption units to treat the soil gas effluent before discharge to the atmosphere (a schematic of the system is attached). The contaminant of concern detected in the soil gas and groundwater is trichloroethene (TCE). The maximum soil gas concentration of TCE is estimated to be 10 parts per million (ppm) by volume, based on the maximum groundwater concentration of TCE detected at 81 micrograms per liter (μg/L) by weight (calculations are attached).

Regulatory Issues

Several SCAQMD rules were identified as ARARs. A brief discussion of these rules and their applicability follows.

The substantive portions of Rule 212 regulate new units that may emit air contaminants located within 1,000 feet of a school. The pilot testing will not be conducted within 1,000 feet of a school. Also, regulated under Rule 212 are new units with increases in emissions of toxic air contaminants that result in an individual cancer risk greater than or equal to one in a million ($1x10^{-6}$). As will be shown in the screening risk evaluation in a later section of this letter, the risk from the pilot testing equipment is less than one in a million.

Rule 401 regulates visible emissions. No visible emissions are expected from the vacuum-assisted pumping equipment.

Rule 402 regulates sources causing nuisances. No nuisances are expected.

Rule 1166 regulates volatile organic compound (VOC) emissions from decontamination of soil. The pilot testing is a soil mitigation measure that meets the requirements under this rule. There will be no tank removals or contaminated soil excavation during the pilot testing.

The status of Regulation XIII is not clear. However, the pilot testing system is in compliance with the applicable portions of the regulation should the regulation become effective during

operations. A carbon adsorber is considered to be an acceptable best available control technology (BACT) candidate for soil vapor extraction and air sparging effluent treatment.

Rule 1401 regulates new sources of carcinogenic air contaminants. The rule specifies limits for maximum individual cancer risk from new units that emit carcinogenic air contaminants. Two carbon adsorbers in series is considered to be an acceptable best available control technology for toxics (T-BACT) for soil decontamination. A screening risk evaluation has been conducted for the system. In accordance with the requirements of Rule 1401, the calculated excess cancer risk from the system is 6.68×10^{-10} at any receptor if the unit is constructed with T-BACT. However, the risk is 6.68×10^{-8} at any receptor location if the unit is constructed without T-BACT. The unit will be constructed with T-BACT. The screening risk evaluation procedures used are described below.

Screening Risk Evaluation Methodology

The hourly emission rate in pounds per hour of TCE is calculated using the soil gas concentration and the air flow rate. The emission rate corresponds to a maximum equilibrium soil gas concentration of 10 parts per million (ppm) by volume based on the maximum detected groundwater concentration of TCE (81 μg/L). These values represent upper bound concentrations in the vapor stream and are used to calculate conservative, maximum emission rates. The calculation for emissions are:

$$(10 \text{ ppm}/10^6)(200 \text{ cfm})(1 \text{ lbmol}/379 \text{ ft}^3)(131.39 \text{ lb/lbmol})(60 \text{ min/hr}) = 0.0416 \text{ lb/hr}$$

Assuming continuous operation over an entire year (i.e., assuming that the equipment operates at the above conditions for 365 days at 24 hours per day), the annual average emission rate is grams per second is calculated. An example calculation is as follows:

$$(0.0416 \text{ lb/hr})(454 \text{ g/lb})(1 \text{ hr}/360) = 0.00525 \text{ g/s}$$

To calculate controlled emissions, a control efficiency of 99% is applied to the emission rates, as suggested by the carbon unit manufacturer (the actual control efficiency should be close to 100% as long as no breakthrough has occurred).

The U.S. EPA-approved SCREEN2 model is used to predict the maximum concentration of TCE at ground level receptors due to air dispersion. The following parameters are used as model input:

emission rate = 1.0 g/s (unit emission rate),
stack height = 1.5 m,
stack inside diameter = 0.1016 m (4-inch vent),
volumetric flow rate = 200 cfm,
stack gas exit temperature = ambient temperature (conservative assumption)

The stack diameter and flow parameters are obtained from the equipment specifications. There will be two parallel process steams, each consisting of two carbon units with a maximum flow capacity of 100 cfm. However, to calculate worst case concentrations, it is assumed that all of the TCE is emitted from the single modeled process stream.

A unit emission rate input for SCREEN2 results in unit maximum hourly concentrations, which are then multiplied by the calculated emission rate to obtain the predicted maximum hourly ground level concentrations. The hourly concentrations are multiplied by a factor of 0.1 to convert to annual average concentrations:

(unit concentration)(calculated emission rate)(0.1) = annual average concentration

Annual average ambient concentrations are then multiplied by the unit risk value for TCE to predict the maximum individual cancer risk. The unit risk factor is defined by the California Air Pollution Control Officers Association (CAPCOA) as the estimated probability of a person contracting cancer as a result of constant exposure to an ambient concentration of 1 $\mu g/m^3$ over a 70-year lifetime. Since the vacuum-assisted pumping pilot test equipment will not operate for more than one year, the calculated excess cancer risk is divided by a factor of 70:

(annual average concentration)(unit risk)(1/70) = maximum individual cancer risk

Although the nearest off-site receptor is more than 100 meters away from the equipment, a minimum distance of 10 meters was input in order to obtain worst case concentrations. The predicted worst case concentration occurred at a receptor 16 meters away from the equipment.

The predicted maximum individual cancer risks are presented in Table 1.

Table 1
Predicted Maximum Individual Cancer Risks

Soil Gas Concentration	Maximum Individual Cancer Risk - Uncontrolled Emissions	Maximum Individual Cancer Risk - Controlled Emissions
10 ppm_v	6.68×10^{-8}	6.68×10^{-10}

Supporting technical documentation, including a calculation spreadsheet, computer modeling output, and equipment manufacturer specifications, are enclosed as attachments to this letter.

The results indicate that the maximum individual cancer risk does not exceed 1×10^{-6} for uncontrolled emissions at a soil gas concentration of 10 ppm_v. The maximum individual cancer risk does not exceed 1×10^{-6} for controlled emissions at any receptor, including on-site receptors. Note that these risk calculations are based on the conservative assumption of continuous operation over one year and a continuous exposure over one year by an individual to the maximum predicted ground level concentration, i.e., they represent worst case values. The actual excess cancer risk from the emissions may be significantly less than the calculated risk.

Conclusions

Based on this review and our interpretation of the rules mentioned above, the SVE pilot testing system does not need a SCAQMD permit. In addition, the system will be in compliance with SCAQMD ARARs. We will proceed with our pilot testing under these assumptions. The pilot testing is scheduled to begin on 3 June 1995. If you have any questions, please call me at (619) 687-8848.

Sincerely,

Timothy W. Latas, R.G.
Contract Task Order Leader
Navy CLEAN II Program

Enclosures: Risk Calculation Spreadsheet
SCREEN2 Modeling Output
Blower Specifications
Carbon Adsorber Specifications

cc: Larry Nuzum, SWDIV
Bonnie Arthur, US EPA
Tayseer Mahmoud, DTSC
Larry Vitale, RWQCB
Joseph Joyce, MCAS El Toro

Risk Calculation Spreadsheet

TCE Groundwater Concentration[1] (ppb)	TCE Soil Gas Concentration[2] (ppmv)	Flow Rate[3] (cfm)	Hourly Controlled Emission Rate[4] (lb/hr)	Annual Avg. Controlled Emission Rate[5] (g/s)	Unit Concentration[6] [(ug/m3/(g/s)]	Unit Risk[7] [(ug/m3)-1]	Maximum Individual Cancer Risk[8]
8.100E+01	1.000E+01	2.000E+02	4.160E-04	5.246E-05	4.457E+02	2.000E-06	6.680E-10

Notes:

[1] 81 ppb = maximum detected soil gas concentration.

[2] 10 ppmv = equilibrium TCE soil Gas Concentration

x_{TCE} = TCE mole fraction in groundwater = 1.094E-8

H_{TCE} = Henry's law constant for TCE @ 20° C = 550 atm

P = total pressure at air/groundwater interface at equilibrium = 1 atm

y_{TCE} = TCE mole fraction in air at air/groundwater interface at equilibrium

$y_{TCE} = x_{TCE} H_{TCE} / P$ (Henry's Law)

y_{TCE} = 6.0143 ppmv

For this exercise a soil gas concentration of 10 ppmv

[3] Flow rate obtained from blower curves.

[4] Hourly emission rate calculated using the following equation:

H = (___ppm/10^6) (___cfm)(1lbmol/379 ft^3)(131.39 lb/lbmol)(60 min/hr)

The control of emissions with activated carbon has been assumed to have a 99% efficiency

[5] Annual average emisison rates calculated using the following equation:

A = (___lb/hr) (454 g/lb)(1 hr/ 3600 s)

[6] Unit concentration calculated by multiplying the SCREEN# maximum hourly predicted concentration by an adjustment factor of 0.1 to obtain an annual average concentration.

[7] Unit risk obtained from the California Air Pollution Control Officers Association (CAPCOA) risk assessment guidelines.

[8] Maximum individual cancer risk = (annual average emission rate) (unit conc.) (unit risk) (1/70) the equipment will not operate for more than 1 year.

SUMMARY OF CALCULATIONS

Soil Gas Concentration

Groundwater Concentration:

81 $\mu g/L$ of TCE in groundwater = 1.0935E-8 mol fraction

X_{TCE} = 1.0935E-8
H_{TCE} = 550 atm
P = 1 atm

$$Y_{TCE} = \frac{X_{TCE} H_{TCE}}{P} \cong \text{TCE mol fraction in air @ interface}$$
$$= \frac{(1.0935E-8)(550atm)}{1atm}$$
$$= 6.0143E\text{-}6$$
$$= 6.0143\ ppm_v$$

10 ppm_v of TCE in soil gas to be used in calculations

Blower Characteristics

200 $scfm$ @ 10"Hg, assuming 4" diameter

$$\left(200\frac{scfm}{10"\,Hg}\right)\left(\frac{30"\,Hg}{20"\,Hg}\right)\left(\frac{1\min}{60s}\right)\left(\frac{1}{0.087ft^2}\right) = 57.5\frac{ft}{s} = 17.5\frac{m}{s}$$

$$\left(\frac{10ppm_v}{1E6}\right)(200scfm)\left(\frac{1lbmol}{379ft^3}\right)\left(\frac{131.39lb}{lbmol}\right)\left(\frac{60\min}{1hr}\right) = 0.0416\frac{lb}{hr}$$

Assume continuous operation for 1 year:

$$\left(0.0416\frac{lb}{hr}\right)\left(\frac{454g}{lb}\right)\left(\frac{1hr}{360s}\right) = 0.00525\frac{g}{s}$$

Screening Risk Calculation

Average Annual Concentration:

(Unit Concentration [*model maximum*])(Calculated Emission Rate)(0.1)

$$\left(4457\frac{\mu g / L}{g / s}\right)\left(0.0525\frac{g}{s}\right)(0.1) = 2.3399\frac{\mu g}{m^3}$$

Maximum Individual Cancer Risk:

(Average Anuual Concentration)(Unit Risk)$\left(\frac{1}{70}\right)$

$$\left(2.3399\frac{\mu g}{m^3}\right)(2.00E-6)\left(\frac{1}{70}\right) = 6.685E-8$$

Terrain

Final Stable Plume Height 3.6 m = 12 ft

Distance to Final Rise 151.3 m

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11:31:29

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

SVE Pilot Test - CTO 76

COMPLEX TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	1.00000
STACK HT (M)	=	1.5000
STACK DIAMETER (M)	=	.1016
STACK VELOCITY (M/S)	=	17.5000
STACK GAS TEMP (K)	=	293.0000
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	.0000
URBAN/RURAL OPTION	=	RURAL

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = .000 M**4/S**3; MOM. FLUX = .790 M**4/S**2.

FINAL STABLE PLUME HEIGHT (M) = 3.6
DISTANCE TO FINAL RISE (M) = 151.3

			VALLEY 24-HR CALCS		**SIMPLE TERRAIN 24-HR CALCS**			
TERR HT (M)	DIST (M)	MAX 24-HR CONC (UG/M**3)	CONC (UG/M**3)	PLUME HT ABOVE STK BASE (M)	CONC (UG/M**3)	PLUME HT ABOVE STK HGT (M)	SC	U10M US (M/S)
15.	122.	1.020	1.020	3.6	.0000	.0	0	.0

05/01/96
11:31:29

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

SVE Pilot Test - CTO 76

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	1.00000
STACK HEIGHT (M)	=	1.5000
STK INSIDE DIAM (M)	=	.1016
STK EXIT VELOCITY (M/S)	=	17.5000
STK GAS EXIT TEMP (K)	=	293.0000
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	.0000
MIN HORIZ BLDG DIM (M)	=	.0000
MAX HORIZ BLDG DIM (M)	=	.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = .000 M**4/S**3; MOM. FLUX = .790 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES *

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWAS
10.	2808.	2	5.0	5.0	1600.0	2.57	2.36	1.28	NO
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 10. M:									
25.	4507.	3	3.5	3.5	1120.0	3.02	3.60	2.21	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SCREEN DISCRETE DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES *

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWAS
20.	4385.	3	4.5	4.5	1440.0	2.69	2.82	1.74	NO
40.	4446.	5	5.0	5.0	10000.0	2.57	2.63	1.67	NO
60.	4457.	5	3.0	3.0	10000.0	3.28	3.85	2.36	NO
80.	4325.	6	4.0	4.0	10000.0	2.83	3.33	1.98	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
* SUMMARY OF TERRAIN HEIGHTS ENTERED FOR *
* SIMPLE ELEVATED TERRAIN PROCEDURE *
****

TERRAIN HT (M)	DISTANCE RANGE (M) MINIMUM	MAXIMUM
0.	10.	92.
0.	20.	--
0.	40.	--
0.	60.	--
0.	80.	--

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)	
SIMPLE TERRAIN	4507.	25.	0.	
COMPLEX TERRAIN	1.020	122.	15.	(24-HR CONC)

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

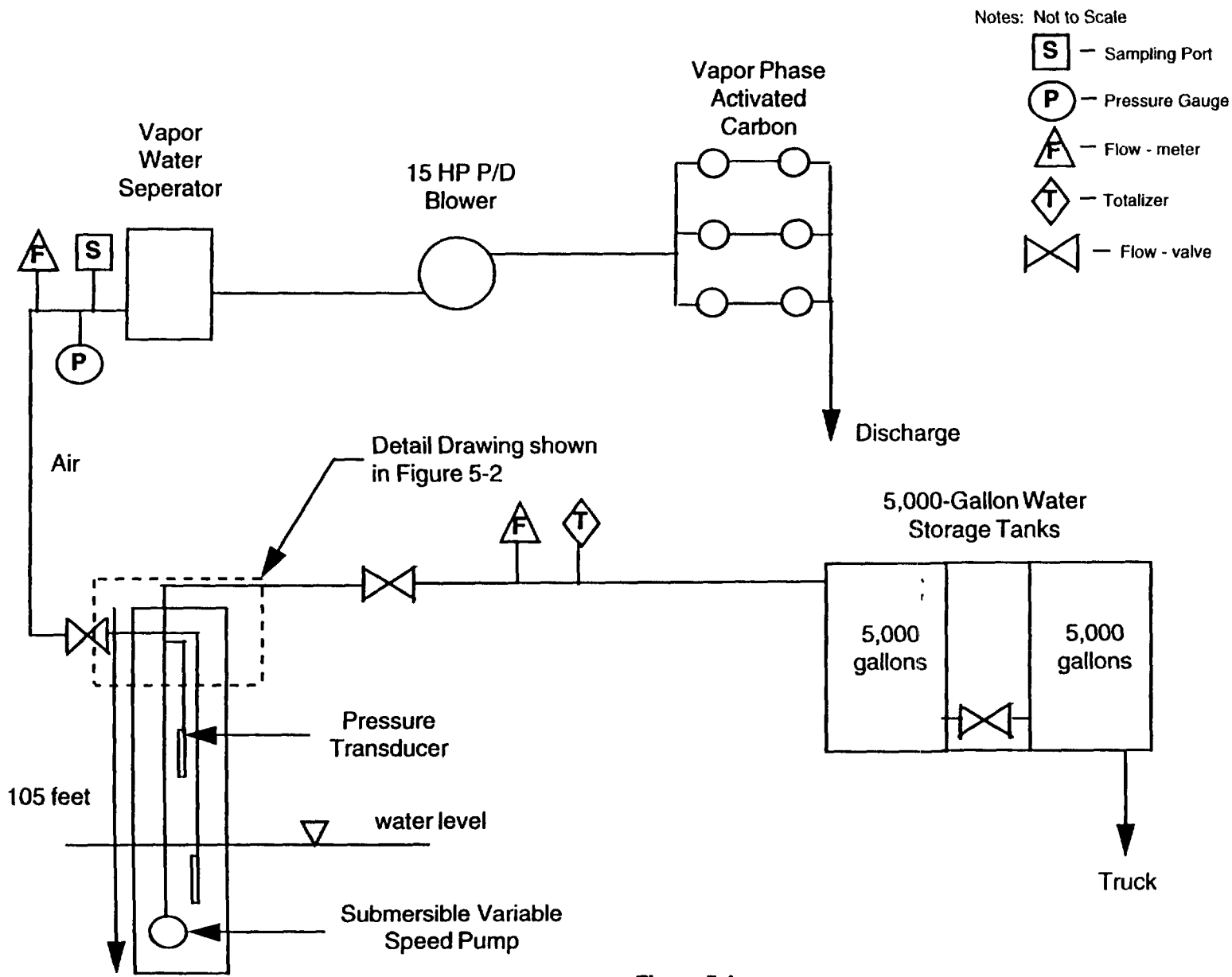


Figure 5-1
Process Flow Diagram for Vacuum Enhanced Groundwater Extraction System

EG&G ROTRON

DR 1223
Regenerative Blower

FEATURES

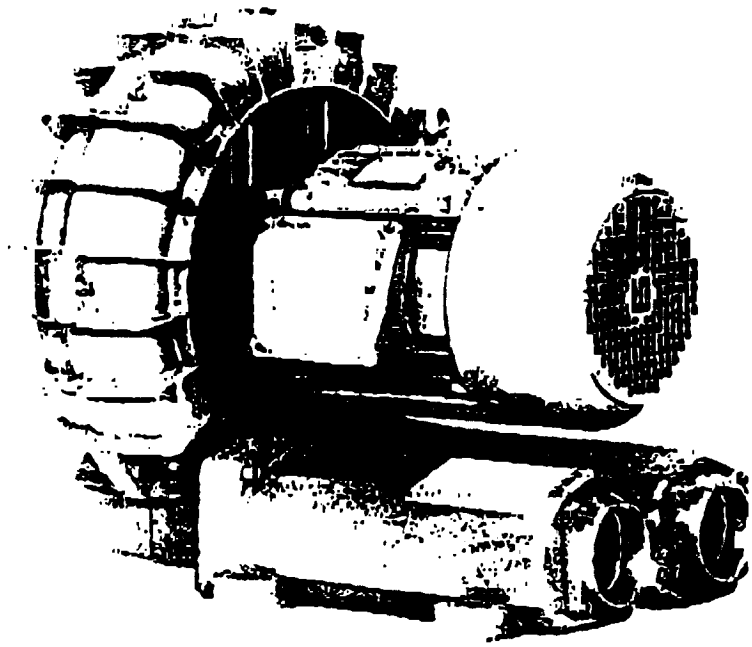
- Manufactured in the USA
- Maximum flow: 384 SCFM
- Maximum pressure: 230" WG
- Maximum vacuum: 12.8" Hg
- 20 HP TEFC motor standard
- Blower construction — cast aluminum housing, dual impellers and cover
- Motor construction — permanently sealed ball bearings
- Inlet and outlet internal muffling
- Quiet operation within OSHA standards
- Shipping weight 400 lbs (182 Kg)

OPTIONS

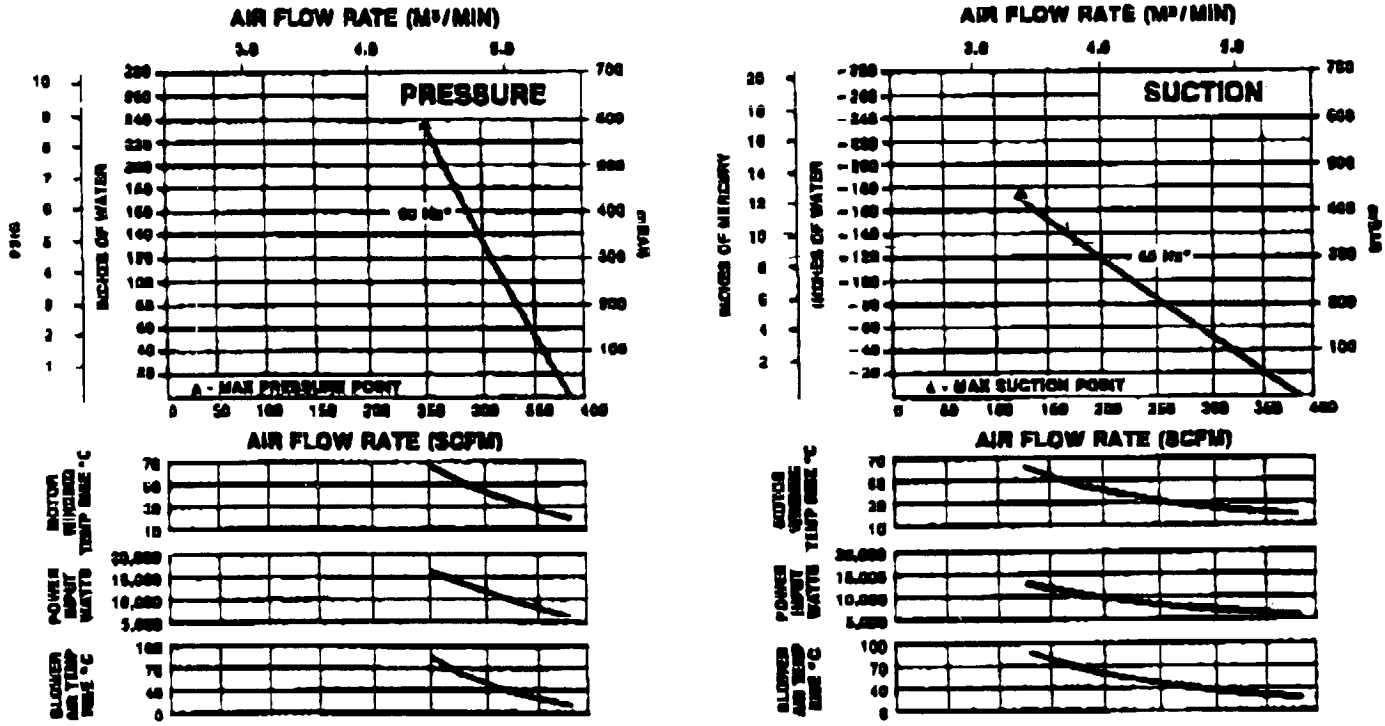
- Other horsepower and voltage motors
- XP motors soon to be available
- Belt drive (motorless) model; for details see Remote Drive Section

ACCESSORIES

- External mufflers
- Inlet and/or inline filters
- For details see Accessories Section



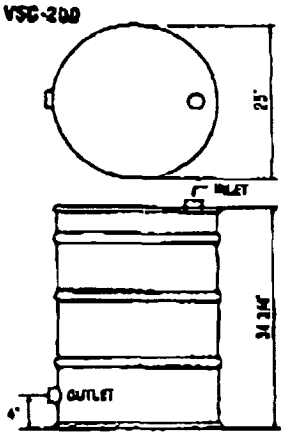
BLOWER PERFORMANCE AT STANDARD CONDITIONS



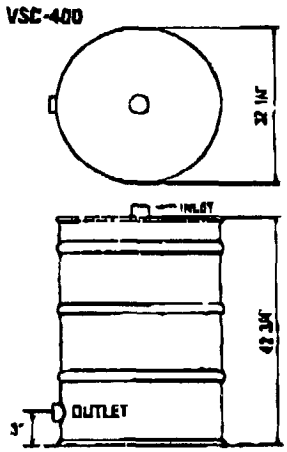
*60 Hz SOON TO BE TESTED

Choose a Vent-Scrub™ system to match your needs.

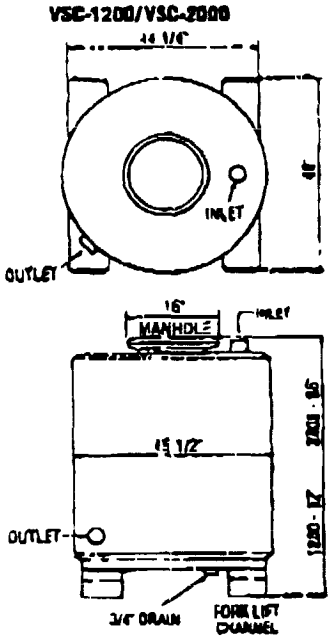
VSC-200



VSC-400



VSC-1200/VSC-2000



Vessel Specifications	VSC-200-2	VSC-400-4	VSC-1200 VSC-2000	VSC-3000[1]	VSC-8000[1]
Inlet Connection	2" FNPT	4" FNPT	4" FNPT	10" Flange	12" Flange
Outlet Connection	2" FNPT	4" FNPT	4" FNPT	10" Flange	12" Flange
Manhole	Top	Top	16" Top	16" Top/20" side	20" top & side
Internal Distribution	Polypropylene	Polypropylene	PVC	Stainless Steel	Fiberglass
Interior Coating	Cured epoxy	Baked enamel	Fusion-bonded epoxy	Fusion-bonded epoxy	Fusion-bonded epoxy
Exterior Top Coating	Enamel	Enamel	Polyester urethane	Polyester urethane	Polyester urethane
Carbon Fill Volume (cu.ft)	4.8	11.4	35/63	100	270
Cross Sectional Area(sq.ft.)	2.8	4.8	11.2	18.0	44.2
Vessel Weight (lbs.): Shipping Weight with CC—601	215	440	1620/ 2340	5700	3600[2]

[1] For VSC-3000 and VSC-8000 dimensional information, contact your WCAS representative.
[2] The VSC-8000 ships without carbon installed. Operating weight is 11,600 lbs.

Operating Specifications

Flow, cfm (max.)	100	300	500	1500	3000
Pressure, psig (max.)	12	6	15	6	15
Vacuum, in. Hg (max.)	18	N/A	12[1]	12[1]	12
Temperature °F. (max.)	140	140	140	140	140

[1] For vacuum greater than 6 in. Hg on VSC-2000 and VSC-3000, contact your WCAS representative.

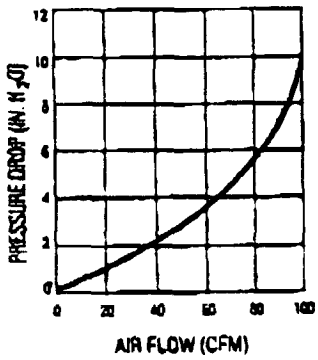
Activated Carbon Specifications[1]

General Applications		
Westates Carbon Model No.	CC-601	
Size	U.S. Sieve 4x10	
Type	Coconut Shell	
Special Applications		
Estates Carbon Model Nos.	KP-801	KG-801
Size	4mm Pellet Extrusion	U.S. Sieve 4x8
Type	Bituminous Coal	Bituminous Coal

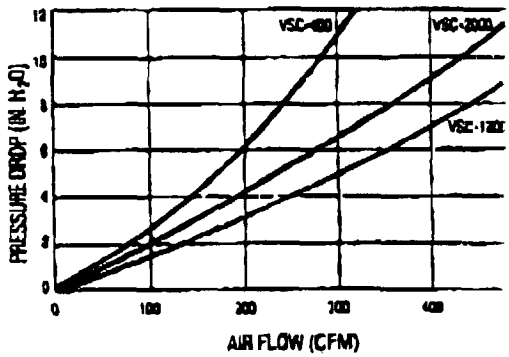
[1] For assistance in selection the proper carbon for your application, see our VOCarb specification sheet or contact your WCAS representative.

Pressure Drop

VSC-200



VSC-400/1200/2000



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