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PITT-01-3-043

January 23, 2003

Mr. Jim Colter (Code EV2/JLC)
Remedial Project Manager
Engineering Field Activity, Northeast
Naval Facilities Engineering Command
10 Industrial Highway, MS#82
Lester, Pennsylvania 19113

Reference: Clean Contract No. N62467-94-D-0888
Contract Task Order 0812

Subject: Design Analysis Report for Air Sparging/Soil Vapor Extraction System at Site 1 – Former Drum Marshalling Area, September 1997.
NWIRP Bethpage, New York

Dear Mr. Colter:

As requested, one copy of the subject report was forwarded to Mr. Steve Scharf of the New York State Department of Environmental Conservation for our meeting next week.

If you have questions or need additional information, please call me at (412) 921- 8375.

Sincerely,

David D. Brayack
Project Manager
/DDB

cc: Mr. R. Boucher (Navy) w/o attachment
Mr. S. Scharf (NYSDEC)
Mr. J. Trepanowski (TtNUS) w/o attachment
File: N4037

Design Analysis Report

for

Air Sparging/Soil Vapor Extraction System at Site 1 - Former Drum Marshalling Area

Naval Weapons Industrial Reserve Plant

Bethpage, New York

Northern Division
Naval Facilities Engineering Command
Contract Number N62472-90-D-1298
Contract Task Order 0213

September 1997

C F BRAUN ENGINEERING CORPORATION

DESIGN ANALYSIS REPORT
FOR
AIR SPARGING/SOIL VAPOR EXTRACTION SYSTEM
AT SITE 1 - FORMER DRUM MARSHALLING AREA

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Northern Division
Environmental Branch Code 18
Naval Facilities Engineering Command
10 Industrial Highway, Mall Stop #82
Lester, Pennsylvania 19113-2090

Submitted by:
C F Braun Engineering Corporation
600 Clark Avenue, Suite 3
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CONTRACT NUMBER N62472-90-D-1298
CONTRACT TASK ORDER 0213

SEPTEMBER 1997

PREPARED BY:

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1.0 INTRODUCTION

1.1 AUTHORIZATION

The Northern Division of the Naval Facilities Engineering Command has issued Contract Task Order (CTO) 0213 to CF Braun Engineering Corporation (CF Braun) under a master agreement with Brown & Root Environmental under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract N62472-90-D-1298. As part of CTO 213, CF Braun collected and tested soil samples to better define the extent of volatile organic compound (VOC) contamination, installed and operated a Pilot Scale Air Sparging/Soil Vapor Extraction System (AS/SVE) from March 1997 to July 1997, and is preparing this Design Analysis Report for implementation of a full scale AS/SVE system. This work is part of the Remedial Design, Phase II, for Site 1 - Former Drum Marshalling Area at the Naval Weapons Industrial Reserve Plant (NWIRP) located in Bethpage, New York.

1.2 PURPOSE OF REPORT

This report and drawings represent the Remedial Action Contract (RAC) design package, which will be used by the RAC contractor as a basis for designing, installing, and operating an AS/SVE System at the NWIRP Bethpage - Site 1. Cleanup of the soils and shallow underlying groundwater at that site is identified in the Record of Decision (ROD) dated May 1995. Specific remedial objectives and cleanup goals are provided in Section 1.3.

1.3 REMEDIAL OBJECTIVES AND CLEANUP GOALS

The remedial activities under the Navy's Installation Restoration Program at the NWIRP Bethpage have been divided into four general units, as follows.

- PCB- and metal-contaminated soils at Sites 1 and 2.
- Low-level VOC-, PCB-, and metal-contaminated soils at Sites 1, 2, and 3.
- Area-wide VOC-contaminated groundwater.
- VOC-contaminated soils and associated shallow groundwater at Site 1.

PCB-contaminated soils at Site 2 were remediated in 1995 via excavation and offsite disposal. PCB- and metal-contaminated soils and cesspool sludge at Site 1 will be remediated following the cleanup of VOC-contaminated soils at that site. The residual low-level contaminated soils at Sites 1, 2, and 3 will be addressed as required in the future based on land use.

Contaminated groundwater is being addressed under a regional groundwater feasibility study (RGFS), in cooperation with Northrop Grumman and Occidental. In addition, Northrop Grumman has installed a groundwater containment system at their southern border. The Northrop Grumman system is designed to capture contaminated groundwater migrating from both the NWIRP Bethpage and Northrop Grumman facilities.

This AS/SVE design specifically addresses the VOC-contaminated soils and associated shallow groundwater contamination at Site 1. The relevant remedial objective from the ROD for the remediation of the soils and shallow contaminated groundwater (10 to 20 feet) at Site 1 is as follows.

- Prevent leaching of contaminants in soils which would result in groundwater contamination in excess of groundwater remediation goals.

The Preliminary Remediation Goals (PRGs) for VOCs in soil to protect groundwater are as follows.

Chemical of Concern	PRG (mg/kg)[1]
Trichloroethene	0.010 - 0.030
Tetrachloroethene	0.027 - 0.081
1,1,1-Trichloroethane	0.010 - 0.030

1. The ROD specifies a modified action level of three times the PRGs to be used to identify the areal extent of contamination. Therefore, the initial target for soil cleanup should be the low concentration within the range of PRGs. However, in the event that this concentration cannot be achieved within a reasonable time frame, then the high concentration within the range can be used.

1.4 BACKGROUND INFORMATION

Site 1 - Former Drum Marshalling Area occupies an area of approximately 4 acres, (See Drawing No. 1). It is surrounded on three sides by a fence and on the fourth side by Plant No. 3. The site is relatively flat, with the eastern portion covered with bare sandy soils, gravel, grass, and a concrete pad. The western portion of the site is predominantly covered with concrete. A vegetated wind row (pine) and fence are present along the eastern edge of the site to reduce community visibility.

The original basis for the environmental work conducted by the Navy at Site 1 resulted from public water supply wells being impacted by VOC contamination. In response to this impact, a regional groundwater quality study was conducted in the 1980s. The results of this study indicated that the Navy's Site 1 is one of several potential sources of a relatively large groundwater VOC plume originating near this area (and others) and extending for several thousand feet to the south (hydraulic downgradient direction).

Several sequential soil and groundwater investigations have been conducted to date, including a Remedial Investigation, pre-design testing investigation, and the AS/SVE pilot study.

The Navy conducted a Remedial Investigation in the early 1990s to investigate potential sources of the VOC contamination, (Halliburton NUS, May 1992 and Halliburton NUS July, 1993). Based on the results of this investigation, the source of the groundwater contamination at Site 1 was determined to originate near the former drum marshalling pads and in particular the northern pad. All shallow groundwater samples collected south of this pad (hydraulically downgradient), as well as a few shallow groundwater samples collected north of the pad, exhibited VOC contamination. However, this area of groundwater contamination also coincides with the location of cesspools at the site. These cesspools could also be a source of the VOC contamination.

Soil testing during the Remedial Investigation determined that Site 1 soils contained VOC, PCB, and arsenic contamination. Subsequent soil testing at the site confirmed the presence of PCB and VOC contamination; however, the arsenic contamination could not be confirmed. In addition, testing of the cesspool contents revealed even higher concentrations of VOCs and

PCBs than those found in the surrounding soils, and revealed the presence of cadmium contamination. Baseline soil and groundwater testing for the AS/SVE pilot study was conducted in March/April 1997. These tests confirmed the presence of VOC-contaminated soils and groundwater in this area.

A summary of available analytical data is presented in Table 1-1. The areal extent of known VOC contamination in soils and groundwater, and PCB contamination in soils is presented on Drawing No. 1. Please note that there are several areas within Site 1 where the exact extent of VOC contamination in soils and cesspool contents is uncertain. However, all of these areas overlay the location of contaminated groundwater. As a result, by addressing the area of groundwater contamination (through air sparging and associated soil vapor extraction), potential unidentified soil contamination in these areas will also be addressed.

A pilot-study air sparge/soil vapor extraction system was operated from April 1997 to July 1997. The preliminary results of this pilot study, and in particular, physical operating parameters, (e.g. radius of influence) were presented in an Interim Results Letter in July 1997. Complete documentation of the pilot study will be presented in a forthcoming report (November 1997).

The conclusions of the AS/SVE pilot study were as follows.

1. Stratification testing results indicate that dense vapor-phase VOCs do not preferentially accumulate near the bottom of an extraction well.

2. Testing of the soil vapor extraction radius of influence showed that the site soils are highly permeable, with extraction rates of 80 cubic feet per minute (cfm) per well achievable. Measured radii of influences ranged from 50 feet at 5 cfm to approximately 100 feet at 80 cfm. A reasonable correlation was developed between flow rate and radius of influence.

TABLE 1-1

SUMMARY OF SOIL AND GROUNDWATER DATA
AIR SPARGING/SOIL VAPOR EXTRACTION
SITE 1 - FORMER DRUM MARSHALLING AREA
NWIRP BETHPAGE, NEW YORK

Chemical of Concern	Maximum Soil Concentration (mg/kg)	Soil PRG (mg/kg)	Maximum Groundwater Concentration (ug/l)	Groundwater PRG[1] (ug/l)
Trichloroethene	158+[3]	0.010	1,500[2]	5
Tetrachloroethene	660[2]	0.021	11,000[2]	5
1,1-Dichloroethane	1.4[3]	*	880	5
1,2-Dichloroethene	9[3]	*	3,600	5
1,1-Dichloroethene	0.016[3]	*	250	5
1,1,1-Trichloroethane	13[3]	0.010	10,000	5

Note that PCBs, pesticides, semi-volatile organics, and metals were also detected in site soils.

1. Groundwater PRGs have not yet been finalized. Values presented are New York State Drinking Water Standards, and do not account for attenuation to the point of compliance. In addition, Northrop Grumman has installed a groundwater collection system, located approximately 4000 feet hydraulically downgradient, which is designed to intercept this contaminated groundwater.

2. Maximum concentration was detected in March/April or July 1997 sampling.

3. Maximum concentration was detected November 1995 to March 1996 testing by Foster Wheeler. Data includes samples collected from the cesspools. The "+" indicates that sample concentration was derived by multiplying TCLP leachate concentration by 20. Actual concentration is likely to be higher.

* No standard has yet been developed. Based on contaminant properties, a PRG similar to 1,1,1-trichloroethane would be expected.

3. Soil vapor extraction at the water table resulted in flow through both the upper and lower unsaturated soil zones. Soil vapor extraction at the middle of the unsaturated zone resulted in flow through the middle of the unsaturated zone, but may have created stagnant flow conditions near the water table.

4. The cesspool structures do not appear to restrict air flow through them.

5. Air injection rates of as high as 60 cfm per well were achieved. However, rates greater than 20 cfm were difficult to consistently achieve and maintain.

6. The air sparging tests were partially successful. An estimated radius of influence of 10 to 40 feet was obtained. Based on the testing data, the radius of influence for air sparging is not a strong function of air flow rate. Chemical results from groundwater testing during the AS/SVE pilot study will be used to refine the radius of influence results.

7. The presence of a clay lens within approximately 5 feet above the water table at one site location requires special consideration for the design of air injection wells. To ensure capture of injected air, soil vapor extraction must be implemented between the clay lens and the point of air injection. Soil boring samples will be required during installation to confirm the location of clay lenses.

8. Based on the testing, soil vapor extraction rates need to be at least 2 to 3 times higher than air injection rates to ensure capture of all injected air.

1.5 REPORT FORMAT

This report is divided into four sections. Section 1.0 is this Introduction. A brief Remedial System Description and individual unit Equipment Design Analysis are provided in Section 2.0. Permitting requirements are presented in Section 3.0. Construction and preliminary operation schedules are provided Section 4.0, along with cost estimates.