DUNN GEOSCIENCE
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12 METRO PARK ROAD
ALBANY, NEW YORK 12205
(518) 458-1313

9 November 1989

Mr. Richard Brazell, P.E.
New York State Department of Environmental Conservation
615 Erie Boulevard West
Syracuse, New York 13204

Subject: **Carousel Mall**
Clark Property
NYSDEC Site No. 734048

Dear Dick:

Two copies of an engineering report for a revised water treatment system for the subject property are enclosed. The revised system retains the usage of activated carbon to treat the water. It also includes an air sparger unit to reduce the concentration of the volatile organics entering the aqueous phase carbon. The air sparger unit will have a vapor phase carbon adsorber to allow recirculation of air resulting in no emission to the atmosphere from the air sparger. The system is designed to process up to 150 gpm.

After reviewing the enclosed report, if you have any questions, please call me at (201) 299-9001.

Sincerely yours,
DUNN GEOSCIENCE ENGINEERING CO., P.C.

Jeffrey L. Duncan, P.E.
Senior Chemical Engineer

JLD: amp
Encl.
cc: Mr. Michael Shanley - S S & R
Tom Johnson w/o attachments

DUNN GEOSCIENCE
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ENGINEERING REPORT
WATER TREATMENT FACILITY
CLARK PROPERTY
SYRACUSE, NEW YORK

PREPARED FOR: SHANLEY, SWEENEY & REILLY
10 THURLOW TERRACE
ALBANY, NEW YORK 12203

PREPARED BY: DUNN GEOSCIENCE ENGINEERING CO., P.C.
12 METRO PARK ROAD
ALBANY, NEW YORK 12205

THIS REPORT IS PREPARED FOR NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION REVIEW FOR PERMITTING PURPOSES ONLY. THE REPORT IS NOT INTENDED FOR THE PURPOSES OF CONSTRUCTION.

JEFFREY L. DUNCAN
NEW YORK STATE PROFESSIONAL ENGINEER
NUMBER:063006-1

9 NOV 89
DATE

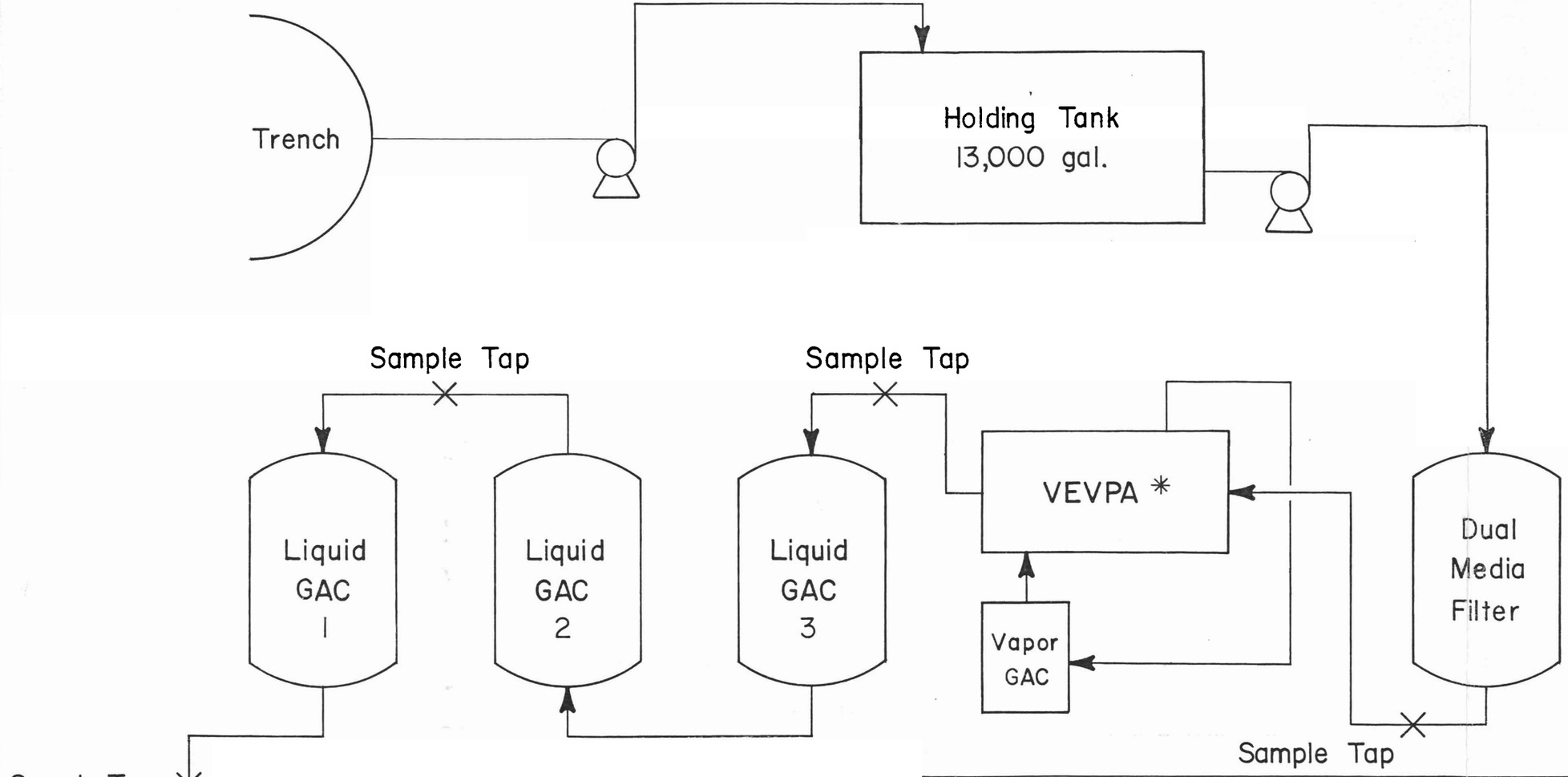
INTRODUCTION

This report documents proposed changes to the wastewater treatment system for the Terra Vac sytem at the Clark Property in Syracuse, New York. The existing system was described in the "Revised Pilot Study Work Plan for Proposed Site #734048" prepared in August 1989. This report documents only the changes to the August 1989 document. All other portions of the August 1989 report remain unchanged.

The Terra Vac pilot plant was started in September 1989 following New York State Department of Environmental Conservation (NYSDEC) approval of the August 1989 report. The system was shut down in less than one week due to insufficient water withdrawal to allow proper performance of the Terra Vac vapor extraction system. Following the shut down, it was decided to complete the enclosure of the Clark site by installing a driven sheet pile wall around the remainder of the site perimeter which was not already walled, and construct a trench system to withdraw the contained water within the wall.

The dewatering of the Clark site by way of the trench system is anticipated to generate larger flowrates of water than the dewatering pumps installed inside the Terra Vac withdrawal wells because of the area available for dewatering. The quantity of water could be larger than the capacity of the water treatment system described in the August 1989 report (20 55-gallon drums). Therefore, an alternative water treatment system has been designed.

The alternative system is presented in schematic form in Figure 1. The new system still uses activated carbon to achieve water treatment. The system will have a filter in front of the carbon columns to remove suspended solids from the water stream to avoid plugging of the carbon beds. The water will then be treated using an air sparger system to volatilize the organics. The organics which are transferred to the air in this unit will be captured by vapor phase activated carbon. The partially treated water will then go through three carbon beds in series. The first bed (Liquid GAC No. 3 in Figure 1) is to protect the next two beds from substances which may prevent the carbon from being reactivated. This type of protection is also installed on the Marley property next door to the Clark property. The next two beds of carbon (Liquid GAC Nos. 1 and 2) serve similar



* Volatilization Enhancement and Vapor Phase Adsorption

Jeffrey L. Duncan 9NOV89

JEFFREY L. DUNCAN
NEW YORK STATE PROFESSIONAL ENGINEER
NUMBER: 063006-1

NOTES:

This drawing is prepared for New York State Department of Environmental Conservation review for permitting purposes only. The drawing is not intended for the purposes of construction.

Unauthorized alteration or addition to this drawing is a violation of Section 7209, Subdivision 2, of the New York Education Law.

DUNN GEOSCIENCE ENGINEERING CO., P.C.
12 Metro Park Road
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CLARK PROPERTY
DEWATERING-WATER TREATMENT SYSTEM SCHEMATIC
SYRACUSE, NEW YORK

PROJECT Nº 2371-1-455	DATE 11/3/89
SCALE NONE DWG Nº 67	FIGURE Nº

145531

purposes as did the primary and secondary units described in the August 1989 report. Unit No. 2 is the primary bed. Unit No. 1 is the secondary bed.

CONTAMINANT LOADS AND TREATABILITY

The August 1989 report presented the anticipated water quality to be treated by the carbon system. The total VOC concentration was estimated to be 214 ppm in that report. Similar analytical data were observed during the one sampling period during the short operation of the Terra Vac system (Table 1). Dissimilar data were observed during pumping of water during construction dewatering for the trench construction (Table 1). The later data are associated with construction of the dewatering trench which was constructed in the cleaner perimeter of the walled site for health and safety conerns. Therefore, the water is expected to be cleaner than within the contaminant plume.

TABLE 1
ANALYTICAL DATA
CLARK PROPERTY; SYRACUSE, NEW YORK

Date	Day	Influent VOC Conc. (ppm)
9-30-89		199.1 *
10-19-89	1	143.28
10-20-89	2	25.03
10-21-89	3	9.79
10-22-89	4	12.28
10-23-89	5	15.72
10-24-89	6	34.62
10-25-89	7	51.92
10-26-89	8	60.26
10-27-89	9	No Data
10-28-89	10	131.94
10-29-89	11	125.68
10-30-89	12	147.54
10-31-89	13	108.97
11-1-89	14	88.12
11-2-89	15	81.84

* Terra-Vac Pilot Test

Dewatering activities have begun - using the existing carbon system to treat the generated water. On-site GC analysis of the water fed to the carbon system is performed each day. These results are presented in Figure 2, which presents the total Volatile Organic Compound (VOC) concentration as a function of time. This curve indicates the concentration has peaked and begun to decline. Based on the location of the trench (generally in cleaner parts of the site) and the concentrations of VOCs detected during earlier site investigations the concentration in the generated water is anticipated to increase to an elevated value and reach an equilibrium concentration. The peak and subsequent decline observed in Figure 2 is not anticipated. However, if an exponential curve is drawn using the same data (Figure 3), the anticpated concentration may be estimated. The total estimated VOCs at the equilibrium concentration is 126 mg/l. Assuming the parameters previously detected in the water retain their comparative concentrations, the anticipated feed water quality, at equilibrium, is presented in Table 2.

TABLE 2
ESTIMATED GROUNDWATER QUALITY
CLARK PROPERTY; SYRACUSE, NEW YORK

Compound	Conc. (ppb)
Vinyl Chloride	2,790
Methylene Chloride	250
1,1 Dichloroethylene	240
1,1 Dichloroethane	1,230
cis 1,2 Dichloroethylene	19,100
1,2, Dichloroethane	30
1,1,1 Trichloroethane	11,160
Trichloroethylene	67,580
Tetrachloroethylene	110
Toluene	23,510

Some of these compounds (e.g. Vinyl chloride) are preferentially removed by air sparging and some are preferentially removed by adsorption onto activated carbon. Therefore, the proposed system will incorporate both treatment technologies.

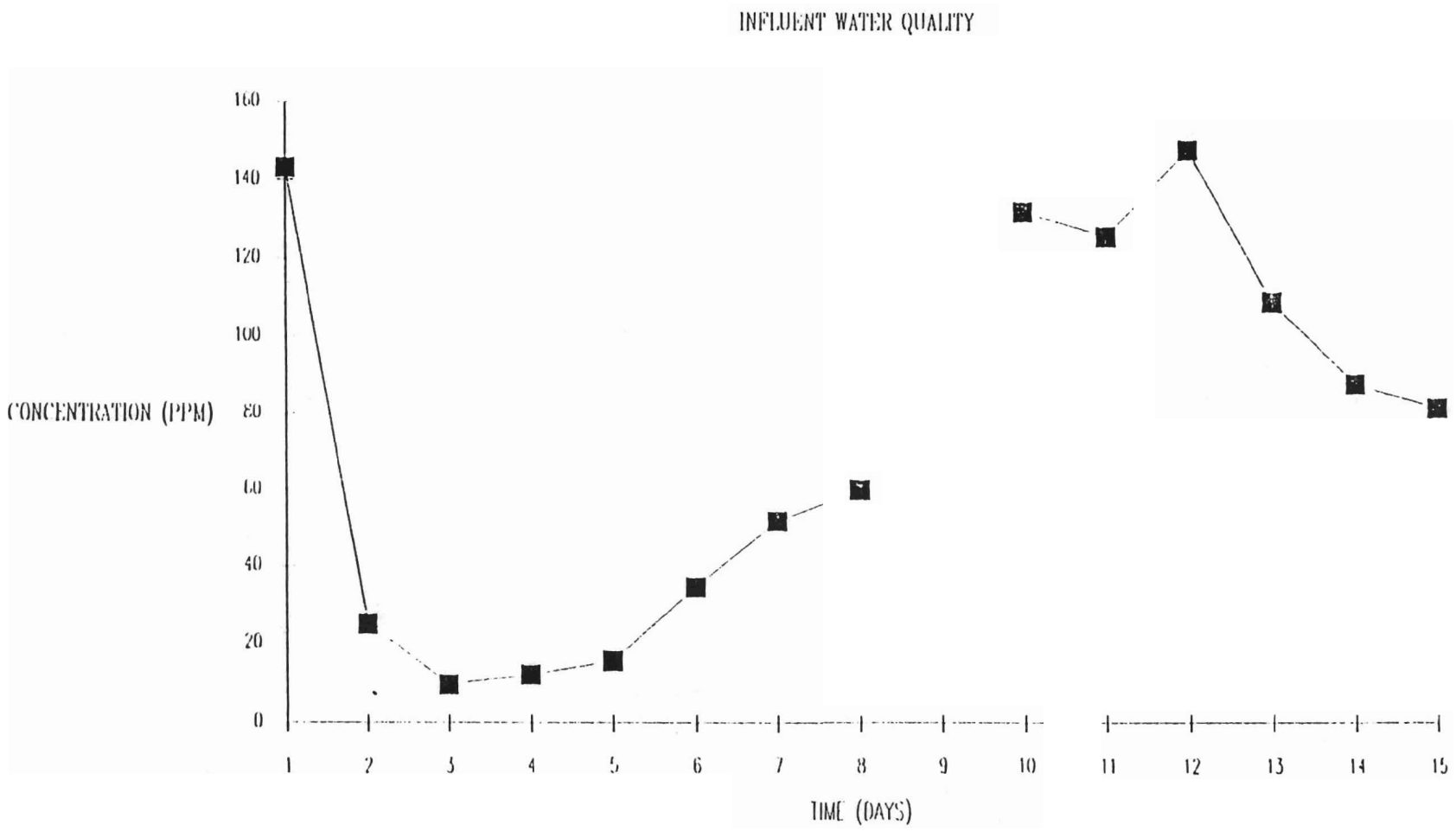
INFLUENT WATER QUALITY
CONCENTRATION (PPM)
160
140
120
100
80
60
40
20
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
TIME (DAYS)

Figure 2

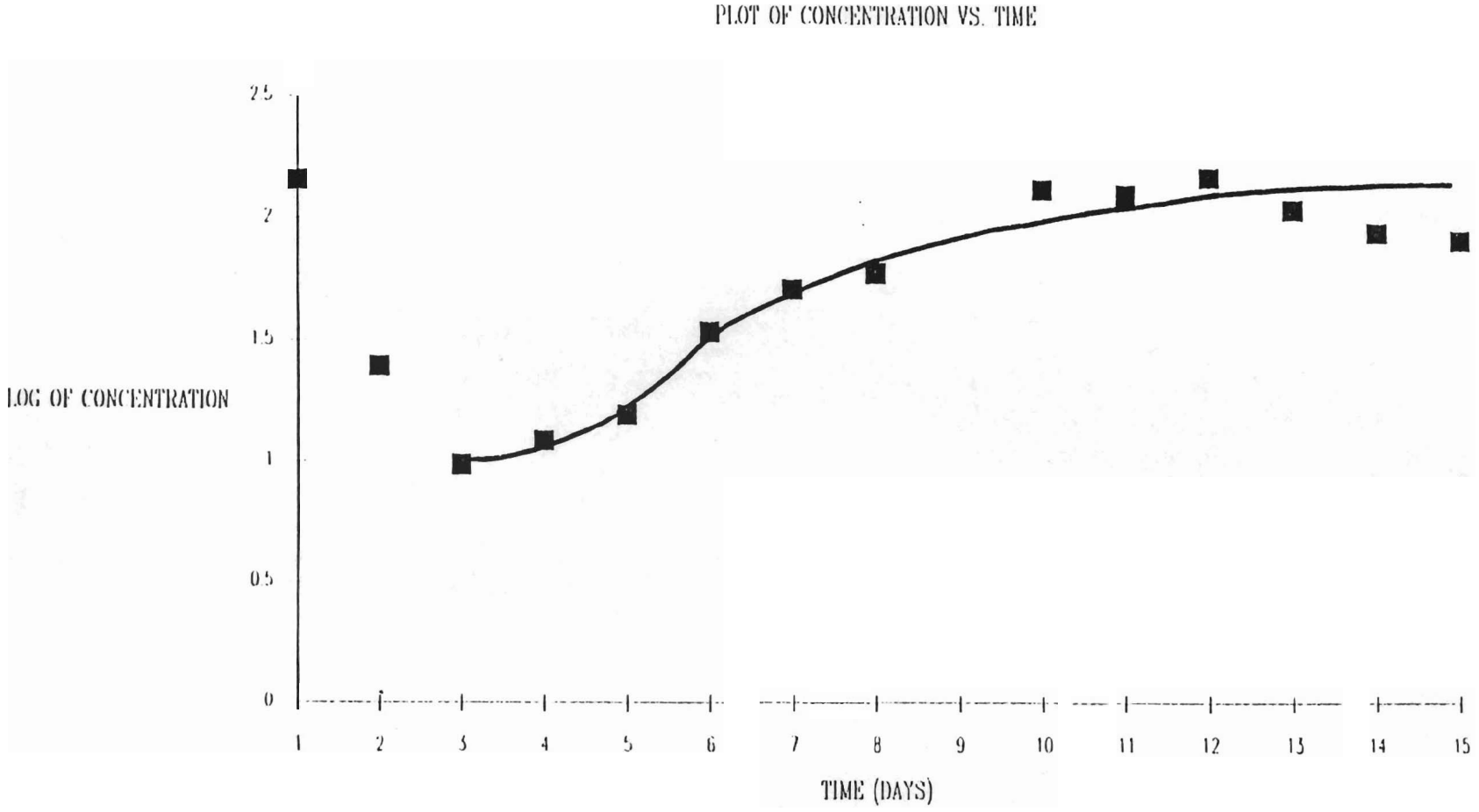
PLOT OF CONCENTRATION VS. TIME
LOG OF CONCENTRATION
2.5
2
1.5
1
0.5
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
TIME (DAYS)

Figure 3

SUSPENDED SOLIDS REMOVAL

The water removed from the trench will be pumped into a 13,000 gal holding tank for settling of larger solids. The water will then be pumped to a pressure vessel for solids filtering. The vessel will contain approximately 18 in of anthracite overlaying approximately 18 in of sand. The anthracite will be a rough filter and the sand a polishing filter.

AIR SPARGING

The water, after particulate matter removal, will enter a volatilization enhancement and vapor phase adsorption (VEVPA) unit. This unit will blow air through a sparger to volatilize the volatile organics. The organics which are transferred to the air will be removed by vapor phase activated carbon. The air will then be recycled through the VEVPA. Therefore, there will not be any air emissions from this unit.

The vapor phase activate carbon system (Vapor GAC in Figure 1) will consist of one carbon unit. The unit will hold 10,000 lbs of vapor phase activated carbon. The vapor phase carbon usage rate is estimated to be 1438 lb/day, based on the following assumptions:

- The liquid flowrate is 150 gpm.
- The average volatilization efficiency of the air sparger unit is 95%.
- The adsorption capacity of the vapor phase carbon is 15% by weight.

Based on a 95% volatilization efficiency, the average contaminant concentration remaining in the aqueous phase following air sparging is 6 ppm. At a flowrate of 150 gpm, the average mass of contaminants being transferred to the vapor phase, therefore, is 215 lb/day. Assuming an adsorption capacity of 15% by weight, a carbon usage rate of 1438 lb/day is calculated.

The estimated concentration of organics in the water after the air sparging system is presented in Table 3.

TABLE 3
ESTIMATED GROUNDWATER QUALITY AFTER AIR SPARGING
CLARK PROPERTY; SYRACUSE, NEW YORK

Compound	Conc. (ppb)
Vinyl Chloride	140
Methylene Chloride	10
1,1 Dichloroethylene	10
1,1 Dichloroethane	60
cis 1,2 Dichloroethylene	960
1,2, Dichloroethane	10
1,1,1 Trichloroethane	560
Trichloroethylene	3380
Tetrachloroethylene	10
Toluene	1180

These concentrations are based on a 95% removal efficiency in the air sparger system.

CARBON USAGE CALCULATION

The capacity of the treatment system is designed to be 150 gpm. The primary and secondary carbon units each contain approximately 14,000 lbs of activated carbon, which occupies a volume of 3300 gallons. At 150 gpm this allows for approximately 22 min of residence time in the aqueous phase carbon contactor. Residence time is the time required for the water flow to pass through the empty contactor.

It should be noted that although the system is designed for a flowrate of 150 gpm, it is possible that the observed flowrates may be less than 150 gpm. If this is the case, flow restriction will be employed to prevent channeling in the carbon units.

The calculated carbon consumptions are presented below.

The average total influent VOC concentration, based on a 95% removal efficiency in the air sparger system, is 6320 ppb. At a flowrate of 150 gpm, the average total mass of contaminants into the aqueous phase carbon unit is 11.4 lb/day. The adsorption capacity of the aqueous phase carbon is assumed to be 5% by weight. The carbon usage rate, therefore, is 227 lb/day.

The remaining liquid carbon unit will be used to protect the other two units. Although the analytical data to date do not show PCBs are present on the Clark property, the unit was considered to be a safeguard. The agreement with the carbon supplier for the Marley property allows the carbon from the primary and secondary carbon units to be regenerated and reused provided the "sacrificial unit" (No. 3 in this design) is in service to remove any PCBs. The carbon from the sacrificial unit will be disposed of as a PCB contaminated waste unless analytical data may show PCBs are not present.

OPERATIONS MONITORING

The effluent quality and carbon consumption monitoring will be performed as defined in the August 1989 report. The same effluent quality limits and breakthrough monitoring will be used.

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ENGINEERING REPORT
TERRA VAC PILOT PLANT STUDY
CLARK PROPERTY
SYRACUSE, NEW YORK

PREPARED FOR: SHANLEY, SWEENEY & REILLY
10 THURLOW TERRACE
ALBANY, NEW YORK 12203

PREPARED BY: DUNN GEOSCIENCE ENGINEERING CO., P.C.
12 METRO PARK ROAD
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JEFFREY L. DUNCAN
NEW YORK STATE PROFESSIONAL ENGINEER
NUMBER: 063006-1

18 August 1989
DATE

INTRODUCTION

The following sections provide detailed information regarding the anticipated contaminant loading, water treatability, and carbon usage during the proposed pumping test and pilot-plant operation of the vacuum extraction system (Terra Vac) at the Clark property. The Clark property is located east of the Barge Canal and south of Onondaga Lake in Syracuse, New York.

A pumping test will be performed prior to the start up of the Terra Vac pilot plant. The proposed pumping test consists of a step test and a 72-hr constant-rate test. The pumping test results will be used to evaluate the hydraulic characteristics of that portion of the Clark site currently with monitoring wells.

The Terra Vac pilot plant for the Clark Property will be operated to remove both groundwater, and volatile organics from above the groundwater. The results of the pilot-plant test will be used to scale up the system, if Terra Vac is applicable to the remediation of the site, to full scale. The groundwater will be pumped from the vacuum extraction wells to lower the water table. A vacuum will be applied to the vacuum extraction wells to remove soil gas from unsaturated soils. The soil gas may contain fine particulates and water. The pumped water may contain fine particulates. The soil gas will pass through a gas-water separator. The water from the gas-water separator and the water from the wells will pass through a solids removal system.

The attached drawing entitled "Terra Vac Pilot Plant; Clark Property; Syracuse, New York" presents a simplified schematic of the system. This drawing is not meant for construction, but is only intended to depict the relationship between the different components of the system.

CONTAMINANT LOADS AND TREATABILITY

The groundwater at the Clark property site is contaminated with chlorinated organics and aromatic hydrocarbons. The results of the Clark property site investigation were previously submitted ("Report on Hydrogeologic Conditions at the Clark Property", September 1988). The compounds and their respective

concentration expected in the groundwater feed to the Terra Vac pilot plant are shown in Table 1.

TABLE 1
ESTIMATED PILOT PLANT FEED QUALITY
CLARK PROPERTY; SYRACUSE, NEW YORK

Compound	Conc.(ppb)
Vinyl Chloride	4,750
Methylene Chloride	420
1,1-Dichloroethylene	400
1,1-Dichloroethane	2,100
cis 1,2-Dichloroethylene	32,500
1,2-Dichloroethane	50
1,1,1-Trichloroethane	19,000
Trichloroethylene	115,000
Tetrachloroethylene	180
Toluene	40,000

This composition is based on a composite of water removed from the monitoring wells prior to the start of the treatability testing.

The compounds present are generally removable from water using granular activated carbon (GAC) treatment. Calgon Carbon Corporation (Calgon) was contracted by Dunn to perform a treatability study on the composite sample. The study provided treatability data for each compound. The results are discussed in a Calgon report entitled "Accelerated Column Test (ACT) for the Removal of Chlorinated Organic Compounds and Toluene from Groundwater", dated March 9, 1989. Applicable portions of this report are included in Appendix A of this document. The test results indicate that GAC is a viable treatment alternative. Carbon usage during the pumping and pilot-plant tests has been estimated, and is presented later in this document.

SOLIDS AND METALS

The Terra Vac System will be set-up to handle solids produced by the wells. Calgon has performed analysis of samples from the site and determined that suspended solids removal may be required prior to aqueous-phase carbon treatment. The Terra Vac system will be equipped with a settling tank and a 10 micron filter to remove particulate matter. Analytical data for metals, with the exception of iron, was not collected during the ACT.

The purpose of the pilot test is to determine the operating parameters for the process. Solids and dissolved metals may lower the efficiency of carbon adsorption. The carbon may need to be changed at a higher frequency. The pilot plant will be monitored to evaluate the site-specific operating conditions via sampling and analysis.

CARBON USAGE CALCULATION

The purpose of this calculation is to determine the carbon-usage rates during the pumping tests and operation of the proposed vacuum extraction system pilot plant at the Clark property. The carbon-usage rates have been estimated using the anticipated pumping rates during the proposed pumping test and pilot plant operation, data provided from Calgon's ACT performed during February 1989, and a feed composition equal to that presented in Table 1.

Calgon estimated the carbon-usage rate to be 495 lbs/day under the following conditions:

- a flow rate of 60 gpm,
- a feed composition as presented in Table 1, and
- a carbon bed residence time of 30 min.

Anticipated Pumping Rates

The groundwater is anticipated to be pumped at differing rates and durations during the pumping and pilot tests. These rates and durations were determined using a mathematical simulation of a pumping test in the existing vacuum extraction wells. Appendix B contains a brief summary of the model used.

The model was used to estimate the pumping rates from five existing vacuum extraction wells. These wells (VE-1, 2, 3, 4, & 5) were previously installed on-site. Existing vacuum extraction wells VE-2 and VE-3 were installed to 14 feet and 10 feet, respectively. The three existing deep vacuum extraction wells (VE-1, VE-4 and VE-5) were each installed to a depth of approximately 28 feet. Flow rates from each well were adjusted in the model to maximize the groundwater drawdown rate without causing the simulation to generate a water level below the bottom of three existing deep extraction wells. An attempt was made during the simulation to maintain the groundwater level 8 to 10 ft above the base of the deep extraction wells.

The input variables [hydraulic conductivity (5 x 10^{-3} cm/s), aquifer thickness (20 ft.), and specific yield (0.15)] used to characterize the aquifer in which the pumping rates were assessed, were based on welltest results provided in the September 1988 report on the hydrogeologic investigation of the Clark property.

The effects of pumping these five wells were simulated with the analytical model according to the following conditions:

- The shallow wells were pumped until the simulated groundwater elevation was below their respective bases.
- The pumping rate was diminished over time in each of the deep wells in order to maintain the designed drawdown of 15 feet.

Based on the results of the analytical model and the limitations thereof, the pumping rates for the duration of the pilot study were estimated. The estimates are presented in Table 2.

Prior to full scale pumping for the pilot study, a step-rate pumping test will be performed to confirm the pumping rates shown in Table 2 for the pilot plant test and to determine hydraulic characteristics of the subsurface. Extraction well VE-1 will be pumped using 4 steps of 100 minutes each (10, 20, 30 and 50 gpm) to yield a total withdrawal of approximately 11,000 gallons of groundwater.

The pumped water will be treated using the aqueous-phase activated carbon units which are part of the Terra Vac pilot plant system. The treated water will be

stored in the storage tank until the VES system is started. A vacuum will not be drawn on the extraction wells during the step-rate pumping test.

TABLE 2

Pumping Rate for Each Well (gpm)

Terra Vac Pilot-Plant Test

Clark Property; Syracuse, New York

Time Since Pumping Began (Days)[1]	VE-1	VE-2	VE-3	VE-4	VE-5	Total Pumping Rate (gpm)
0	30	25	25	30	30	140
2 hrs	30	25	pump off	30	30	115
10 hrs	30	pump off	--	30	30	90
1	20	--	--	20	20	60
5	15	--	--	15	15	45
14+	10	--	--	10	10	30

The higher rates (greater than 10 gpm) are required to lower the water table to allow soil vacuuming. The 10 gpm flow rate is necessary to maintain the artificial vadose zone during the pilot test.

Estimated Carbon Use During Pumping and Pilot Tests

The carbon-usage rates associated with the anticipated pumping rates have been estimated. The rates are estimated based on the following assumptions:

- o the influent composition throughout the pilot-plant test duration will be similar to the composition used for the ACT (Table 1);
- o the shorter contact time for the first 24 hrs of the pumping test due to a higher flow rate than used by Calgon in their design basis will not adversely affect the overall carbon usage;
- o the carbon usage rate is linearly dependent on the mass feed rate of organics; and,

1 Unless otherwise noted.

- o the carbon-usage rate for the representative feed composition with a 30 min residence time is 495 lb/d.

The following carbon-usage rates during the step-rate pumping test are estimated:

100 min at 10 gpm

$$\frac{10\text{gpm}}{60\text{gpm}} \times (495\text{lb/d}) \times \frac{1\text{ day}}{24\text{ hr}} \times \frac{1\text{ hr}}{60\text{ min}} \times 100\text{ min} = 6\text{ lb}$$

100 min at 20 gpm

$$\frac{20\text{gpm}}{60\text{gpm}} \times (495\text{lb/d}) \times \frac{1\text{ day}}{24\text{ hr}} \times \frac{1\text{ hr}}{60\text{ min}} \times 100\text{ min} = 12\text{ lb}$$

100 min at 30 gpm

$$\frac{30\text{gpm}}{60\text{gpm}} \times (495\text{lb/d}) \times \frac{1\text{ day}}{24\text{ hr}} \times \frac{1\text{ hr}}{60\text{ min}} \times 100\text{ min} = 17\text{ lb}$$

100 min at 50 gpm

$$\frac{50\text{gpm}}{60\text{gpm}} \times (495\text{lb/d}) \times \frac{1\text{ day}}{24\text{ hr}} \times \frac{1\text{ hr}}{60\text{min}} \times 100\text{ min} = 30\text{ lb}$$

Estimated Step-Rate Pumping Test Carbon Use: 65 lb

The following carbon-usage rates during the pilot plant test are estimated:

0-2 hr at 140 gpm

$$\frac{140\text{ gpm}}{60\text{ gpm}} \times (495\text{ lb/day}) \times \frac{1\text{ day}}{24\text{ hr}} \times 2\text{ hr} = 100\text{ lb}$$

2-10 hr at 115 gpm

$$\frac{115\text{ gpm}}{60\text{ gpm}} \times (495\text{ lb/day}) \times \frac{1\text{ day}}{24\text{ hr}} \times 8\text{ hr} = 320\text{ lb}$$

10-24 hr at 90 gpm

$$\frac{90\text{ gpm}}{60\text{ gpm}} \times 495\text{ lb/day} \times \frac{1\text{ day}}{24\text{ hr}} \times 14\text{ hr} = 430\text{ lb}$$

day 1 to day 5 at 60 gpm

$$495\text{ lb/day} \times 4\text{ days} = 1980\text{ lb}$$

day 5 to day 14 at 45 gpm

45 gpm / 60 gpm	x	495 lb/day x	9 days =	3,340 lb

day 14 to day 30 at 30 gpm

30 gpm / 60 gpm	x	495 lb/day x	16 days =	3,960 lb

Estimated Pilot Plant Carbon Use:	10,130 lb
Estimated Project -Total Carbon Use:	10,195 lb

The total amount of carbon to be used during the pump tests and VES pilot test is approximately 10,000 lbs. The Terra Vac pilot plant will be equipped with ten primary and secondary carbon canisters of 1,000 lbs each. The primary canisters will be operated in parallel. The effluent from each primary canister will be the influent to one secondary canister. Therefore, it is estimated that the useful life of the carbon in the primary canisters will be spent at the end of the pilot-plant test. The carbon in the secondary canisters will be provided as a back up to maintain acceptable effluent quality from the pilot plant during the test.

It is not anticipated to require changeout of the carbon canisters during the duration of the pumping test and pilot-plant test (30 d).

DURATION OF PILOT PLANT OPERATIONS

The pilot-plant and pumping tests will be run long enough to develop sufficient data to determine if the objectives of the study have been achieved. Nominally, these tests are estimated to last a cumulative period of 30 days. During this period, an estimated 1,767,600 gal of groundwater will have been withdrawn from beneath the Clark property, treated, and discharged.

The test duration may be different than the 30 days. A decision tree (attached) will be used to provide a means to determine when the pilot-plant test is complete.

OPERATIONS MONITORING

Discharge Monitoring

Monitoring of the liquid stream as it passes through the Terra Vac system will be performed during the pilot study. Samples will be collected to evaluate the quality of the discharge from the Terra Vac Pilot Plant. In addition, on a less frequent basis, the feed to the treatment system and a representative sample of the water between the primary and secondary carbon units will be collected. Table 3 presents the sample frequency and the sample analyses to be performed during the pilot plant test. Each sample will be collected as a grab sample at the respective location (except for PCB analysis which will be a 6 hour composite) and will be submitted to a New York State DEC Certified Laboratory for organic and inorganic analysis. The discharge flow will be continuously monitored and recorded. The analyses will be requested on a rapid turnaround basis (less than one week). The results will be available to NYSDEC Region 7 and the Onondaga County Health Department at the site upon receipt. A copy of the results will be sent to the NYSDEC Region 7 and the Ononadaga County Health Department within one business day of the data receipt. The results will be certified by the laboratory manager and will be sent under cover signed by a Conklin Ltd. corporate official.

Carbon Usage Monitoring

Breakthrough of the primary activated carbon canister will be monitored using analytical results for 1,1-DCA (1,1-Dichloroethane). 1,1-DCA was chosen as the breakthrough monitor because Calgon determined, during the ACT, that 1,1-DCA was the first constituent to be detected in the test column effluent which has a NYS DOC imposed daily maximum discharge limit of 10ug/l and was monitored during the ACT.

Only one compound (MTBE) has a lower daily maximum discharge limitation (5ug/l). This compound was not analyzed for during the site investigation. Therefore, MTBE analysis in between the primary and secondary carbon canisters will also be monitored.

According to the results from the ACT, vinyl chloride was the first substance to break through. The daily maximum discharge limit for this substance is at least five times higher than the other regulated substances. Therefore, this substance is not proposed for breakthrough determination. However, it will be monitored in the treatment system effluent. The effluent concentration will be checked against the daily maximum discharge limitation. If the vinyl chloride concentration in the system effluent exceeds 50ug/l of the daily maximum discharge limit for three consecutive sampling periods before 1,1-DCA or MTBE is detected in the water discharging from the primary carbon canister, breakthrough will be determined to have occurred.

If breakthrough, as determined by detecting 1,1-DCA or MTBE in the discharge from the primary carbon units or by finding vinyl chloride in excess of 50% of its daily maximum concentration in the system effluent during three consecutive sampling events, occurs during the pilot plant test, the primary carbon units will be removed from service, the secondary units will become the primary units, and new carbon canisters will be put in service as secondary units.

WASTE DISPOSAL

All carbon will be taken off-site after completion of the pilot-plant test to be regenerated, or for disposal in accordance with local, state, and federal regulations.

All water generated during the pumping tests and pilot plant operation will be discharged to surface water (the Barge Canal) after treatment.

All solids which have settled in the settling tank will be disposed of off-site in accordance with local, state, and federal regulations.

TABLE 3

TERRA VAC PILOT PLANT

CLARK PROPERTY, SYRACUSE, NEW YORK

MONITORING PLAN

PARAMETER	FREQUENCY[1]			ANALYTICAL PROCEDURE[2]
LOCATION:	1	2	3[3]	
pH	1	1	2	150.1[4]
Aluminum	1	1	2	6010
Iron	1	1	2	6010
Lead	1	1	2	6010
Manganese	1	1	2	6010
Total Suspended Solids	1	1	2	160.2
Oil and Grease	1	1	2	413.2
Naphthalene	1	1	2	610 or 625
Phenol	1	1	2	604 or 625
PCBs	1	1	5/mo[5]	608
Purgeable Halocarbon	1	1	2	601 or 624
Purgeable Aromatics[6]	1	1	2	602 or 624
MTBE[7]	1	1	2	624[8]
2-butanone	1	1	2	624

Notes:

1. Frequency numbers indicate the number of samples collected per week during the duration of the pilot test for analysis unless otherwise indicated.

2. 1xx and 4xx series analyses from Methods for Chemical Analysis of Water and Wastes EPA 600/4-79-020

   6xx series analyses from Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater EPA 600/4-82-057

   6xxx series analyses from Test Methods for Evaluating Solid Waste SW-846

3. Location 1 is the inlet to the activated carbon treatment system.

Location 2 is one sample from the transfer line from a primary carbon canister to its corresponding secondary carbon canister.

Location 3 is a sample from the treatment system discharge after the storage tank.

4. This measurement will be performed in the field using a calibrated pH meter.

5. This sample will be a 6-hour composite comprised of equal-volume grab samples collected once per hour during the 6-hour period.

6. Modified to include calibration for xylenes.

7. Methyl Tertiary Butyl Ether.

8. Forward library search for MTBE.