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C-49-09-5-258

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Project Number 5563

Mr Jim Colter (Code 1823)
Remedial Project Manager
Northern Division
Naval Facilities Engineering Command
10 Industrial Highway MS#82
Lester, Pennsylvania 19113

Reference Contract No N62472-90-D-1298
CTO No 0223

Subject Nitrogen Addition - Air Sparging/Soil Vapor Extraction Pilot Study
NWIRP Calverton New York

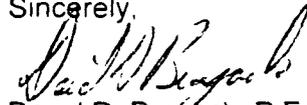
Dear Mr Colter

In support of a pilot-scale air sparging/soil vapor extraction system being conducted at the NWIRP Calverton, CF Braun is planning on applying approximately 175 pound of ammonium nitrate (61 pounds as N) solution to a test area at Site 2 on September 28, 1995, (see Figure 1). The application would be in accordance with the Work Plan and is based on the finding of no measurable levels of nitrogen in site soils. Note that the test area was selected because of the presence of a free product layer in this area. Calculations on the basis for the application rate are attached.

As discussed, this letter is being faxed to Suffolk County and the New York State Department of Environmental Conservation for their review.

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

Sincerely,


David D. Brayack, P.E.
Project Manager

cc Mr R Boucher (Navy) w/o attachment
Mr D Rule (Navy) w/o attachment
Mr S Lehman (Navy)
Mr J McCullough (NYSDEC)
Mr J Pim (Suffolk County)
Mr J Farrell (HNUS) w/o attachment
Mr D Hutson (HNUS)
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CTO 223 - CALVERTON AIR SPARGING/VAPOR EXTRACTION PILOT STUDY	
Proposed Nitrogen Addition at the end of month of operation.	
Basis:	Add nutrients to soils to determine if biodegradation rates can be increased. Carbon dioxide concentrations in extraction wells will be tracked.
Existing soil data, collected at groundwater interface on 7/31/95	
Kjeldahl Nitrogen:	ND at all three locations
Phosphorus:	17, 41, 33 mg/kg
Determine nitrogen requirements based on oxygen uptake and total quantity of organics present.	
Set up a 80 x 80 foot test cell and control cell in the area of free product, see Figure 1.	
Total quantity of organics present, with an estimated 2 inches of free product, and 25% porosity.	
80'x80'x(2/12)'x0.25x60 lb/CF	16,000 pounds of organics
At a typical BOD to organic ratio of 2.7:	43,200 pounds of BOD equivalent
Total nutrient requirements, assuming only partial re-utilization of nutrients are	
Nitrogen (as N), 5% of BOD:	2,160 pounds
Phosphorous (a P), 1% of BOD:	432 pounds
Comment: This quantity of nutrients can not be directly added to the system in one step. Therefore, estimate requirements based on one month of biodegradation. Note that system is also oxygen limited, and the availability of oxygen is a limiting factor.	
Oxygen is currently being introduced into this area through two air injection wells, each discharging approximately 9 CFM.	
This corresponds to:	
$2 \times 9 \text{ CFM} \times 0.075 \text{ lb/CF} \times 0.21 \text{ (\% oxygen)} \times 1440 \text{ min/day} \times 30 \text{ day/month}$	
=	12,247 pounds of oxygen/month
Because of mass transfer considerations and non-ideal flow patterns, it is likely that only approximately 10 to 20% of the oxygen is being used by the system.	
For a 10 percent utilization, BOD reduction is:	
	1225 pound of BOD reduction/month
Nitrogen requirement, @5%:	61 pound of nitrogen
Phosphorous, @1%:	12 pounds of phosphorous

For a 1 foot soil zone of biological activity, the equivalent soil concentration would be:

Nitrogen: $61 / [(80' \times 80' \times 1') \times 100 \text{ lbs/CF}]$

= 95 mg/kg

Phosphorous = 19 mg/kg

Based on a comparison of the nutrient requirements with analytical results, nitrogen addition is required, but phosphorous addition is not required.

Check to see what would happen if all of the nitrogen enters the groundwater in mass.

Use a 10 foot thick mix zone for the groundwater.

Maximum groundwater concentration:

$61 \text{ lbs} / (80' \times 80' \times 10' \times 0.25 \text{ (porosity)} \times 62.4 \text{ lb/CF})$

61 mg/l

Note that a limit for nitrates in groundwater is 10 mg/l.

Based on utilization and adsorption, nitrate concentrations exceeding 10 mg/l would not be expected to leave the facility. However, add groundwater monitoring for nitrates/nitrites to confirm this conclusion.

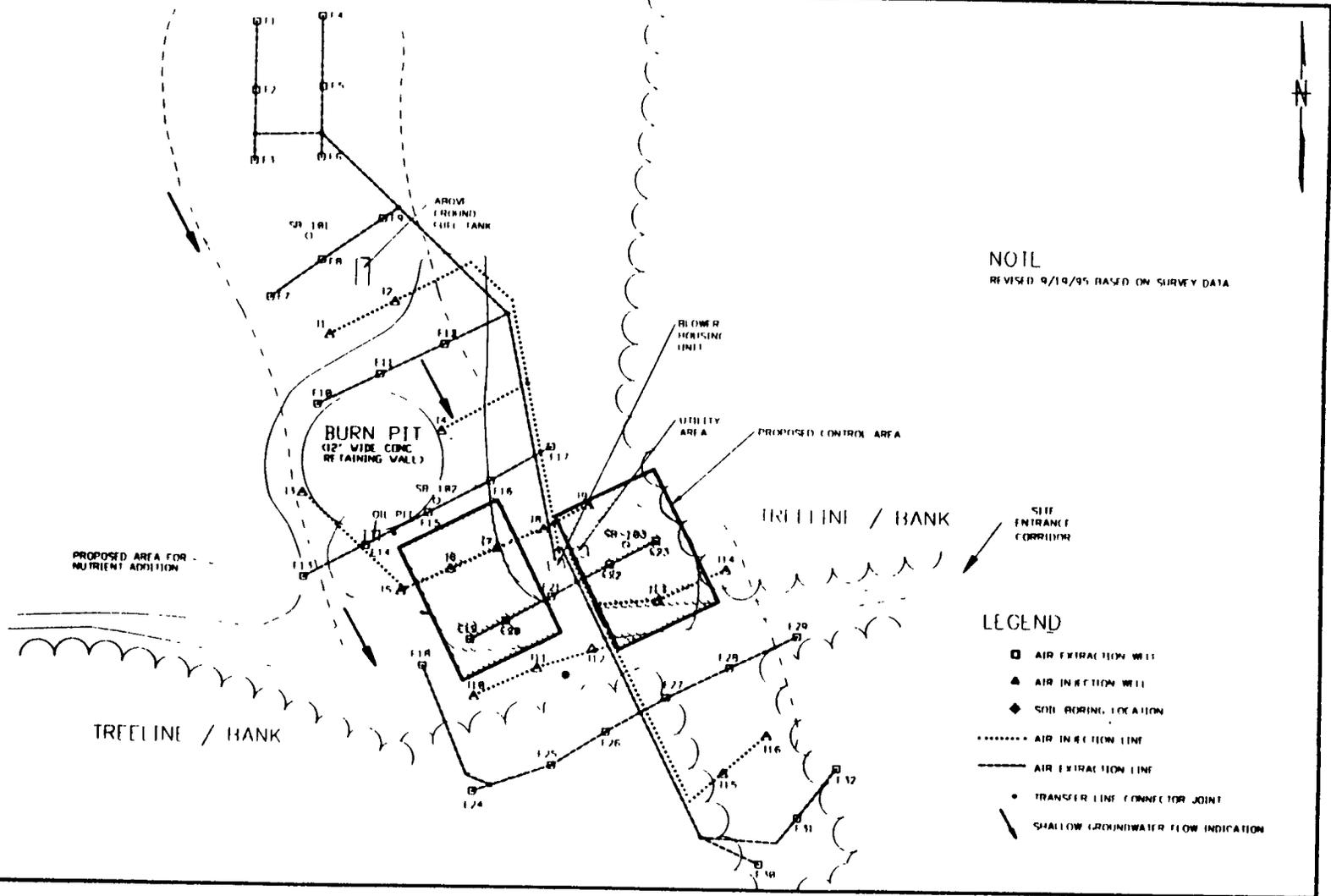


FIGURE 1