The Chemours Company
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February 6, 2020

Mr. Phil E. Richard
Hydrogeologist
Wisconsin Department of Natural Resources
Park Falls Service Center
875 4th Avenue South
Park Falls, WI 54554-1130

RE: Hazardous Waste Remediation Variance Modification Request
Former DuPont Barksdale Explosives Plant
72315 State Highway 13
Town of Barksdale, Bayfield County, Wisconsin
FID No.: 804009140
EPA ID No.: WIR000133447
BRRTS No. 02-04-00156

Dear Mr. Richard:

This letter comprises The Chemours Company FC, LLC's (Chemours') request for modification to the May 2015 Hazardous Waste Remediation Variance (HWRV) issued for the Former DuPont Barksdale Works site in Barksdale, Wisconsin (site). The modification will allow for the use of thermal heating methods to enhance degradation of nitroaromatic and nitramine organic constituents (NNOCs) in pilot test cells at the site. This modification request is being submitted as a condition of issuance (Condition 6) of the HWRV, which specifies the following:

- *Any changes in hazardous waste remediation activities which are not identified in the Revised Remediation Variance Request for Removal of Residual Product and Debris, dated February 17, 2012, or the Remediation Variance Renewal Request, dated February 22, 2017, will constitute a remediation variance modification. Modifications to this remediation variance shall be submitted as a Class 1 modification request requiring Department review and approval in accordance with s. NR 670.042(1), Wis. Admin. Code. The submittal shall include the appropriate fee stated in ch. NR 670, Wis. Adm. Code, Appendix II.*

Background

Chemours has been conducting in-situ pilot testing of bioremediation methods within test cells at the site as permitted in the May 2015 HWRV to study NNOC degradation processes in soil. As allowed in the permit, the in-situ mechanisms of constituent reduction within the test cells involve a combination of aerobic degradation via indigenous microorganisms and transformation via pH adjustment using lime amendments to promote alkaline hydrolysis (AH). Elevating the soil pH allows for degradation of high concentrations of 2,4,6-trinitrotoluene (TNT) and other NNOCs, which can limit biodegradation. The transformation via AH occurs in the soil pore water through dissolution of the NNOCs. It has been observed in lab and field studies that TNT particle size limits mass transfer to the aqueous phase.

Chemours' investigation of the site has identified that TNT is present in soil over a range of particle sizes from fine, sand grain sized to several inches or greater. The field process appears to address most fine-grained particles in soil. However, it has been determined that attrition (i.e. size reduction of residual solid product [RSP]) of the larger particles is necessary to increase

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transfer to the aqueous phase by reducing particle size and increasing surface area of larger pieces of RSP in soil.

Several techniques to reduce RSP size have been evaluated to date. Based on the results of these evaluations, the project team has identified low temperature, thermally assisted particle size reduction as a focus area for further evaluation. The approach developed for this technique included pre-treatment of soil with hydrated lime to reduce soil plasticity, followed by heating of the soil to the melt temperature of TNT. Once the desired temperature is reached, the soil and molten TNT would be mixed. Initial melt and mixing tests were performed by the United States Army Corps of Engineers (USACE) at their Engineer Research and Development Center in Vicksburg, Mississippi under a Cooperative Research and Development Agreement. The results of the testing indicated that:

- TNT can be safely melted and mixed with soil without risk of fire or explosion,
- TNT particle size after melting and mixing was small enough to allow AH to occur, and,
- The AH process is accelerated at elevated temperatures, with a general twofold increase in rate for every 10 degrees Celsius (° C) that temperature was increased. This rate increase is primarily because the solubility of the NNOCs was observed to increase with elevated temperature, and degradation via AH occurs in the aqueous phase.

Proposed Pilot Test at Site

Based on the results of the work completed to date, Chemours requests a modification to include in-situ heating, in addition to, water and pH amendments currently being used. Chemours proposes to conduct a pilot test at the site to evaluate the feasibility of heating soil, RSP, hydrated lime, and water mix in a test cell. Cell contents will be heated to temperatures above the TNT melt temperature of 176° Fahrenheit (F) (80° C). After heating, the contents of the cell will be mixed using a rotary mix-head attached to an excavator.

Chemours is currently evaluating soil heating mechanisms and conceptual designs for heating the soil at the Barksdale site. Although the specific heating process, duration and temperatures utilized during the pilot test has not yet been determined, the addition of heat will be the only change to the current field pilot testing. All other pilot work, permitted as part of the current HWRV, will remain the same, with the exception of cell configuration/construction. In order to efficiently distribute heat evenly, slight modification of the cell design may be required.

One of the conceptual designs being considered includes the use of a closed loop system of pipes installed in a treatment cell as shown on Figure 1. Heat to the pipes would be supplied by a fluid heating system positioned outside the test cell and heat would be transferred from the pipes to the soil through conduction. The test cells will be constructed with a clay base, berms, and a stormwater/sediment containment basin as described in the HWRV. An insulating layer may be added to retain heat in the cell.

Chemours may also evaluate small ex-situ batch treatment systems performed in a small closed container, such as a 55-gallon drum.

The findings of the soil heating pilot test are anticipated to be incorporated into an interim action and/or remedial action plan(s) for the site, which is due to the WDNR prior to the expiration of the HWRV on May 18, 2022.

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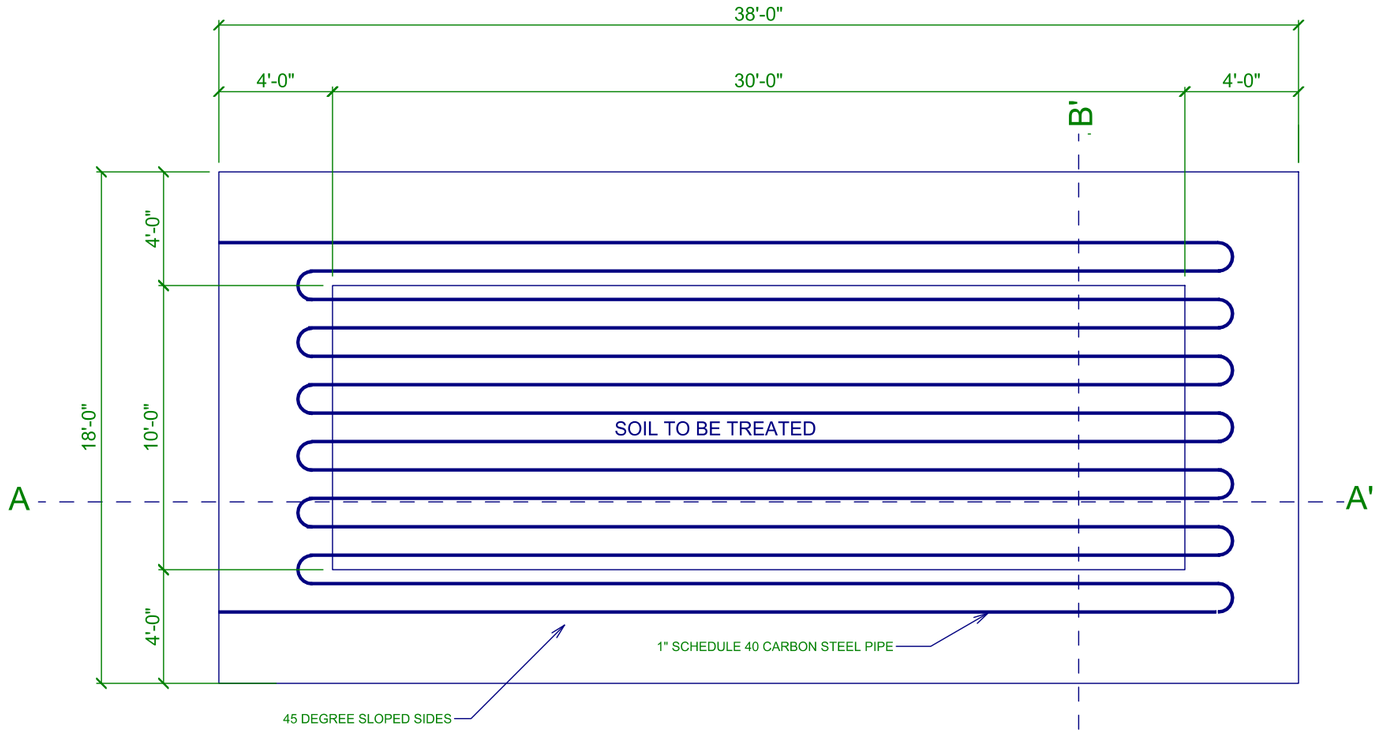
If you have any questions or comments, please feel free to contact me by telephone at (812) 923-1136 or by email at Bradley.S.Nave@chemours.com.

Sincerely,

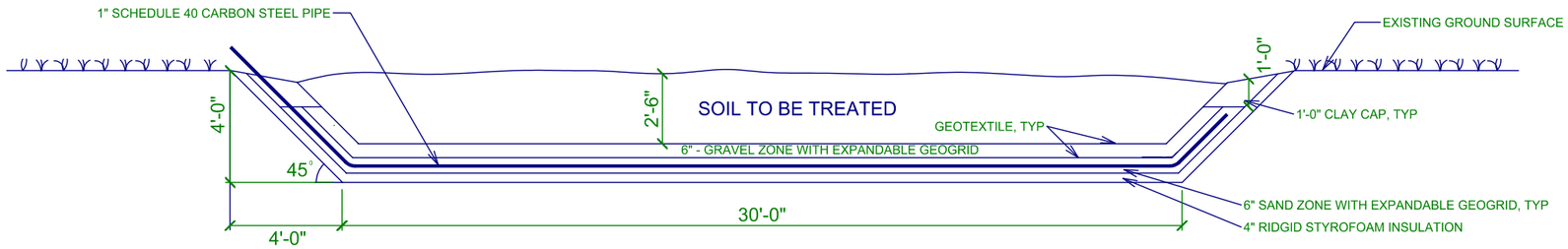
Bradley S. Nave
Chemours Corporate Remediation Group

Attachments: Figure 1 – Modular Closed Loop Steam Conductive Soil Heating Concept
Check for $400 (NR 670 Review of Class 1 Modification Fee)

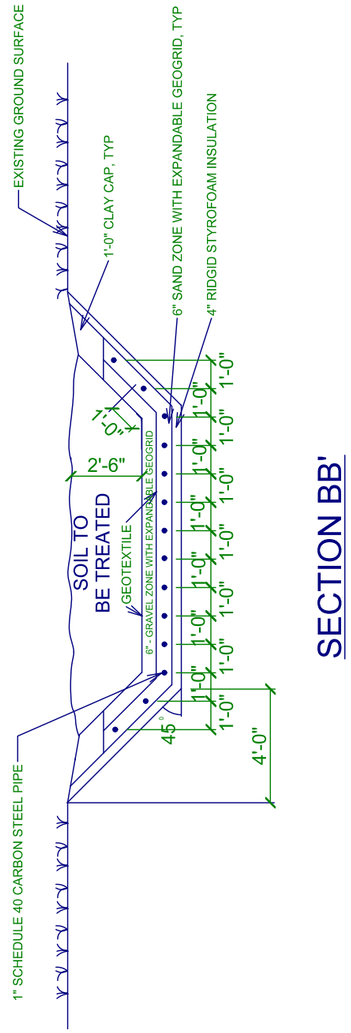
Cc: Chris Saari, WDNR
Jill Schoen, WDNR
Cary Pooler, AECOM
Eric Schmidt, AECOM



PLAN VIEW



SECTION AA'



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Notes:
Conceptual arrangement; actual layout may be modified as needed.

Scale: 3/16" = 1'
MAP FORMATTED FOR "B" (11" X 17") SIZE SHEET.
SCALE NOT VALID FOR DIFFERENT PAGE SIZE.

FILE NUMBER:	
DESIGNED BY:	RL
DRAWN BY:	VN
DATA QUALITY CHECK BY:	ES

Conductive Soil Heating Concept

Former DuPont Barksdale Works
Barksdale, Wisconsin 54806

PROJECT NUMBER:	60525652
DATE:	01/15/2020
FIGURE NUMBER:	1

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