April 23, 2008

Mr. David Dorian
U.S. EPA, Region 4
On-Scene Coordinator
61 Forsyth Street, S.W. (11th Floor)
Atlanta, Georgia 30303

Subject: **Response to EPA Letter of March 28, 2008: Technical Approach for Removal Action at Spring Area CERCLA Docket No. CER-04-2004-3755**

Dear Mr. Dorian:

On January 10, 2008, MACTEC Engineering and Consulting, Inc. (MACTEC), on behalf of CTS Corporation (CTS) and Mills Gap Road Associates (MGRA), submitted an evaluation of removal action technologies for the identified springs. MACTEC recommended an enhanced volatilization via surface water features removal method. However, EPA asked that another alternative be evaluated. In response, MACTEC communicated with the local Publically Owned Treatment Works (POTW) and its counsel, Mr. Billy Clarke. They advised that given the volumes of water and the contaminant removal effectiveness needed that discharge of the water into the POTW was neither technically nor economically feasible. The alternative would also likely require lengthy permitting delays and undesirable impacts on the perceived wetland areas and stream flows. As a result, on April 2, 2008, you explained that you were "very much amenable to a remedy in which the spring water is treated (e.g., run through activated carbon) and then released."

Accordingly, MACTEC now recommends an ozonation technology that will remove the concentrations of trichloroethylene (TCE) from the groundwater before it discharges at the four springs. This technology is safe, reliable and proven effective at numerous locations throughout the country, including various installations within North Carolina. At this site, the removal method will be particularly advantageous because it will avoid stream or wetland impacts and effectively minimize the potential for TCE vapor emanations from the surface water after its discharge at the springs. This removal technology will not have an adverse effect on groundwater and surface water quality because the process destroys the TCE and its degradation products.

The proposed removal approach consists of in-situ chemical oxidation (ISCO) through injection of an air/ozone gas mixture into the saturated soil via injection points. The injection points would be installed in a configuration that would provide an in-situ chemical oxidation reactive treatment zone prior to the discharge of ground water at the locations of the springs. Injection of air/ozone gas mixture would be conducted at one or more injection points simultaneously in a sequenced fashion, which will be determined from field testing and performance monitoring. Unlike conventional air sparging applications, sparging with ozone offers an oxidative decomposition process that destroys contaminants rather than transferring them to another phase. A conceptual overview of the design approach is provided in the attached Figure 1. This conceptual layout assumes a zone of influence of 20 feet extending radially outward from each injection point. Actual spacing and depths of injection points will be subject to field specific topographic and accessibility features as well as any pre-design investigation and piloting hydrogeochemical data collected during the injection point installation and start-up testing. The ozone injection points must be sufficiently deep to prevent surface loss of the injected ozone, and targeted within any higher permeability zones encountered during drilling activities. Additionally, multi-depth injection points might be beneficial and can be further evaluated based on the initial test drilling and pilot study activities.

Ozone is a strong oxidant, is sparingly soluble in water and is generated on site using a self-contained atmospheric oxygen concentrator and ozone generator to provide a continuing source of oxidant, rather than one-time or multiple injections. The ozone unit will be constructed with a built-in ambient ozone sensor for safety shut down and built-in high limit pressure switches and pressure relief valves. The ozone is co-injected with supplemental air to enhance delivery of the ozone into the shallow aquifer formation upgradient from the spring discharge points. This method results in sustaining and enhancing oxidant contact time and can increase the zone of ozone treatment influence. Off-gas treatment will not be required.

Contaminants are destroyed by direct oxidation with ozone (Eq. 1), which has a standard oxidation potential of 2.1V, or indirectly by ozone decomposition and formation of hydroxyl radicals, a stronger (2.8V) and much more kinetically favorable oxidant (Eq. 2). The TCE hydroxyl radical rate constant is 4×10^9 $M^{-1}s^{-1}$, and for ozone it is 1.7×10^9 $M^{-1}s^{-1}$. Ozone reactions typically generate both H^+ and OH^- ions at a similar rate, thus the groundwater pH generally does not change appreciably.

Direct Oxidation

$O_3 + C_2HCl_3 + H_2O \rightarrow CO_2 + 3H+ + 3Cl-$ (1)

·OH Formation

$O_3 + H_2O \rightarrow O_2 + 2 \cdot OH$ (2)

An initial pilot study is envisioned to gain site-specific understanding of the capacity to distribute the air/ozone gas into the shallow aquifer formation, and adjust injection rates and pressures. Such a pilot test phase would likely be implemented over a two to three month period using a self-contained mobile ozone sparge unit capable of providing ozone to the specified number of oxidation points at typical flowrates of two to five scfm. The unit would be equipped with a field programmable controller used to set the injection sequencing. Ozone gas is supplied to the in-situ injection points (made of porous Kynar (PVDF)) through ozone-compatible tubing (*i.e.*, Kynar, Teflon (PTFE, PFA)). During the pilot study phase, the tubing from the ozone generation unit to the injection points will be placed within aboveground PVC conduit. If the pilot study demonstration is successful, the conduit and tubing will then be buried during final full-scale installation. For the full-scale operation, injection points and piping will be designed and installed below ground, with access to the injection point wellheads being provided in water-tight locking vaults. A schematic of a typical injection point and vault installation is provided in Figure 2. During the pilot study phase, water and vapor monitoring will be performed at temporary monitoring points, as necessary, to provide performance information and support final design activities.

Routine maintenance will consist of checking equipment and system operation and adjusting flow and pressure settings, as necessary. Operator site visits will include, at a minimum:

- Checking the compressor and ozone generator for proper rates and absence of leakage, and lubricating per manufacturer recommendations;
- Visually inspecting the ozone generator for physical fouling and changing filters and cleaning as necessary;
- Measuring system ozone concentrations and flow rates;
- Checking the operation of the high level ambient ozone shut off switch and the high pressure shut off switch;

- Checking the injection point timers and actuator valves between the points for proper switching and control; and,
- Checking flow meters and pressure gauges for proper operation.

Prior to performing the field activities, a Type 5I Injection Well Permit Application will be submitted in accordance with North Carolina Administrative Code (NCAC) 15A 2C). A wetland delineation and possible permitting or notification of the Army Corps of Engineers might be required if the proposed removal activities include work/filling in the wetlands.

If you have any questions, please feel free to call either Mr. Marv Gobles at (574) 293-7511, or Mr. Matt Wallace at (828) 252-8130.

Sincerely,

MACTEC ENGINEERING AND CONSULTING, INC.

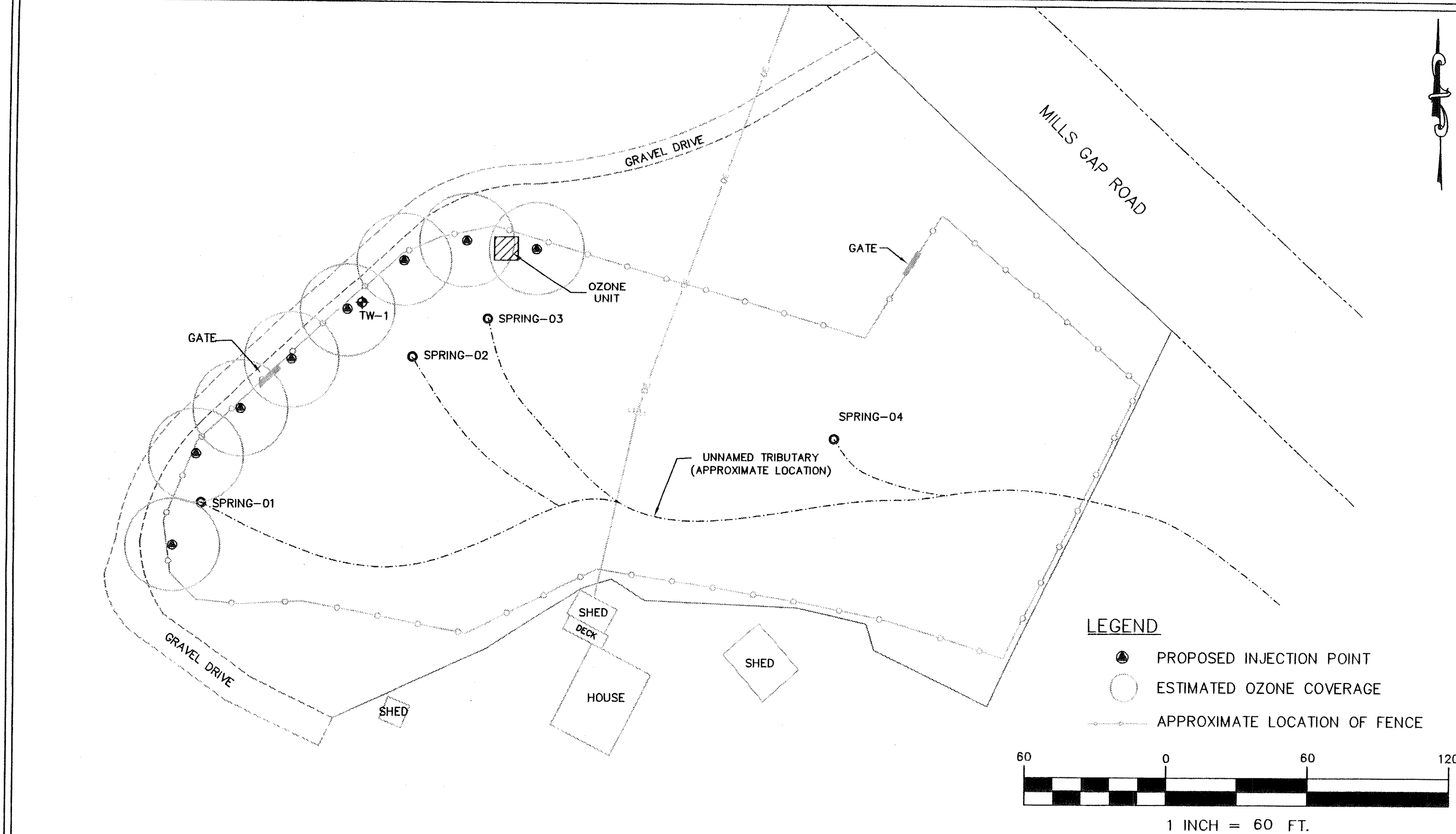
Matthew E. Wallace, P.E.
Project Coordinator

Larry A. Neal, P.E.
Senior Principal Environmental Engineer

for Larry A. Neal
with permission

Attachments: Figure 1 – Proposed Ozone Injection System Layout
Figure 2 – Typical Injection Point

cc: Marvin Gobles, CTS Corporation
Elizabeth Bottorff Ahlemann, CTS Corporation
Michael F. Dolan, Esq., Jones Day
William Clarke, Robert & Stevens, P.A.

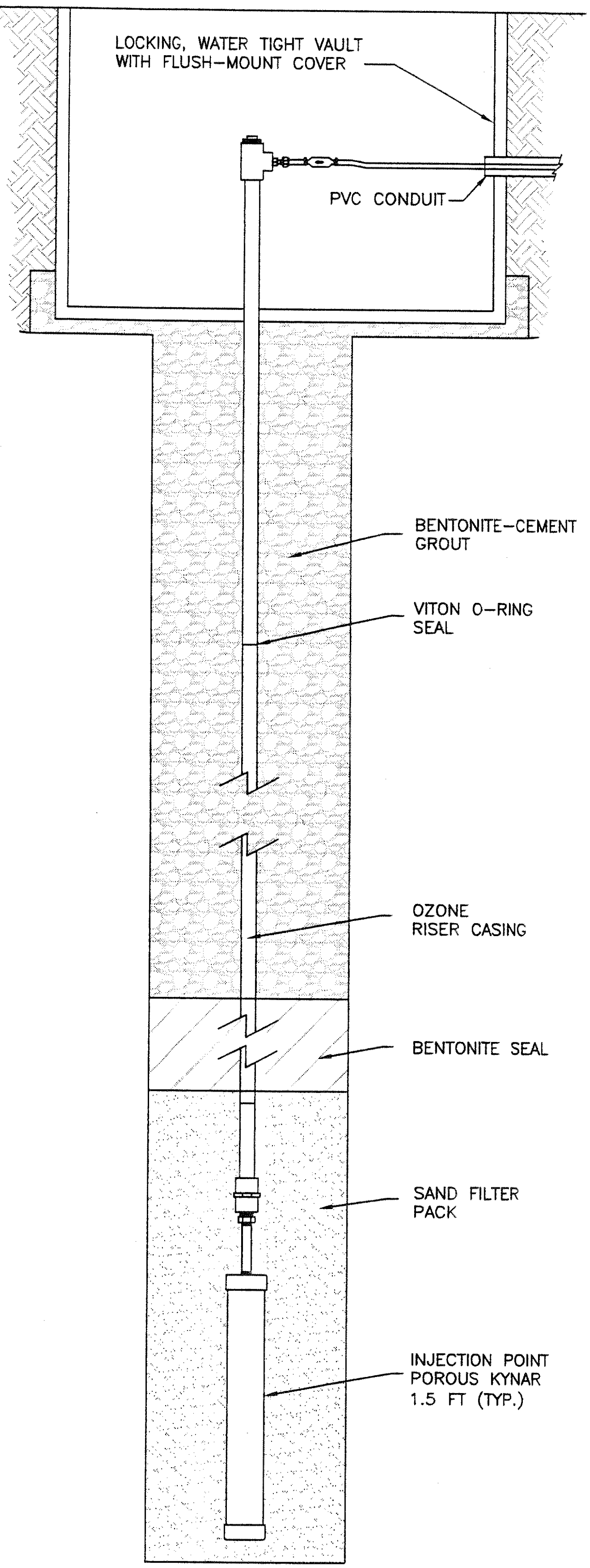


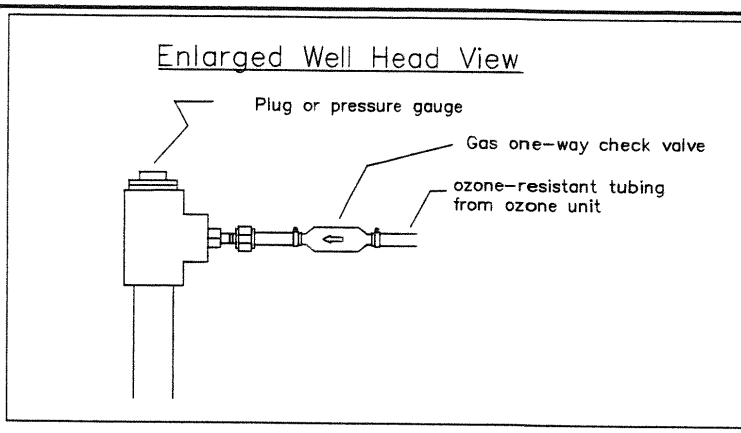
PROPOSED OZONE INJECTION SYSTEM LAYOUT
MILLS GAP GROUNDWATER CONTAMINATION SITE
SKYLAND, NORTH CAROLINA

MACTEC
ENGINEERING AND CONSULTING, INC.

DRAWN: SEK	ENG CHECK: –	DATE: APRIL 2008	PROJECT: 6690039450
DFT CHECK: MEW	APPROVAL: MEW	SCALE: 1" = 60'	FIGURE: 1

REFERENCE: BASE SURVEY PREPARED BY FREELAND & ASSOCIATES, INC., AND MACTEC FIELD NOTES.





NOT TO SCALE

MILLS GAP GROUNDWATER
CONTAMINATION SITE
SKYLAND, NORTH CAROLINA

MACTEC
ENGINEERING AND CONSULTING, INC.

TYPICAL INJECTION POINT

PROJECT 6690039450

FIGURE 2

PREPARED BY/DATE SEK 4/23/08
CHECKED BY/DATE MB 4/23/08