APPENDIX A

Ground Penetrating Radar (GPR) Data for soils

August 12, 2003

Carl Young
Cabrera Services, Inc.
111 W. Monument Street
Baltimore, MD 21201

Re: Results of Ground Penetrating Radar Survey at the Dupont Plant, Deepwater, New Jersey

Dear Carl:

Earth Resources Technology, Inc. (ERT) performed a Ground Penetrating Radar (GPR) survey at the Dupont Plant on July 29, 2003. Two areas were investigated: Area 3SB, along the central drainage ditch and Area 5SB, near Building J-26. The object of the investigation was to detect any utilities or other anomalies in the subsurface that could interfere with boreholes to be drilled in those areas. Some portions of Area 3SB were inaccessible due to drainage ditches.

1.0 Equipment and Field Methods

The SIR-3000 Ground Penetrating Radar unit, manufactured by Geophysical Survey Systems, Inc. (GSSI), was used to conduct the GPR survey. The device radiates a polarized electromagnetic wave from a transmitter antenna into the earth and receives at a receiving antenna the reflection of the wave from subsurface interfaces at which changes in the electrical properties (dielectric permittivity and electrical conductivity) of the subsurface materials occur. Dielectric permittivity controls wave speed; and conductivity determines the signal attenuation. Radar reflections occur when the radio waves encounter a change in the velocity or attenuation. The greater the change in properties the more signal is reflected. These properties may be controlled by water in the material, hence by the porosity and quantity of dissolved solids in the water. Metallic objects usually exhibit strong subsurface reflection character due to their high electrical impedance or contrast versus surrounding soil or fill. Depth of penetration of the radar signal is inversely proportional to the conductivity of the soil. As a result, electrically resistive earth materials such as coarse-grained, unsaturated sediments allow a deeper radar penetration than the conductive finer-grained soils such as clay and silt. Similarly, reinforced concrete and shallow groundwater are conductive and thus attenuate the radar signals and limiting the depth of penetration. A 400MH antenna was used for this survey, allowing for a depth of penetration of up to 18-feet, depending on the site conditions. At the Dupont Plant, penetration depth was approximately 6- to 7-feet, which supported the depth-to-groundwater of 6-feet, as reported by Cabrera Services.

The 400 MHz antenna was used with an odometer to collect GPR data with accurate position information. The odometer was set up such that one radar reading would be acquired every inch. The time range was selected as 60 ns and such a time range would allow a theoretical penetration depth of about 3 meters or 9.7 feet assuming a signal velocity of 0.1 m/ns (an overall average for earth materials).

GPS readings were recorded at the end points of each GPR line collected using a Trimble 3600 Series GPS antenna.

2.0 Results

The approach to interpreting the GPR data is through analyzing the reflections created by subsurface objects. On a GPR cross-section, a utility may be represented by strong reflections caused by the difference in properties between the utility pipe material (metal, PVC, plastic, etc.) and the soil, concrete, or asphalt above. The reflection pattern varies depending on the condition of the pipe. To separate utility pipe reflections from the reflections created by isolated structures such as underground storage tanks, boulders, or even voids is difficult. The usual practice is to evaluate if the anomalous reflections are isolated (usually standing for voids, rocks, debris, or other types of isolated structures) or continuous for some linear distance (usually standing for utilities). Because only single GPR profiles were collected in each area, it was not possible to determine if an anomaly was isolated or continuous; thus, all anomalies were noted on the GPR profiles and transferred to the site maps (Figures 1 and 2).

Plot 1 and Plot 2 present representative GPR profiles acquired at the site. On these profiles, the horizontal axes represent the horizontal distance in feet. The left vertical axes represent the depth in feet and are reported as negative numbers with the ground surface equal to zero. The GPR profile is made of individual traces that have peaks and valleys (sometimes called a wiggle-trace). The peaks of radar signals represent different interfaces in the subsurface encountered by the penetrating signals. The GPR profile is constructed by connecting and coloring the peaks and valleys of successive traces. As shown in the profiles, the black reflections are peaks of individual traces with the highest amplitudes, while the white reflections are the valleys of individual traces with the lowest amplitudes.

As shown on Plot 1 and Plot 2, the anomalous GPR reflections are identified by yellow marks on each GPR profile. Figure 3 and Figure 4 present plan view maps showing the location of the GPR profiles and the anomalies for Area 3SB and Area 5SB, respectively. The GPR profiles are shown as thin magenta lines, and the anomalies identified from each GPR profile are shown as thick, shaded rectangles in cyan.

ERT recommends the review of the existing utility and mechanic drawings to verify those anomalies associated with known utilities or underground structures. For those anomalies without any associated utilities or structures, ERT recommends further investigation through excavation or probing or simply avoiding those undefined anomalous areas when drilling.

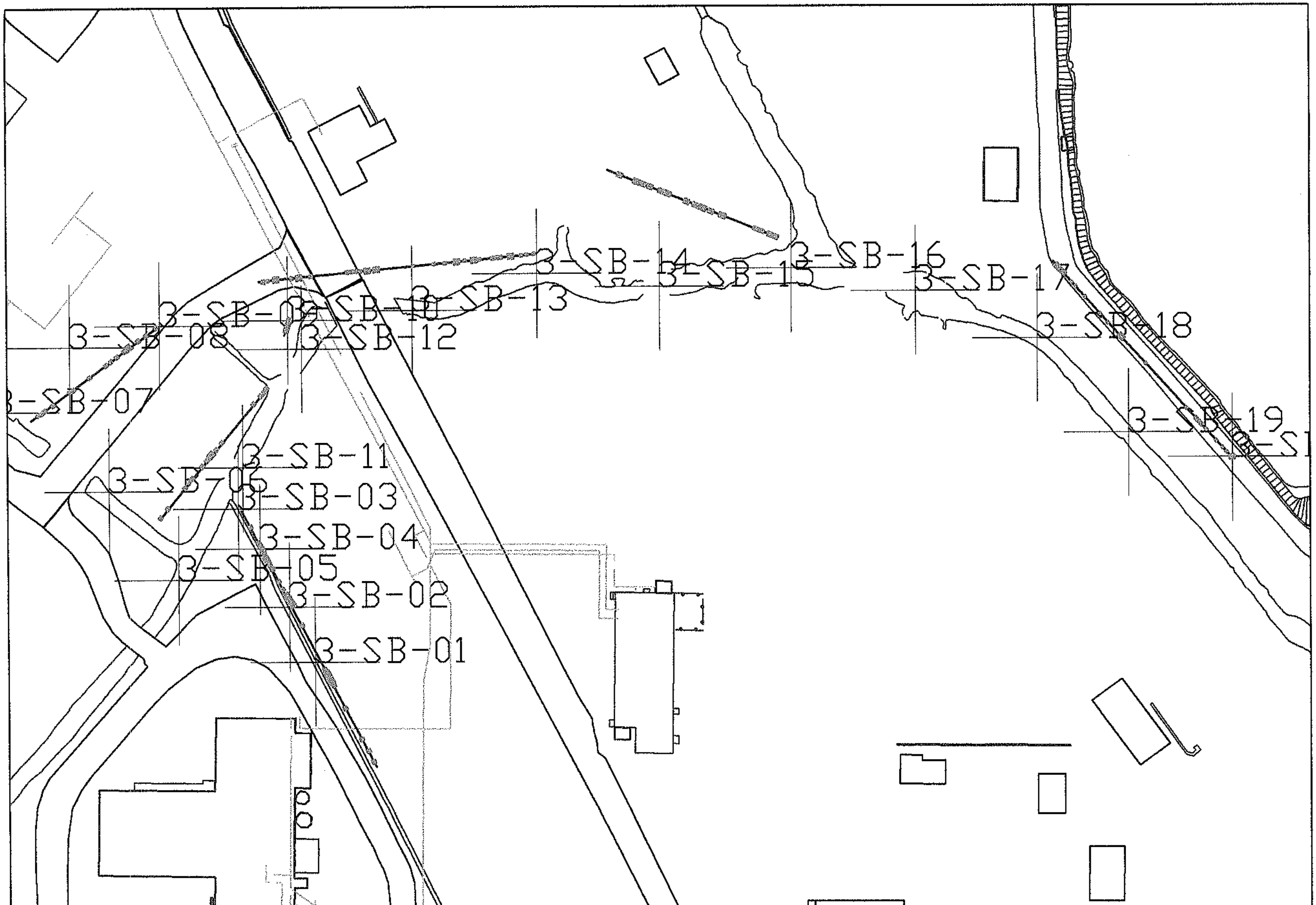
3.0 Closing

The field procedures and interpretative methodologies used in this project are consistent with standard, recognized practices in similar geophysical investigations. The correlation of geophysical responses with probable subsurface features is based on the past result of similar surveys although it is possible that some variation could exist at this site. This warranty is in lieu of all other warranties either implied or expressed. **ERT** assumes no responsibility for interpretations made by others based on work performed by or recommendations made by **ERT.**

Sincerely,
Earth Resources Technology, Inc.

Dorian L. Shuford

Dorian L. Shuford
Project Geophysicist



EARTH RESOURCES TECHNOLOGY

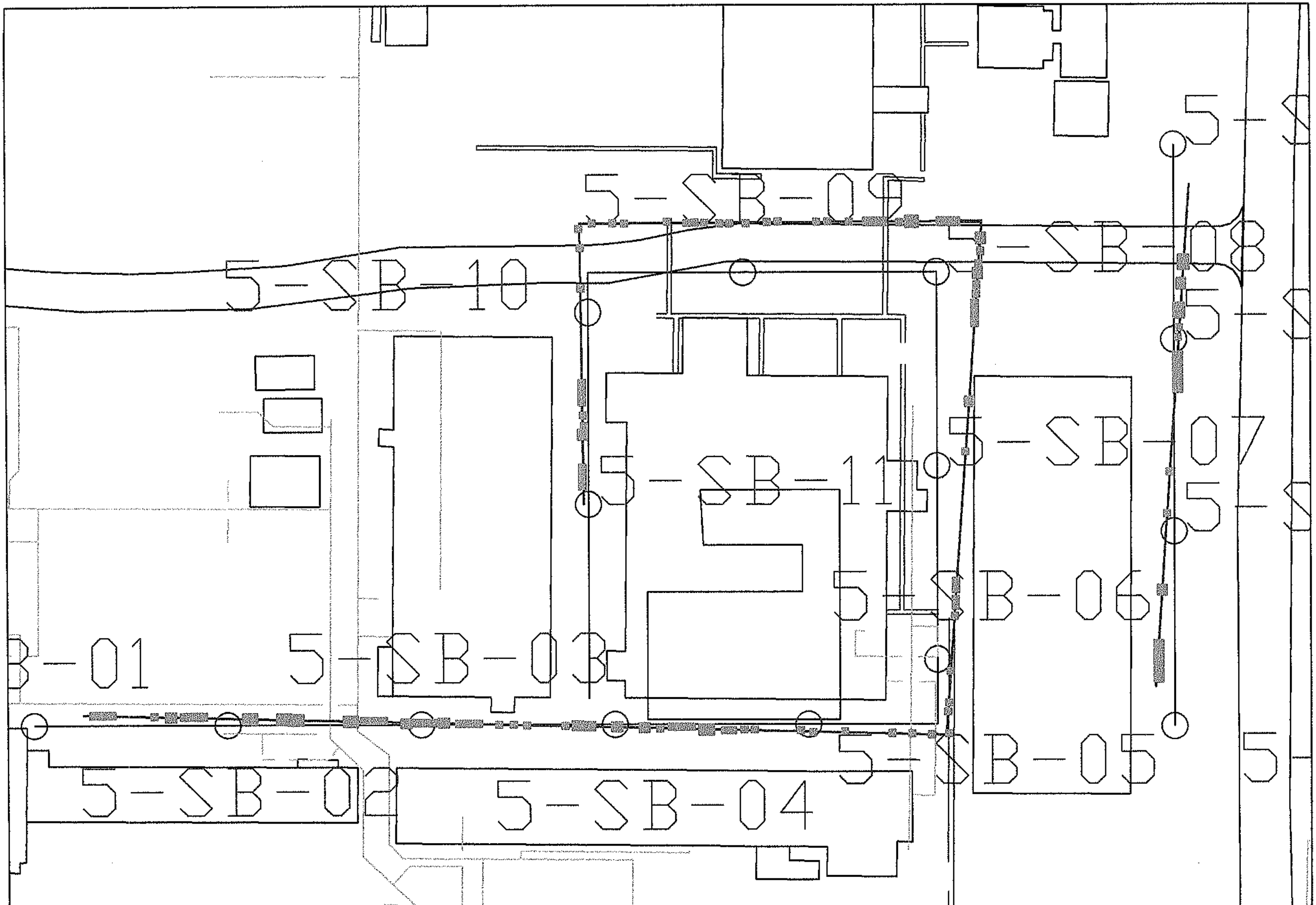
GPR PROFILE LOCATIONS – AREA 3SB

DUPONT PLANT
DEEPWATER, NEW JERSEY

FIGURE 1

SCALE: 1" = 100'

JULY 31, 2003



EARTH RESOURCES TECHNOLOGY

GPR PROFILE LOCATIONS - AREA 5SB

DUPONT PLANT
DEEPWATER, NEW JERSEY

FIGURE 2

SCALE: 1" = 50'

AUGUST 12, 2003