

SITE ASSESSMENT FIRST PHASE REPORT

Gaston County Landfill (Mt. Holly Landfill)

NONCD0000321

Old Highway NC 27

Gaston County

Pre-Regulatory Landfill Unit

State of North Carolina

State Contract N010002S

W&R Project No. 02100001.02

June 1, 2010

Prepared for:

North Carolina Department of Environmental and Natural Resources

Superfund Section

Inactive Hazardous Sites Branch

Pre-Regulatory Landfill Unit

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1 SITE LOCATION RESEARCH SUMMARY

LANDFILL NAME(S): Gaston County Landfill (Mt. Holly Landfill)

LANDFILL SIZE: Approximately 10.00- acres (Disposal area boundary by GPS coordinates provided by geophysical subcontractor 4-1-2010) on 24.52 acres of property owned by Robert Shannon.

DATE OPENED: Approximately 1970's (data obtained from aerial photographs)

DATE CLOSED: Approximately 1980 (data obtained from property owner by others as the last date that waste was received)

CURRENT OWNER: Robert Shannon

OWNER ADDRESS: 1044 Coral Lane, Mount Holly, NC 28120
OWNER TELEPHONE NO: 704-822-1531

TAX PARCEL./PIN No.: 3598-12-8735, 3598-22-0660 (total 24.52 acres)

DEED REFERENCE: DEED BOOK 4186, PAGE 1788

COORDINATES:

Reading Location: At property entrance from handheld GPS
State Plane Coordinates (NAD83, meters):

Northing: 582740.7948

Easting: 1392108.22657

Latitude: N36° 20' 05.8"

Longitude: W81° 02' 13.3"

Directions to Landfill:

Follow Old Highway 27/Woodlawn Avenue north out of Mt. Holly, NC approximately three miles. The property is situated on the west side of Old Highway 27 between Angel Ham Street and Noell Drive in the 1500-1600 Block of Old Highway 27.

2 PROPERTY ASSESSMENT

Information in this section of the report was collected and previously reported by Schnabel Engineering under contract with the Inactive Hazardous Sites Branch (IHSB) and by the 2010 work completed by Withers & Ravenel for the Pre-Regulatory Landfill Unit (PRLU).

2.1 Landfill Conditions

This section discusses the observed conditions at the site, as defined as the property or properties (tax parcels) on which the disposal area is located. The disposal area is defined as the area observed or reported to have been used for waste placement or burial. The boundary (perimeter) of this area is the mapped limit of waste material based on the April 1 2010 geophysical investigation report completed as part of this assessment and discussed in Section 3. Photographs illustrating site conditions are included in Appendix A.

2.1.1 Current Usage

The disposal area is situated on two parcels comprising 24.5 acres of land. Approximately 14.5 acres of this land has been cleared and is pasture land. Mr. Robert Shannon, the current property owner, currently cultivates hay on this cleared portion of the property and the balance of the property, approximately 10-acres, is comprised of woodlands.

The majority of the 10.00- acre-disposal area is located beneath the cleared portion of the site used as pasture land. An area of surface dumping is present on the southwest property boundary with the mobile homes along Angel Ham Road. The refuse appears consistent with rural dumping of mainly household items, appliances, tires, etc. along the property boundary. This portion of the property is wooded and the refuse is deposited along the steep slope in this location.

2.1.2 Disposal Area Conditions

Access to the disposal area is from a driveway off of North Carolina (NC) Highway 27. The disposal area occupies 10.00--acres based on the disposal area perimeter determined by the March 2010 electromagnetic geophysical survey. The limits of the landfill are shown on Figure 1. Global positioning system (GPS) coordinates of the limits of the landfill disposal area collected by the geophysical contractor are shown on the attached Table 1.

The disposal area slopes to the southwest. A comparison of the topography from the United States Geological Survey (USGS) 7.5 minute topographic quadrangle map (20 foot contours) with the 2005 North Carolina Department of Transportation (NCDOT) Geographic Information System (GIS) Branch (10 foot contours) indicates that

disposal material has filled in the northeast-southwest drainage on the central part of the disposal area.

The surface condition of the disposal area appears in overall good condition. No exposed waste, attributable to the reported disposal area limits, was observed during the site visit. It is apparent that the hay cultivation practices have served to maintain the cover cap condition and has for the most part prevented erosion of the cover by maintaining a permanent vegetated cover.

The disposal area has several grassed terraces serving as stormwater diversions that are aligned across the short axis of the grass covered field. Numerous areas of ponded water were observed along the berms. The non-uniform surface flow of water along the berms appears attributable to possible settlement of the disposal area with time and or the deposit of silts and sediment along the berm alignments. Photographs are included in Appendix A.

The southwest corner of the disposal area contains an obvious surface seep of water through the cap. This area is approximately 25 by 25 feet. One the day of the February visit the water from the seep did not contain obvious staining, however, the vegetation in the area appeared to be a deeper shade of green and slightly more dense than the surrounding pasture grasses which were dormant from the winter months. Although a log of the type and species of grasses was not maintained as part of this initial site investigation, it appeared that on the date of our visit the vegetation within the seep area contained the presence of algae or moss, distributed between the blades of established pasture grasses. The seep may be associated with a possible thin surface cap in this location coupled with the upslope ponding and preferential infiltration of water at the stormwater diversion berms. A second smaller seep was observed east of the larger berm within the disposal area.

2.1.3 Water Supply Wells and Intakes

One on-site water supply well was observed on the property during the site visit. The well is located on the northeast central part of the site (Figure 1) and is reportedly in use by the residence at 1605 Old Highway 27. This supply well is located approximately 230 feet northwest and apparently upgradient of the limits of the disposal area determined by the electromagnetic (EM) survey.

The 2008 supply well sampling effort by Schnabel did not identify elevated concentrations of targeted volatile organics, semivolatile organics and harmful metals.

No water meters or fire hydrants were observed on the site during the site visit. No mapped public utilities were shown on the Gaston County GIS website. Mr. Shannon was also questioned and indicated that municipal sewer lines have not been extended to the properties surrounding the disposal area.

2.1.4 Surface Water Features

Section 2.1.3 of this report describes the location of two apparent seeps through the cover of the disposal area. The location of each seep is shown on the attached Figure 1.

2.1.5 Potential Landfill Gas Migration Pathways

Schnabel reported that potential gas migration pathways were observed on the disposal area and site. A stormwater grate and drainage pipe was observed west of the seep on the disposal area.

The mobile homes present along offsite properties at the southern property boundary have crawl spaces that could be considered receptors of landfill gas. Many of the mobile home lots also contain detached storage buildings that may also be receptors of landfill gas.

2.1.6 Other Pertinent Information

W&R completed a search on the site for the Sensitive Environments identified in the First Phase Work Plan, IHSB Guidelines for Addressing Old Landfills and Dumps, October 2009. Our search included emailing or calling the contacts provided by the PRLU as well as a review of appropriate online maps and databases supported by the North Carolina Center for Geographic Information and Analysis as appears on metadata supplied by their organization and mapped by our firm using GIS products.

Based on our GIS mapping of the features mapped by NC One Map and NC Center for Geographic Analysis no areas of interest were identified within a 500 foot distance of the property and disposal area limits other than the tributary that traverses the property containing the disposal area.

According to Ms. Melanie Williams of NCDWQ, the site is part of a State-Designated Area for the Protection or Maintenance of Aquatic Life. The tributary, which extends through the westernmost portion of the site, is a tributary of Dutchman's Creek, which has been listed as an impaired waterway. The property is within the Lake Wylie water supply (WS)-IV water supply watershed. A copy of the maps produced by the NCDWQ are attached in Appendix B. A table is included in Appendix B that summarizes the persons contacted and the responses obtained from those contacts.

2.2 Vicinity Conditions

This section describes the observed general conditions in the vicinity of the site, as defined as an area within 1,000 feet of the perimeter of the disposal area. Photographs illustrating vicinity conditions are included in Appendix A.

2.2.1 Adjacent Properties and Structures

Aerial photography provided by Gaston County suggests that between 40 and 50 residences are located within 500 feet of the disposal area. The majority of the residences are mobile homes along Angel Ham Street. The closest mobile homes are approximately 120 feet from the limits of the disposal area determined by the 2010 EM geophysical survey.

Several houses are located to the east and north of the disposal area on multiple tax parcels on NC Highway 27. These structures are shown on Figure 2 and on aerial photographs in Appendix C.

2.2.2 Current Land Usage

The property surrounding the disposal area is developed as residential to the north, south and east. The property to the west of the disposal area is predominately undeveloped woodlands.

2.2.3 Surface Water Features

An unnamed intermittent stream flows from north to south through the western part of the property. This feature is located 500 to 600 feet downgradient of the southwest limits of the disposal area determined by the EM survey. The unnamed intermittent stream was approximately five feet wide with slow flowing clear water at the time of the site visit. Parts of the stream bed were littered with tires.

This stream is a tributary of Dutchman's Creek (an impaired waterway according to NCDWQ), which is situated in the immediate southern vicinity. The berm and riser barrel outlet structure of a sediment basin is present at the southwest corner of the property and the approximate location is shown on the attached Figure 1. Stormwater discharges from the outlet of the pond have eroded the former ditch line from the outlet of the basin to the unnamed tributary to Dutchman's Creek. This discharge has eroded the ditch severely. The scoured area is estimated to be over 10 feet deep at the pipe outlet. The width of the scoured ditch is approximately 8 to 10 feet and has near vertical sidewalls. This feature is a potential hazard to visitors to the site due to the potential collapse of the sidewalls and the unprotected access to the sides of the scoured ditch which represent a fall hazard. Furthermore, the scoured ditch also represents a potential source of water quality impairment for the tributary.

Correction of the stormwater discharge from the property will be necessary to prevent the scoured area at this outfall from expanding. It appears that left uncorrected the scour will eventually advance the limits of the eroded ditch northward through the berm of the former stormwater control pond. Eventually this erosion will reach the limits of the disposal area, however, the timeframe required to produce that level of destruction is uncertain.

2.3 Aerial Photography Review

Aerial photographs were reviewed for the years 1968, 1979, 1984, 1995, and 2005. The reported years of operation of the landfill were from the 1970's to 1980. Observations of each of the photographs are included in the following table. Copies of the aerial photographs are included in Appendix C.

Flight Year	Observations	Source
1956	The Property is partially wooded and appears to be either recently clear cut or pasture land that is becoming overgrown. The property to the south appears to be used for farming.	1
1968	The Property is covered with trees, and a few residences are located in the surrounding vicinity. Structures are not apparent on Angel Ham Street.	1
1979	The majority of the Property has been cleared and the Disposal area is evident. Berms are apparent, and Disposal area access roads are apparent on the northern and eastern part of the Disposal area. A few structures have been built to the south of the Property.	1
1984	The cleared area has been extended toward the southwest since 1979. Additional residences have been constructed to the south of the Property.	1
1993	The Disposal area appears to be grass covered	2
2008	Terraces are apparent on the grass covered Disposal area. The aerial photograph shows conditions representative of those observed during the 2010 property visit.	3

Sources of aerial photos:

- 1) USDA NRCS office in Gastonia, NC
- 2) www.terraserver-usa.com and MapTech Terrain Navigator digital images of USGS orthophotoquadrangles
- 3) Gaston County GIS, www.co.gaston.nc.us/

2.4 Local Geologic & Hydrogeologic Conditions

The Piedmont is comprised of a system of crystalline-rock aquifers, overlain in areas by younger siliciclastic rock aquifers and locally intruded by diabase units of varying ages. Typically the lithified components of the crystalline-rock aquifers are extensively folded, faulted, and fractured, commonly showing preferential joint orientation along fault zones and stress-relief fractures. Structure within the rocks, including bedding, foliation, and folding, vary with rock origin and composition and is a factor in the susceptibility of the

individual rocks to weathering. The rocks are mantled by a cover of regolith, comprised of that unconsolidated material situated above competent bedrock to include materials such as saprolite, colluvium, and alluvium. Generally, a transition zone of weathered rock, boulders, and saprolite are at the base of the regolith. According to the 1985 Geologic Map of North Carolina (USGS, et.al.) the subject Property is located within an intruded suite of Paleozoic-aged, metamorphosed, foliated to massive quartz diorites of the Charlotte Belt.

The regolith and underlying fractured bedrock combine to make up a complex, multi-component ground-water-flow system within the aquifers of the Piedmont. The components of the system may be described as: the unsaturated zone within the regolith (commonly referred to as the vadose zone); the saturated zone within the regolith (commonly referred to simply as the saturated zone); the transition zone (generally comprised to a significant extent of somewhat to highly weathered rock units and boulders); and, the fractured-bedrock system underlying the foregoing components. Recharge to the ground-water system is by infiltration of precipitation through the unsaturated zone. The regolith serves as a reservoir supplying water to interconnected fractures within the bedrock. The transition zone has high permeability relative to other zones, and it may potentially represent a high-flow zone within the ground-water-flow system. Because of the separation of large sheets of somewhat weathered rock through fracturing processes and the existence of boulders of varying degrees of weathering, the boundary of the transition zone with the fractured bedrock is irregular. The fractured-bedrock flow system has low storage capacity, yet where inter-connected fractures occur, water can move rapidly.

According to the Surface Water Supply Watershed Protection Map of Gaston County North Carolina dated July 2007, the property is situated within a water supply (WS) IV critical area. Presumably, this critical surface water designation is related to the position of the water intake for the cities of Gastonia, Mount Holly, and various other subordinate water supplies approximately 3.6 miles due east of the Property.

The property slopes to the southwest towards the Dutchman's Creek tributary, which extends through the southwestern portion of the property. Surficial drainage collected by the tributary flows south along the tributary before conveying drainage to Dutchman's Creek approximately 2,300 feet south of the property. Dutchman's Creek eventually conveys drainage to the Catawba River. Based on the surficial topography, groundwater flow would likely be to the southwest; however, groundwater flow cannot accurately be predicted based solely on surficial topography.

3 GEOPHYSICAL INVESTIGATION

3.1 Waste Characterization

W&R contracted Geo Solutions Ltd. to complete a geophysical investigation of the property. At the request of PRLU, the investigation techniques were limited to an electromagnetic survey intended to identify the later limits of landfill waste.

During the week of March 22, 2010, Geo Solutions completed a Medium Resolution Multi-frequency Electromagnetic (EM) survey on the entire property in an effort to identify the limits of buried waste material on the property. A GEM-2 instrument was used to complete the survey on the property.

The GEM-2, is a hand-held, digital, multi-frequency sensor. The GEM-2 operates in a frequency range of about 300 Hz to 24 kHz, and can transmit an arbitrary waveform containing multiple frequencies. The unit is capable of transmitting and receiving any digitally-synthesized waveform by means of the pulse-width modulation technique. Owing to the arbitrary nature of its broadcast waveform and high-speed digitization, the sensor can operate either in a frequency-domain mode or in a time-domain mode.

Depth of exploration for a given earth medium is determined by the operating frequency. Therefore, measuring the earth response at multiple frequencies is equivalent to measuring the earth response from multiple depths. The idea of using multiple frequencies stems from the so-called "skin-depth," also known as the depth of exploration, which is inversely proportional to frequency: a low-frequency signal travels far through a conductive earth and, thus, "sees" deep structures, while a high-frequency signal can travel only a short distance and thus, "sees" only shallow structures. Therefore, scanning through a frequency window is equivalent to depth sounding.

Depth sounding by changing the transmitter frequency is called "frequency sounding," which measures the target response at many frequencies in order to image the subsurface structure. In most shallow geophysical surveys, the ppm data generated by GEM-2, often plotted into a contour map for each frequency, are sufficient to locate buried objects without going through elaborate processing or interpretation. One can also estimate the target depth from the data obtained at multiple frequencies.

The EM survey was completed using an all-terrain vehicle (ATV) mounted GEM-2 instrument with GPS data collection. The property was traversed with the ATV along a tortuous grid pattern over the cleared portions of the property and along certain cleared paths within the wooded portions of the landfill perimeter. For a detailed description of the applied technique and survey methodology refer to Geo Solution's Geophysical Investigation report dated April 1, 2010.

3.2 Results

GeoSolutions field survey identified the presence of two disposal areas, a main disposal area (Area A) and a secondary, much smaller, disposal area (Area B). Figure 10 of the GeoSolutions report attached in Appendix D of this report depicts their interpretation of the disposal areas. For a detailed description of the geophysical investigation results refer to Geo Solution's Geophysical Investigation report dated April 1, 2010.

The aerial photographs of the property show north to south trending trench style landfill cells that traverse the short axis of the property. The yellow to orange to red false color images shown on Figures 2 through 10 of the Geophysical Investigation Report show the intensity of conductivity of the buried debris as compared to those of the surrounding soils. The alignment of the areas of higher intensity conductivity readings reflect the general orientation and location of the cells shown on the aerial photographs. From the

photographs and EM contour data it appears that the waste was deposited in trench style cells that were excavated with the overburden used as cover soils following the placement of waste.

The results of the survey suggest that limits of buried debris are relatively apparent and appear to be contained within the property limits. W&R did not observe the actual staked limits of the disposal area determined by the EM survey contractor. The determination that the disposal limits are on the property owned by Robert Shannon should be made by an actual survey of the property.

Once the survey is completed the staked limits of the disposal area may be compared with the property boundaries. At this time, it does not appear absolutely necessary to complete test pits or soil boring to verify the results of the EM study unless the vertical limits of waste and or waste characterization is desired. The limits of waste identified through geophysical survey are smaller than those limits approximated through visual inspection and presented in Schnabel's 2007 Site Summary Report.

W&R recommends that the survey intended to document those limits of waste identified during the recent geophysical evaluation be surveyed as soon as practicable. It was the intention of the landowner to continue active cultivation of his fields to include, plowing, disking, planting, and fertilization; and those activities could be detrimental to the completed landfill limits staking outlined in the project scope.

Tables

**Table 1 - Tabulated GPS Coordinates
Mt. Holly Landfill
Old Highway 27
Mt. Holly, Gaston County, North Carolina
W&R Project Number: 02100001.02**

Area	Easting	Northing	Easting	Northing
Main Disposal Area	1392057.2	583177	1391970.7	582443.8
	1392130.7	583192.1	1391916.6	582402.7
	1392182.6	583205.1	1391875.5	582385.4
	1392228	583200.8	1391836.6	582376.8
	1392254	583164	1391819.3	582396.2
	1392260.5	583107.8	1391782.5	582435.2
	1392256.2	583066.7	1391758.7	582433
	1392230.2	583036.4	1391728.5	582391.9
	1392232.4	583014.8	1391702.5	582361.6
	1392256.2	582978	1391650.6	582353
	1392288.6	582932.6	1391590	582346.5
	1392318.9	582898	1391551.1	582355.2
	1392353.5	582859.1	1391499.2	582441.7
	1392362.1	582828.8	1391471.1	582515.2
	1392334	582792	1391505.7	582584.4
	1392301.6	582757.4	1391572.7	582668.8
	1392260.5	582722.8	1391687.4	582811.5
	1392197.8	582651.5	1391879.8	583001.8
	1392135.1	582584.4	1392046.4	583170.5
1392059.4	582515.2	1392057.2	583177	
Secondary Disposal Area	1391706.8	582216.7	1391557.6	582264.3
	1391719.8	582255.7	1391529.5	582236.2
	1391732.8	582292.4	1391490.6	582195.1
	1391734.9	582327	1391488.4	582156.2
	1391689.5	582327	1391527.3	582119.4
	1391665.7	582322.7	1391631.1	582175.6
	1391639.8	582333.5	1391691.7	582210.3
	1391607.3	582329.2	1391706.8	582216.7
	1391583.5	582294.6		

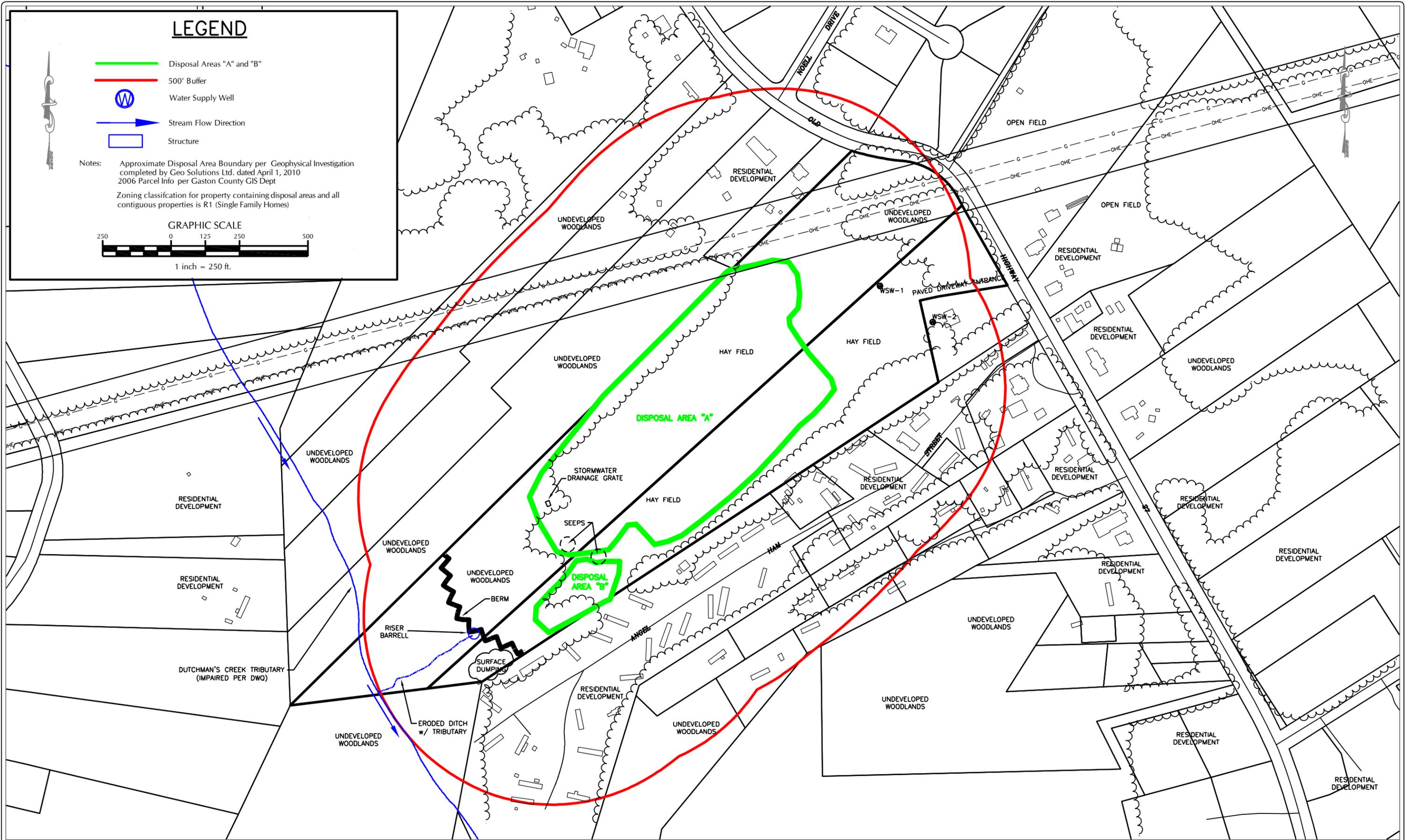
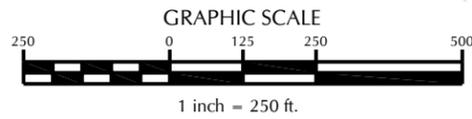
Source: GeoSolutions EM Survey Data

Figures

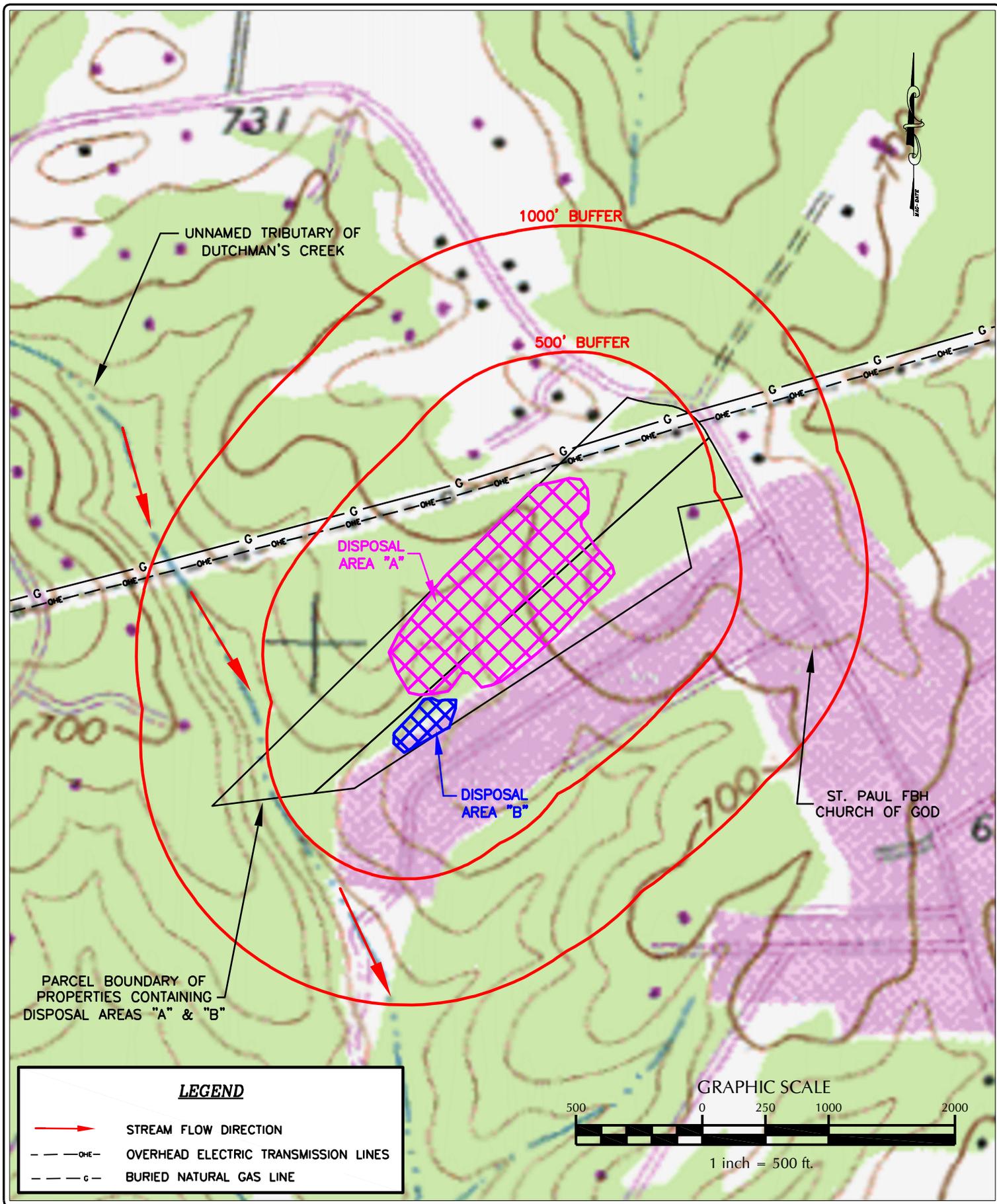
LEGEND

- Disposal Areas "A" and "B"
- 500' Buffer
- Water Supply Well
- Stream Flow Direction
- Structure

Notes: Approximate Disposal Area Boundary per Geophysical Investigation completed by Geo Solutions Ltd. dated April 1, 2010
 2006 Parcel Info per Gaston County GIS Dept
 Zoning classification for property containing disposal areas and all contiguous properties is R1 (Single Family Homes)



Revisions			
No.	Description	Date	By

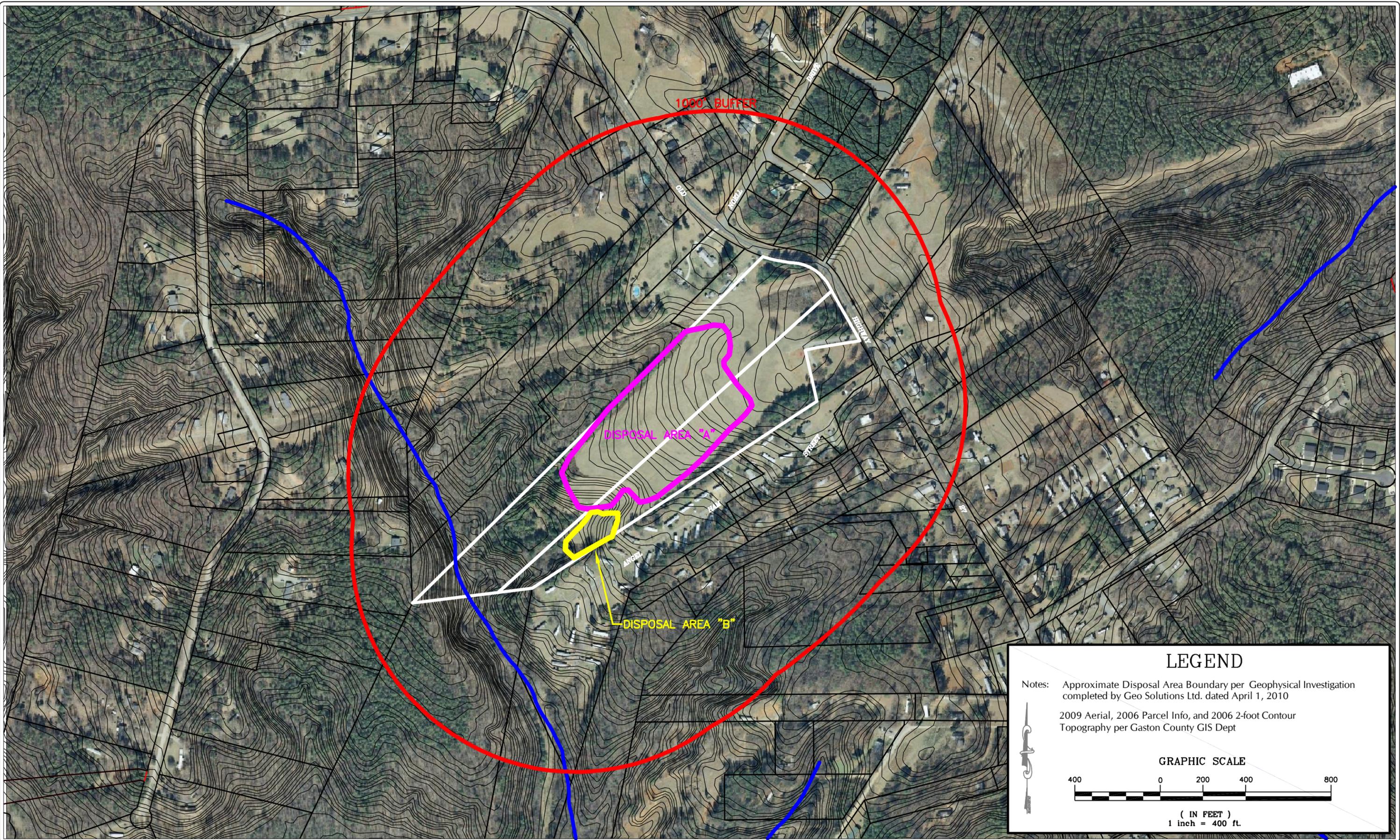


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USGS VICINITY MAP
 GASTON COUNTY (MT. HOLLY) LANDFILL NONCD0000321
 OLD HIGHWAY 27
 MT. HOLLY, NORTH CAROLINA
 USGS MT. HOLLY, NC
 7.5 min. Quadrangle

DRAWN BY: JLF
 SCALE: 1"=500'
 APPROVED BY: CCB
 DATE: 4/20/10

FIGURE NO. 2
 JOB NO. 02100001.02



Revisions			
No.	Description	Date	By

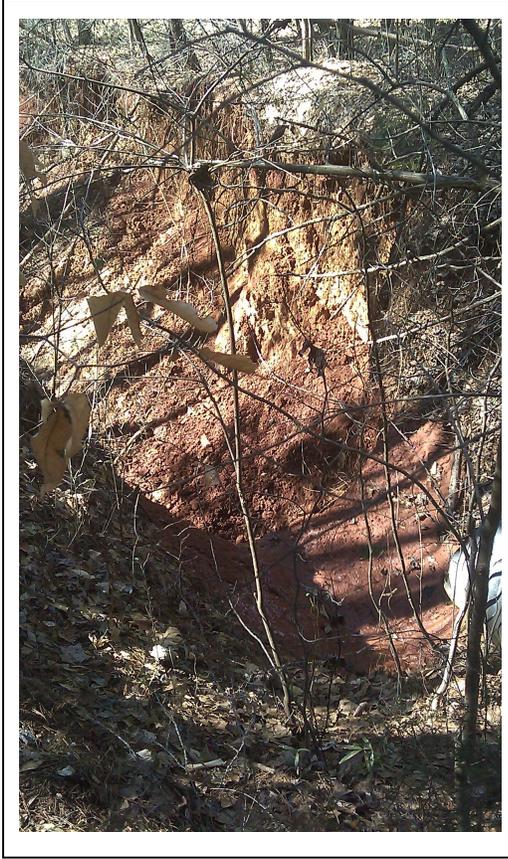
Drawn By JLF	Scale 1" = 400'	Job No. 02100001.02
Checked By CCB	Date 5/25/10	Sheet No. 3

Appendix A Site Photographs

Photographic Record

Project Name: Gaston County – Mount Holly Landfill

NONCD0000321



Frame No. 1 View of scoured ditch from former sediment pond to stream that traverses southwest portion of Robert Shannon property.



Frame No. 2 Another view of scoured ditch line.

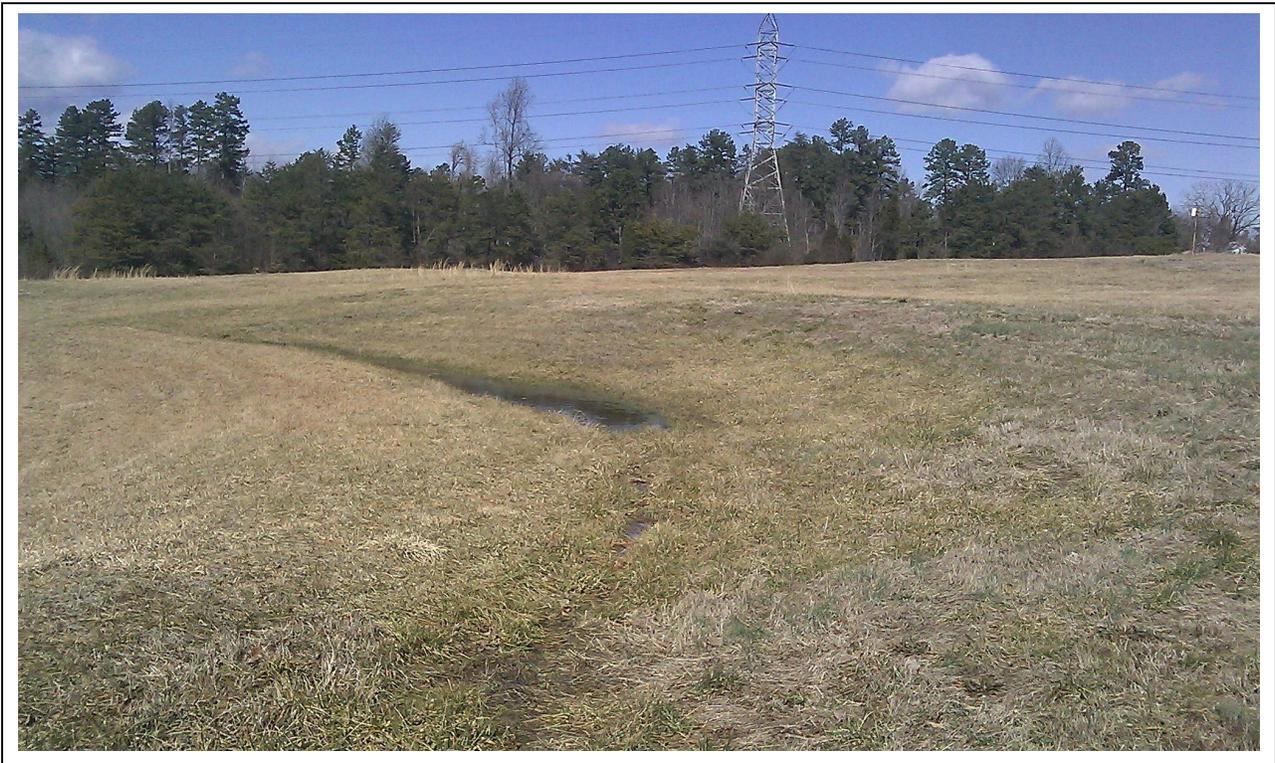
Photographic Record

Project Name: Gaston County – Mount Holly Landfill

NONCD0000321



Frame No. 3 View of apparent surface dumping along the southwest property boundary.



Frame No. 4 View of ponded water at terrace/berm on landfill cap.

Photographic Record

Project Name: Gaston County – Mount Holly Landfill

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Frame No. 5 View of southern property line with homes along Angel Ham St.



Frame No. 6 View of landfill surface looking northeast along property boundary.

Photographic Record

Project Name: Gaston County – Mount Holly Landfill

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Frame No. 7 View of landfill cap condition.



Frame No. 8 View of homes north of landfill site.

Photographic Record

Project Name: Gaston County – Mount Holly Landfill

NONCD0000321



Frame No. 9 View of mobile homes along south property boundary from landfill perimeter.



Frame No. 10 View of residence abutting landfill to the east –northeast.

Photographic Record

Project Name: Gaston County – Mount Holly Landfill

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Frame No. 11 View of drain inlet and area of seep in background.



Frame No. 12 View of seep on grassed slope.

Appendix B Pertinent Public Documents

Sensitive Environments Research Summary Table
Mt. Holly Landfill
Old Highway 27
Mt. Holly, Gaston County, North Carolina

Sensitive Environment	PRLU Provided Contact	Results
State Parks	Mr. Harry LeGrand NC Parks and Recreation Natural Heritage Program (919) 715-8697 harry.legrand@ncdenr.gov	No response to request; none identified by W&R search
Areas Important to Maintenance of Unique Natural Communities		No response to request; none identified by W&R search
Sensitive Areas Identified Under the National Estuary Program		Not Applicable
Designated State Natural Areas		No response to request; none identified by W&R search
State Seashore, Lakeshore, and River Recreational Areas		No response to request; none identified by W&R search
Rare Species (State & Federal Threatened and Endangered Species)		No response to request; none identified by W&R search
Sensitive Aquatic Habitat		No response to request; none identified by W&R search
State Wild and Scenic Rivers	Mr. Bryan Strong NC Planning and Natural Resources (919) 715-8711	No response to request; none identified by W&R search
National Seashore, Lakeshore, and River Recreational Areas	Ms. Anita Barnett National Parks Service Public Affairs Office (404) 562-3124 ext. 705 http://www.nps.gov/rivers	No response to request; none identified by W&R search
National Parks or Monuments		No response to request; none identified by W&R search
Federal Designated Wild and Scenic Rivers		No response to request; none identified by W&R search
Designated and Proposed Federal Wilderness and Natural Areas	Ms. Ruth Berner U.S. Forest Service (828) 257-4862	No response to request; none identified by W&R search
National Preserves and Forests		No response to request; none identified by W&R search
Federal Land Designated for Protection of Natural Ecosystems		No response to request; none identified by W&R search
State-Designated Areas for Protection or Maintenance of Aquatic Life	Ms. Melanie Williams NC Division of Water Quality (919) 807-6300 ext. 76447 melanie.williams@ncdenr.gov	Email response indicated that Site was located within this sensitive environment associated with Dutchman's Creek and Lake Wylie, which are both impaired waters.
State Preserves or Forests	Mr. Chris Carlson NC Division of Forest Resources (919) 857-4819	No response to request; none identified by W&R search
Endangered Species	Mr. Pete Benjamin U.S. Fish and Wildlife Service (919) 856-4520 ext. 11	No response to request; none identified by W&R search
Marine Sanctuaries	Mr. Matt Stout NOAA (301) 713-3125 ext. 273	Not Applicable
National and State Historical Sites	Ms. Renee Gledhill-Early NC Department of Cultural Resources (919) 807-6579	No response to request; none identified by W&R search
Areas Identified Under Coastal Protection Legislation, Coastal Barriers, or Units of a Coastal Barrier Resources System	Mr. Ted Tyndall NC Division of Coastal Management (252) 808-2808 http://dem2.enr.state.nc.us	Not Applicable
National or State Wildlife Refuge	Mr. David Cox NC Wildlife Resources Commission (919) 528-9886	No response to request; none identified by W&R search
Migratory Pathways and Feeding Areas Critical for Maintenance of Anadromous Fish Species within River Reaches or Areas in Lakes or Coastal Tidal Waters in which such Fish Spend Extended Periods of Time		No response to request; none identified by W&R search
Spawning Areas Critical for the Maintenance of Fish/Shellfish Species within River, Lake, or Coastal Tidal Waters		No response to request; none identified by W&R search
Wetlands	Ms. Dorothy Harrington U.S. Army Corp of Engineers (919) 554-4884 ext. 28	No response to request; stream crosses westernmost portion of the Site, but no wetlands identified by U.S. Fish & Wildlife Service National Wetlands Inventory during W&R search

Appendix C Historical Aerial Photographs

Appendix D Geophysical Subcontractor Report



P.O. Box 37698
Raleigh, North Carolina 27627
(919) 233-5858 (Phone)
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April 1, 2010

Mr. John Palmer, P.G.
Withers & Ravenel
111 MacKenan Drive
Cary, NC 27511

Dear Mr. Palmer:

Geo Solutions Limited, Inc. (Geo Solutions) is pleased to submit this report for a geophysical survey at the Gaston County Landfill, located along Old Highway 27, Mount Holly, Gaston County, North Carolina. This report was completed in support of Withers & Ravenel's ongoing evaluation of the Gaston County Pre-Regulatory Landfill (GCPRL) where the extent (horizontal) and contents of the fill have not been characterized. The site and the location of the location of the geophysical traverses are presented in Figure 1.

Background

According to Withers & Ravenel (W&R) the State of North Carolina has asked W&R to conduct a site evaluation of a former Gaston County landfill. According to our conversations, the site operated from 1971 till 1983. The landfill foot print is estimated to be approximately 15.7 acres, and is located within a larger tract of approximately 24.5 acres. Most of the landfill area is currently used to produce hay, and at the time of this evaluation was cut to a height of less than 6 inches. The fill site is a hollow fill type landfill. Here, the historical drainage filled drained from the northeast to the southwest. The fill appears to be capped. The purpose of this geophysical evaluation is to verify the horizontal extent of buried waste.

Field Activities

Geo Solutions completed a medium resolution multifrequency electromagnetic (EM) survey over the entire site (including wooded and grassy areas) to evaluate the distribution of buried waste material. The field work was completed during the week of March 22, 2010.

Field Method - Multifrequency Electromagnetic Survey (In-phase and Soil Conductivity)

The Electromagnetic Method (EM) is a non-contact (uncoupled) geophysical method that utilizes a multiple frequency electromagnetic detector (Geophex Model GEM-2). The GEM-2 instrument collects electromagnetic responses in the in-phase (metal detection or magnetic susceptibility mode) and quadrature (conductivity) mode.

The EM in-phase and conductivity data was collected simultaneously at seven varying frequencies (1470 Hz, 5130 Hz, 9090Hz, 19950 Hz, 39510 Hz, 60030 Hz, and 90030 Hz). By varying the collection frequencies, Geo Solutions was able to better identify the extent of the buried waste.

The GEM-2 was operated in remote control configuration. In this mode the GEM-2 unit was mounted on a plastic sled positioned approximately 3-feet above the ground surface. The receiving coil (detector coil) is situated directly above the exposed ground surface. Data was collected at the rate of 10 samples per second. The position of each sample point is measured utilizing a CSI Wireless SERES GPS with a data update rate of 6 Hz. These data were transferred from the GEM-2 unit to a portable laptop computer that was carried onboard a 4WD vehicle (Polaris Ranger with covered cab). The sample spacing is thus a function of rate of travel of the sled and rate of data sampling. Geo Solutions collected data along straight survey lines at 0.5 to 2 ft. intervals. The site was surveyed in a set of parallel path patterns. The location of the EM data points are presented in Figure 1.

Results

Based on the results of the EM field data, Geo Solutions prepared maps showing comparing the results of the In-phase and Conductivity data by frequency. These results are shown in Figures 2 through 8. Here, orange and red hues indicate increased values in the soils in-phase and conductivity values. A summary Figure showing the maximum extent of the fill material is shown in Figure 10.

Additionally, Geo Solutions prepared a figure showing the magnetic susceptibility of the site soil at the 90030 Hz frequency, and the location of energy levels from 60-cycle alternating current (AC) "Hum" (Figure 9). The magnetic susceptibility indicates that the natural soil conditions are higher than the fill material in the landfill proper. The lack of large anomalies in the fill likely excludes the presence of large metal objects, and/or reinforced concrete debris.

The single AC Hum anomaly is associated with the high voltage power lines that traverse the property. Additionally, along side of the power lines, Geo Solutions identified the presence of a buried gas line (Figure 10).

Field-Plotting of Extent of Fill

Geo Solutions compiled a field map showing the distribution of the land area underlain by fill material. Based on these data, Geo Solutions established the extent of the fill using wooded and metal stakes. The use of metal markers and wooded stake combinations was limited to the edges of the existing field, whereas wooden stakes alone were used in the interior portions of the property (this was because the land owner indicated that he was anticipating plowing of the grassy field, and iron stakes may encumber plowing). The following coordinates identify the extent of the primary fill area (*coordinates in North Carolina State Plane, survey feet units*):

X- Feet	Y-Feet
1392057.2	583177.0
1392130.7	583192.1
1392182.6	583205.1
1392228.0	583200.8
1392254.0	583164.0
1392260.5	583107.8
1392256.2	583066.7
1392230.2	583036.4
1392232.4	583014.8
1392256.2	582978.0
1392288.6	582932.6
1392318.9	582898.0
1392353.5	582859.1
1392362.1	582828.8
1392334.0	582792.0
1392301.6	582757.4
1392260.5	582722.8
1392197.8	582651.5
1392135.1	582584.4
1392059.4	582515.2
1391970.7	582443.8
1391916.6	582402.7
1391875.5	582385.4
1391836.6	582376.8
1391819.3	582396.2
1391782.5	582435.2
1391758.7	582433.0
1391728.5	582391.9
1391702.5	582361.6
1391650.6	582353.0
1391590.0	582346.5
1391551.1	582355.2
1391499.2	582441.7
1391471.1	582515.2
1391505.7	582584.4
1391572.7	582668.8
1391687.4	582811.5
1391879.8	583001.8
1392046.4	583170.5
1392057.2	583177.0

A secondary fill area was identified as surface debris associated with a neighboring trailer park area. It is suspected that this material was indiscriminately dumped and not covered. The location of this secondary fill area is identified below (*coordinates in North Carolina State Plane, survey feet units*):

X-Feet	Y-Feet
1391706.8	582216.7
1391719.8	582255.7
1391732.8	582292.4
1391734.9	582327.0
1391689.5	582327.0
1391665.7	582322.7
1391639.8	582333.5
1391607.3	582329.2
1391583.5	582294.6
1391557.6	582264.3
1391529.5	582236.2
1391490.6	582195.1
1391488.4	582156.2
1391527.3	582119.4
1391631.1	582175.6
1391691.7	582210.3
1391706.8	582216.7

Summary of Results

An EM evaluation was completed at the Gaston County Landfill site located along Old Highway 27, Mount Holly, North Carolina. The area of the investigation represented approximately 15 acres in area. EM profiles were completed over the entire area of interest and illustrated the following:

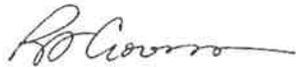
1. Presence of high in-phase and quadrature (soil conductivity) over regions of the landfill. These areas are demarked as red and orange hues in each figure;
2. Presence of a larger capped primary fill area;
3. Presence of a small and uncapped dump area (secondary fill area) associated with a neighboring property;

4. Presence of a large buried gas line located on the north border of the property; and
5. Lack of evidence of active buried electric lines on the property.

Geo Solutions is pleased to have been provided this opportunity to serve you, please give me a call should you have any questions concerning the above.

Very truly yours,

GEO SOLUTIONS LIMITED, INC.

A handwritten signature in cursive script, appearing to read "Ron Crowson", with a long horizontal flourish extending to the right.

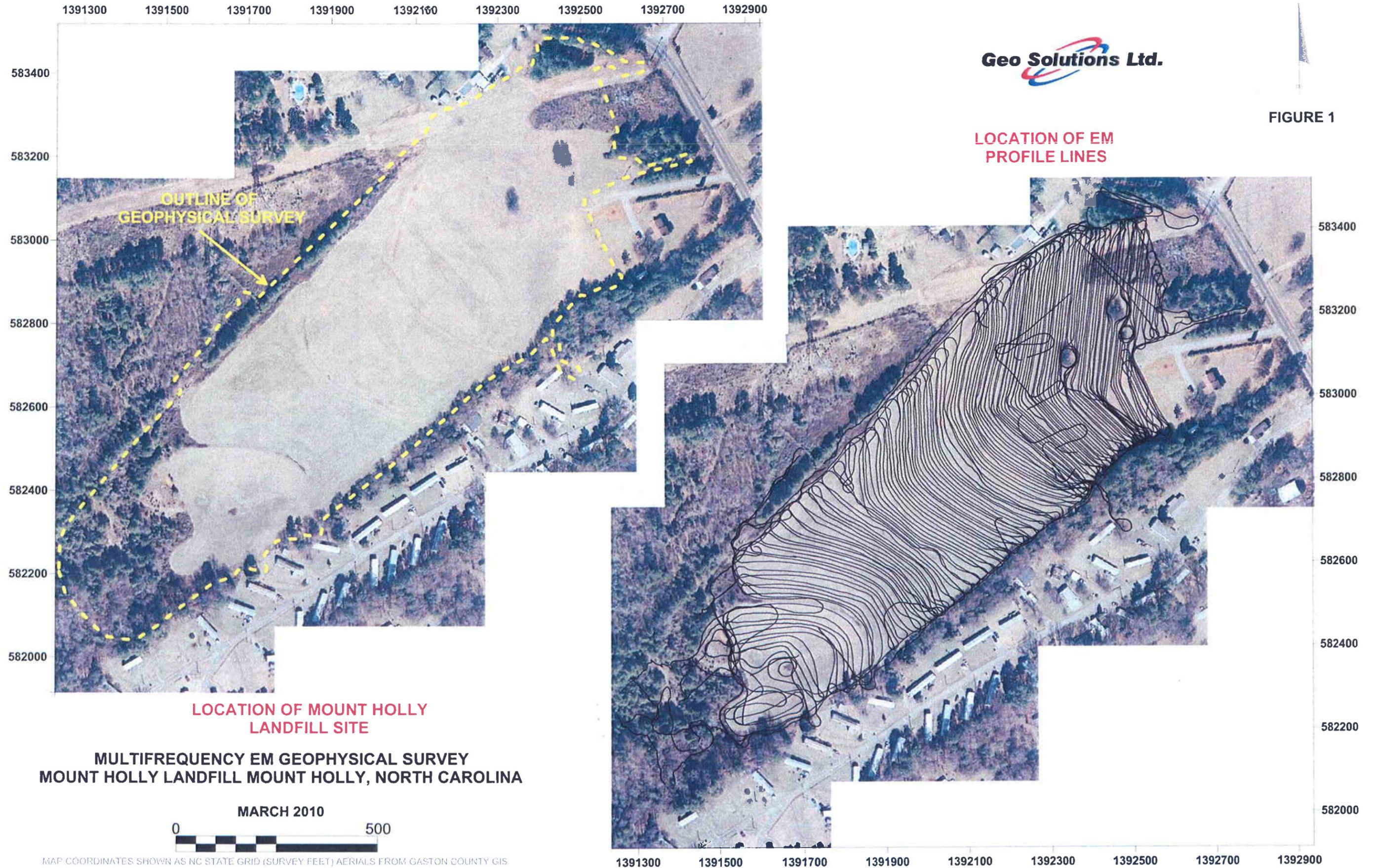
Ronald A. Crowson
Geophysicist

FIGURES 1 THROUGH 10



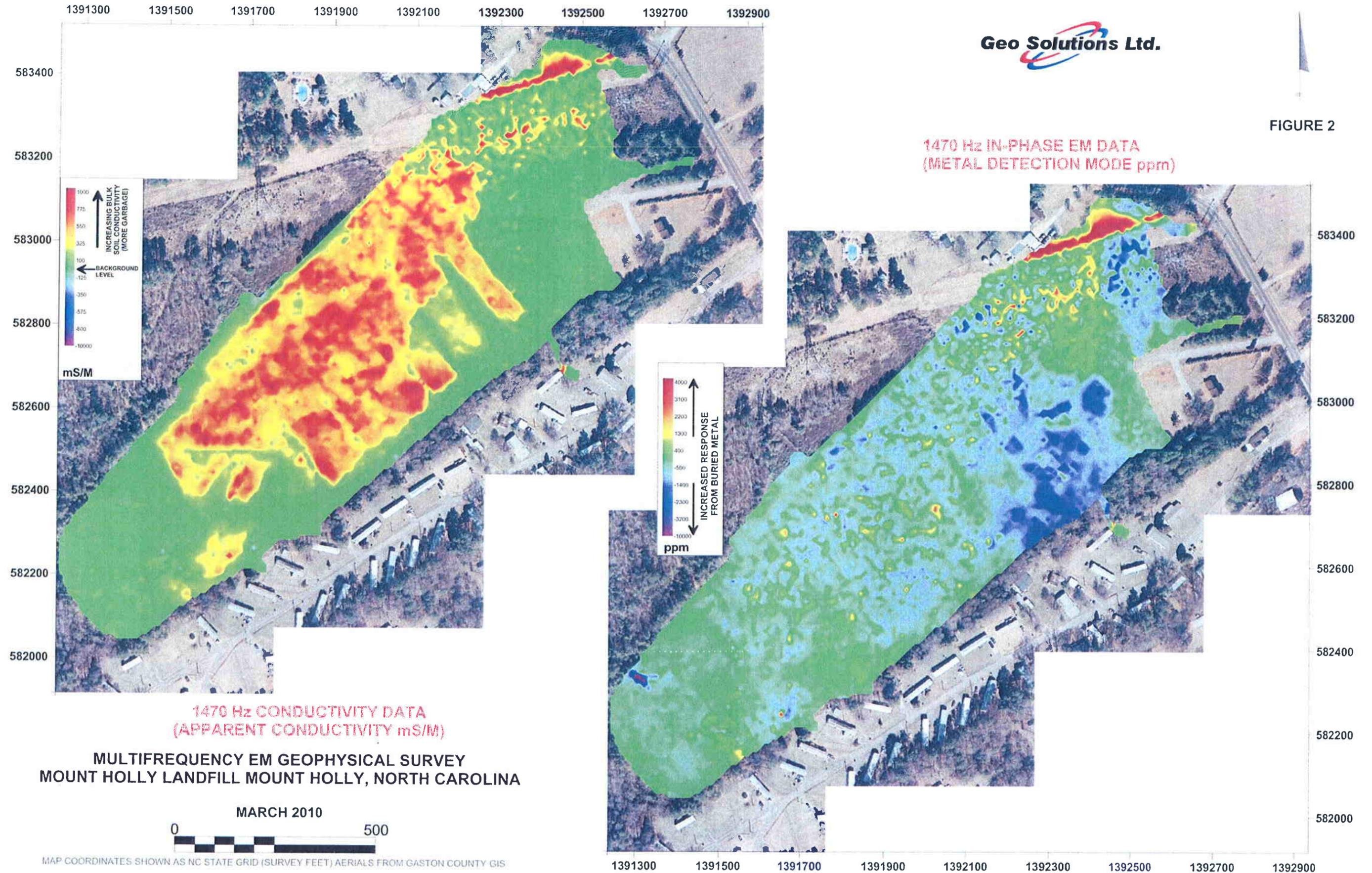
FIGURE 1

LOCATION OF EM
PROFILE LINES



MAP COORDINATES SHOWN AS NC STATE GRID (SURVEY FEET) AERIALS FROM GASTON COUNTY GIS

FIGURE 2



MULTIFREQUENCY EM GEOPHYSICAL SURVEY
MOUNT HOLLY LANDFILL MOUNT HOLLY, NORTH CAROLINA

MARCH 2010



MAP COORDINATES SHOWN AS NC STATE GRID (SURVEY FEET) AERIALS FROM GASTON COUNTY GIS

FIGURE 3

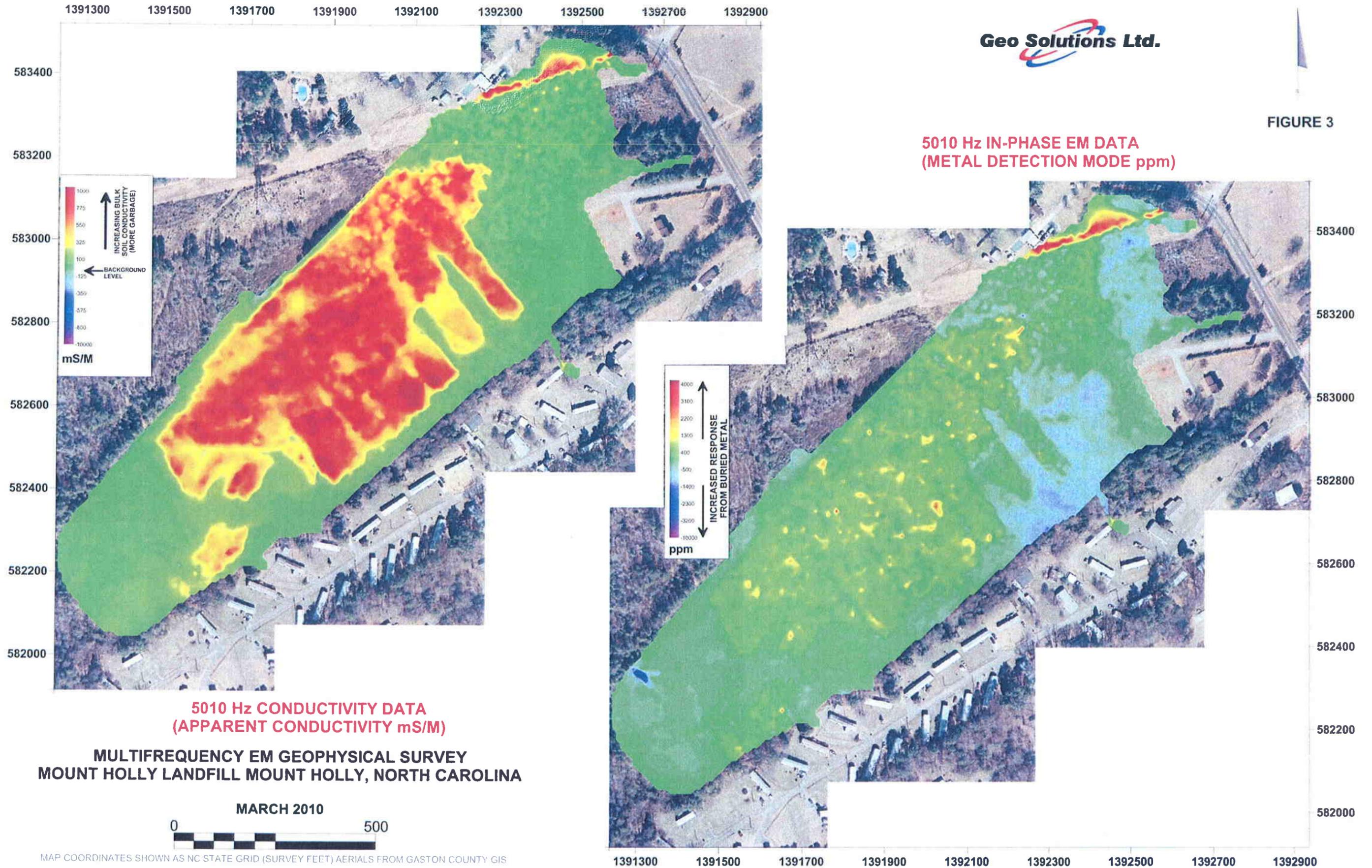


FIGURE 4

9090 Hz IN-PHASE EM DATA
(METAL DETECTION MODE ppm)

9090 Hz CONDUCTIVITY DATA
(APPARENT CONDUCTIVITY mS/M)

MULTIFREQUENCY EM GEOPHYSICAL SURVEY
MOUNT HOLLY LANDFILL MOUNT HOLLY, NORTH CAROLINA

MARCH 2010



MAP COORDINATES SHOWN AS NC STATE GRID (SURVEY FEET) AERIALS FROM GASTON COUNTY GIS

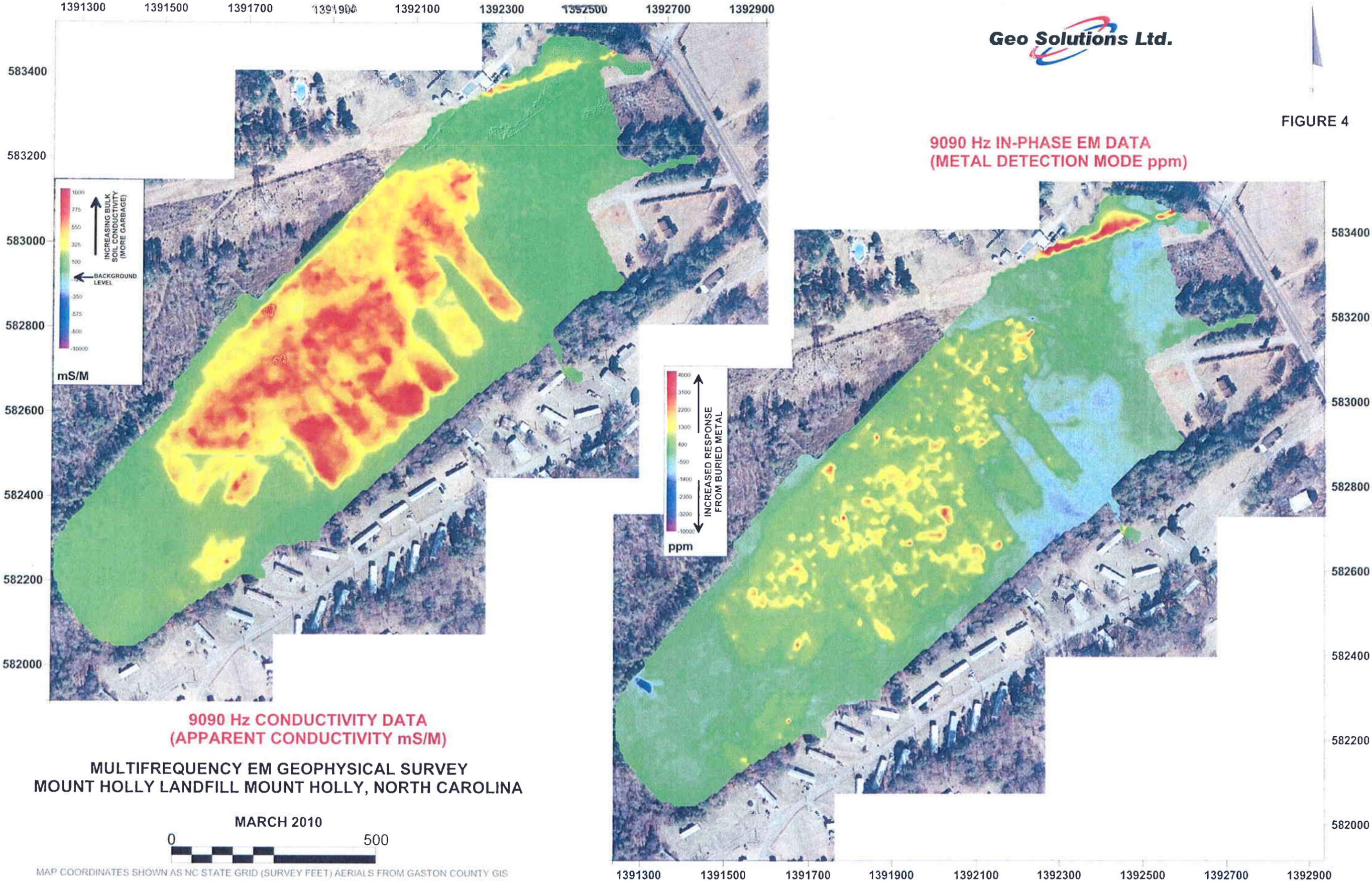
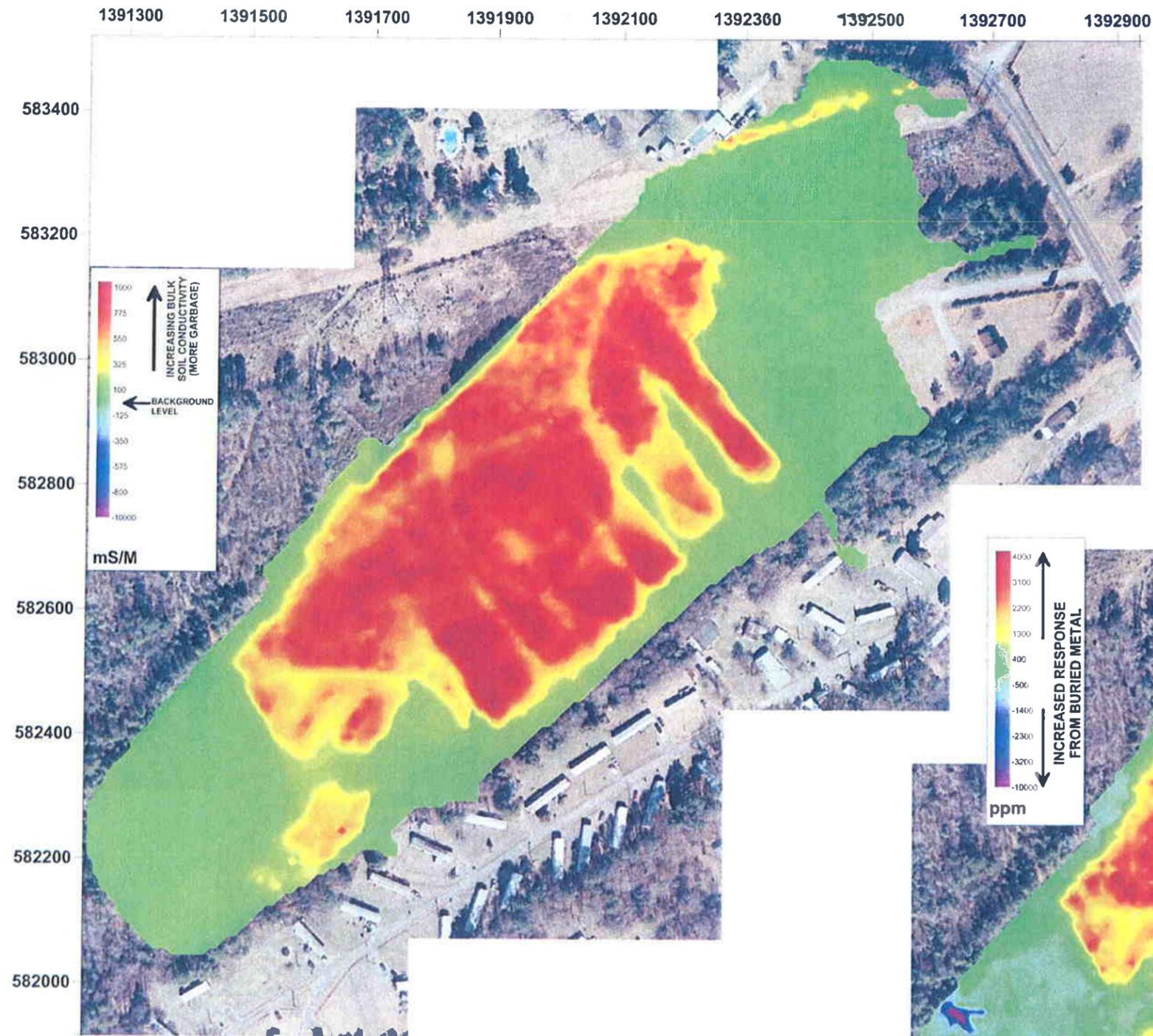
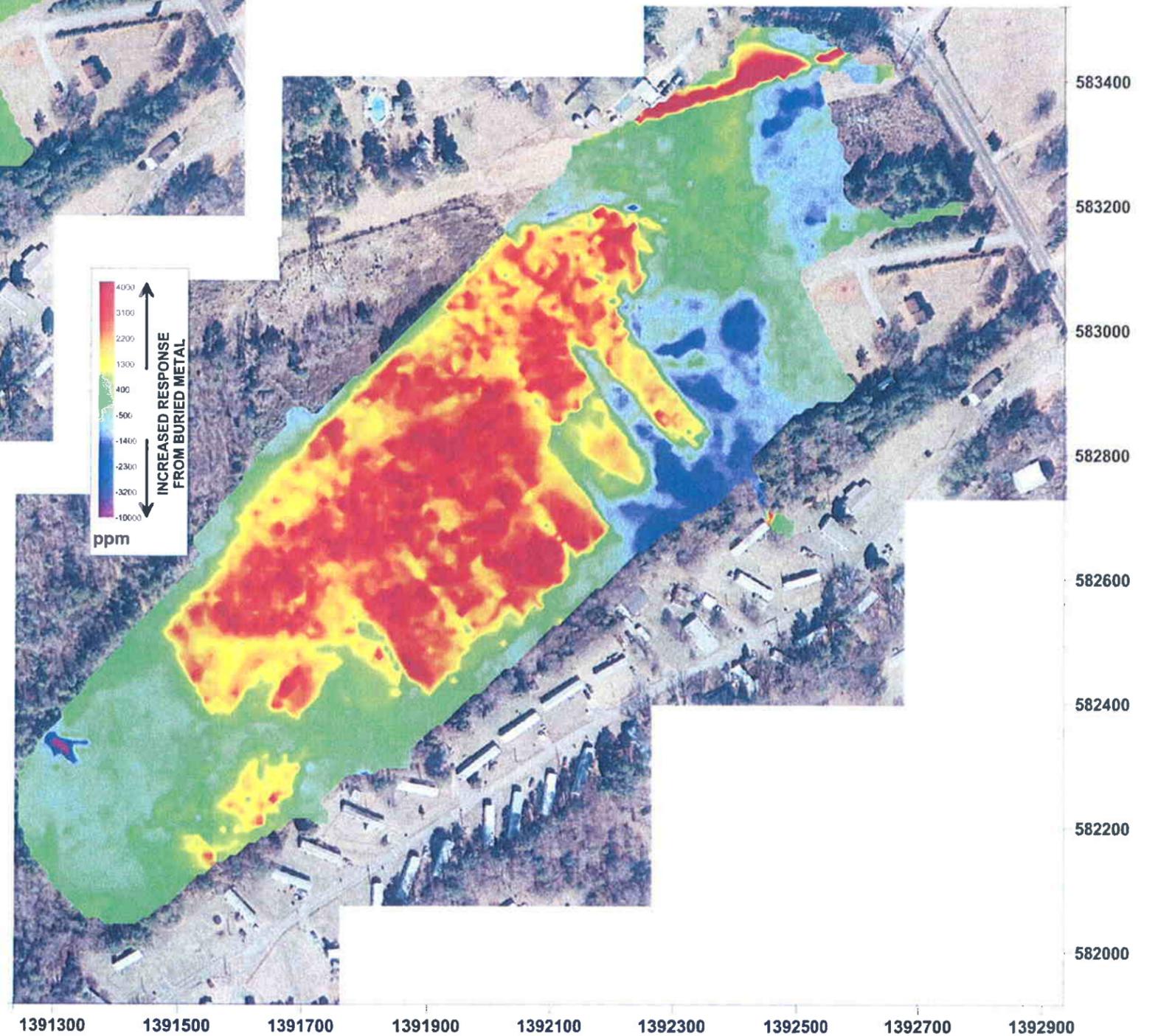


FIGURE 5

19950 Hz IN-PHASE EM DATA
(METAL DETECTION MODE ppm)



191950 Hz CONDUCTIVITY DATA
(APPARENT CONDUCTIVITY mS/M)



MULTIFREQUENCY EM GEOPHYSICAL SURVEY
MOUNT HOLLY LANDFILL MOUNT HOLLY, NORTH CAROLINA

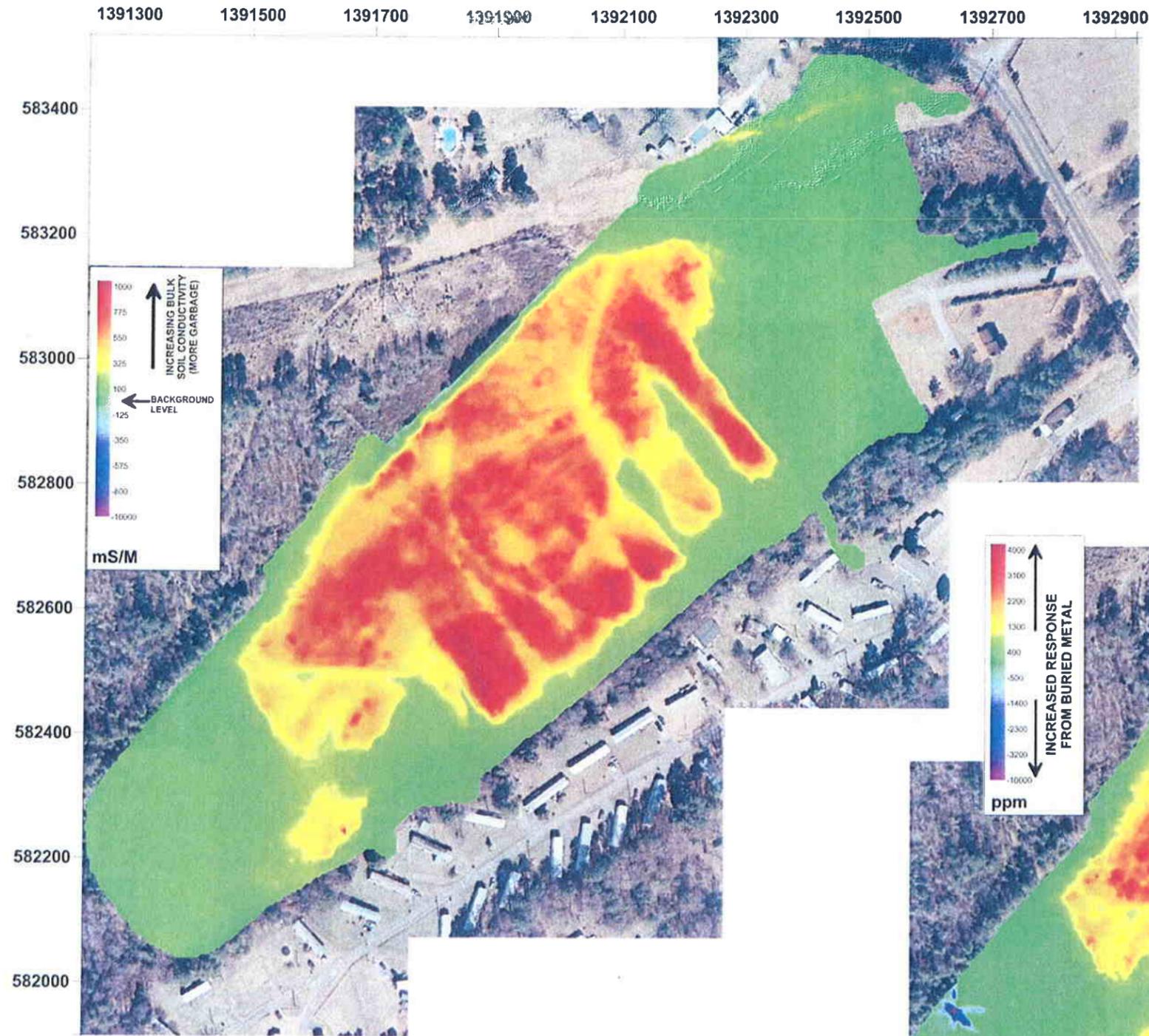
MARCH 2010



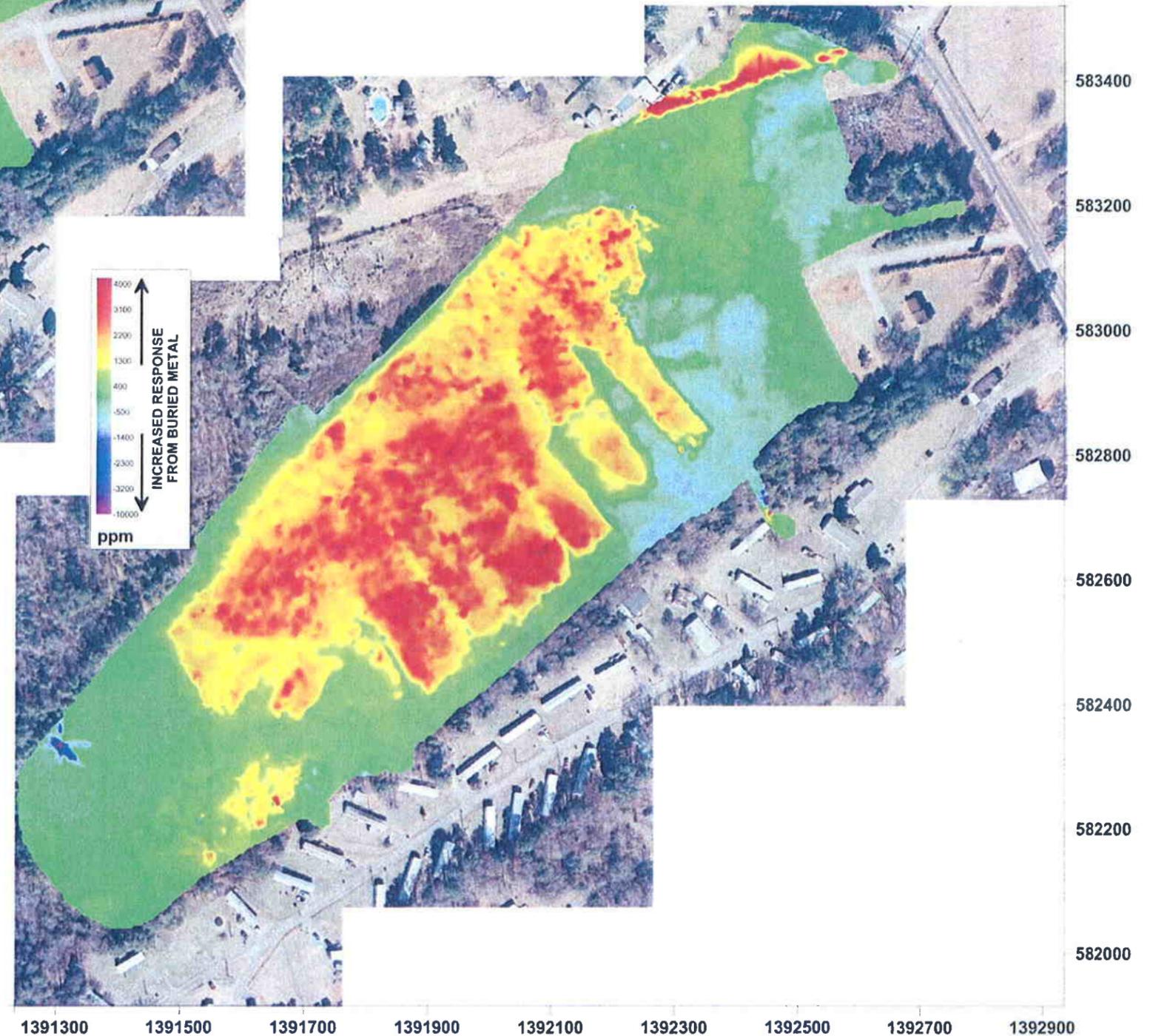
MAP COORDINATES SHOWN AS NC STATE GRID (SURVEY FEET) AERIALS FROM GASTON COUNTY GIS

FIGURE 6

39510 Hz IN-PHASE EM DATA
(METAL DETECTION MODE ppm)



39510 Hz CONDUCTIVITY DATA
(APPARENT CONDUCTIVITY mS/M)



MULTIFREQUENCY EM GEOPHYSICAL SURVEY
MOUNT HOLLY LANDFILL MOUNT HOLLY, NORTH CAROLINA

MARCH 2010



MAP COORDINATES SHOWN AS NC STATE GRID (SURVEY FEET) AERIALS FROM GASTON COUNTY GIS

FIGURE 7

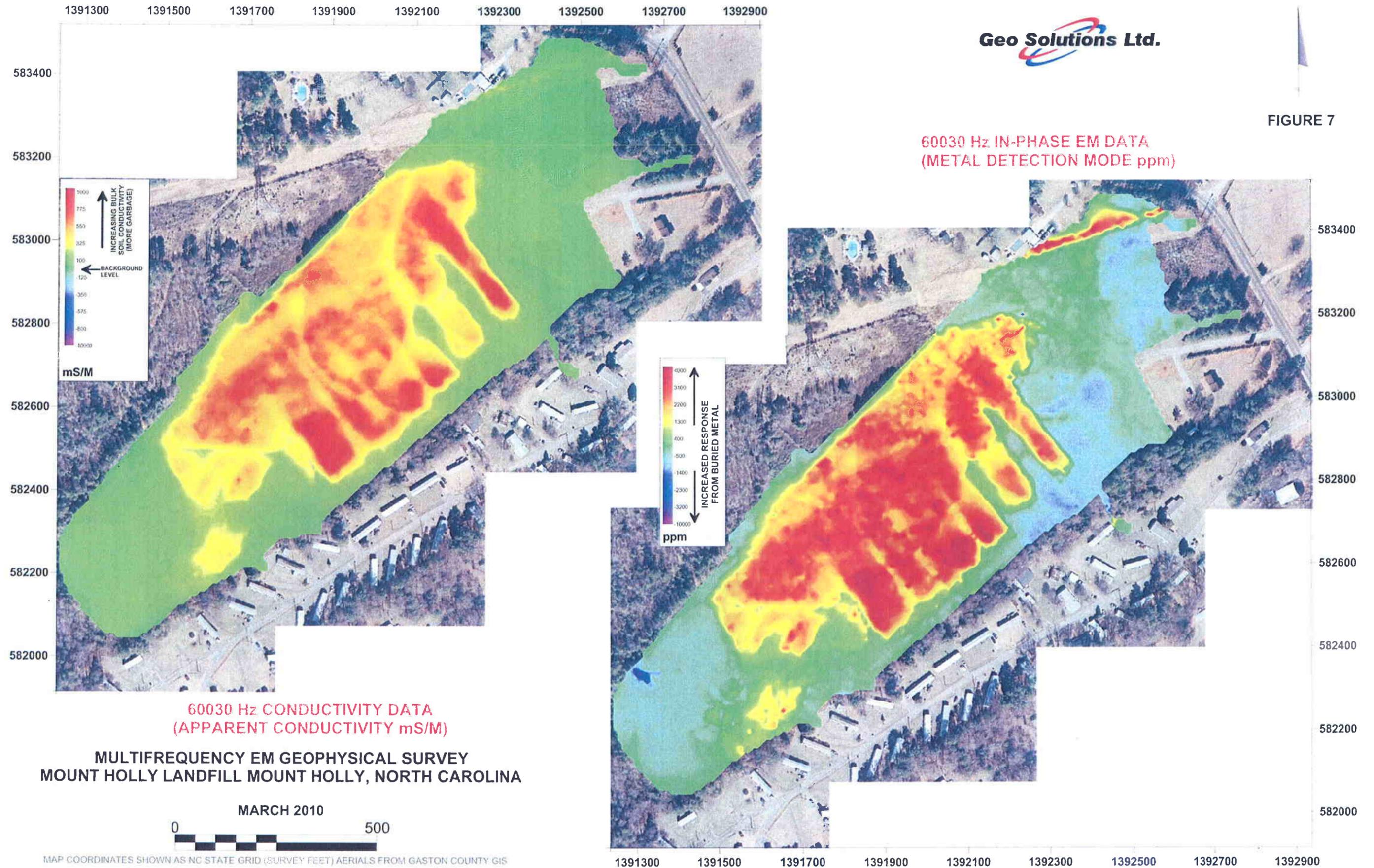
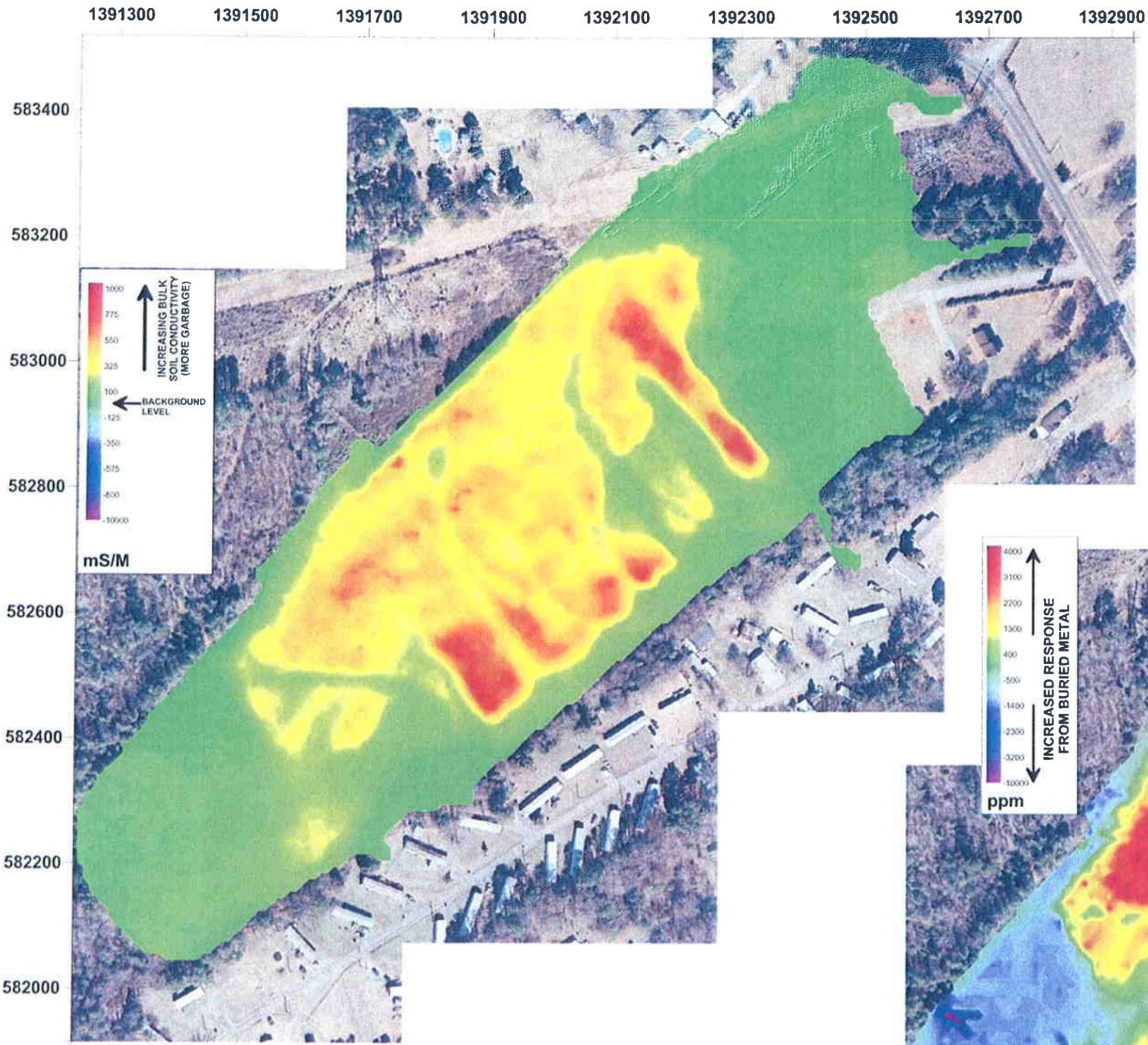
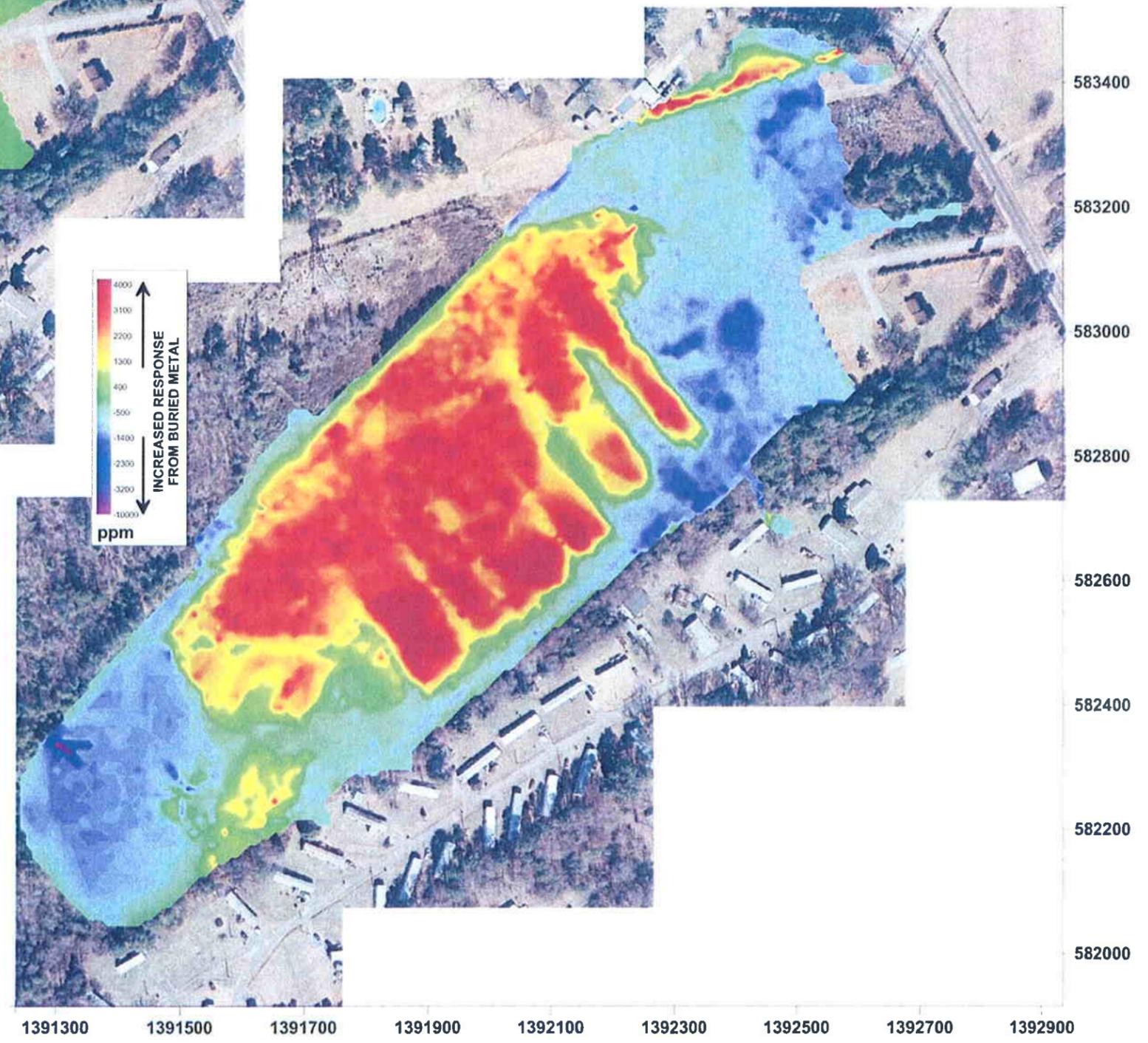


FIGURE 8

90030 Hz IN-PHASE EM DATA
(METAL DETECTION MODE ppm)



90030 Hz CONDUCTIVITY DATA
(APPARENT CONDUCTIVITY mS/M)



MULTIFREQUENCY EM GEOPHYSICAL SURVEY
MOUNT HOLLY LANDFILL MOUNT HOLLY, NORTH CAROLINA

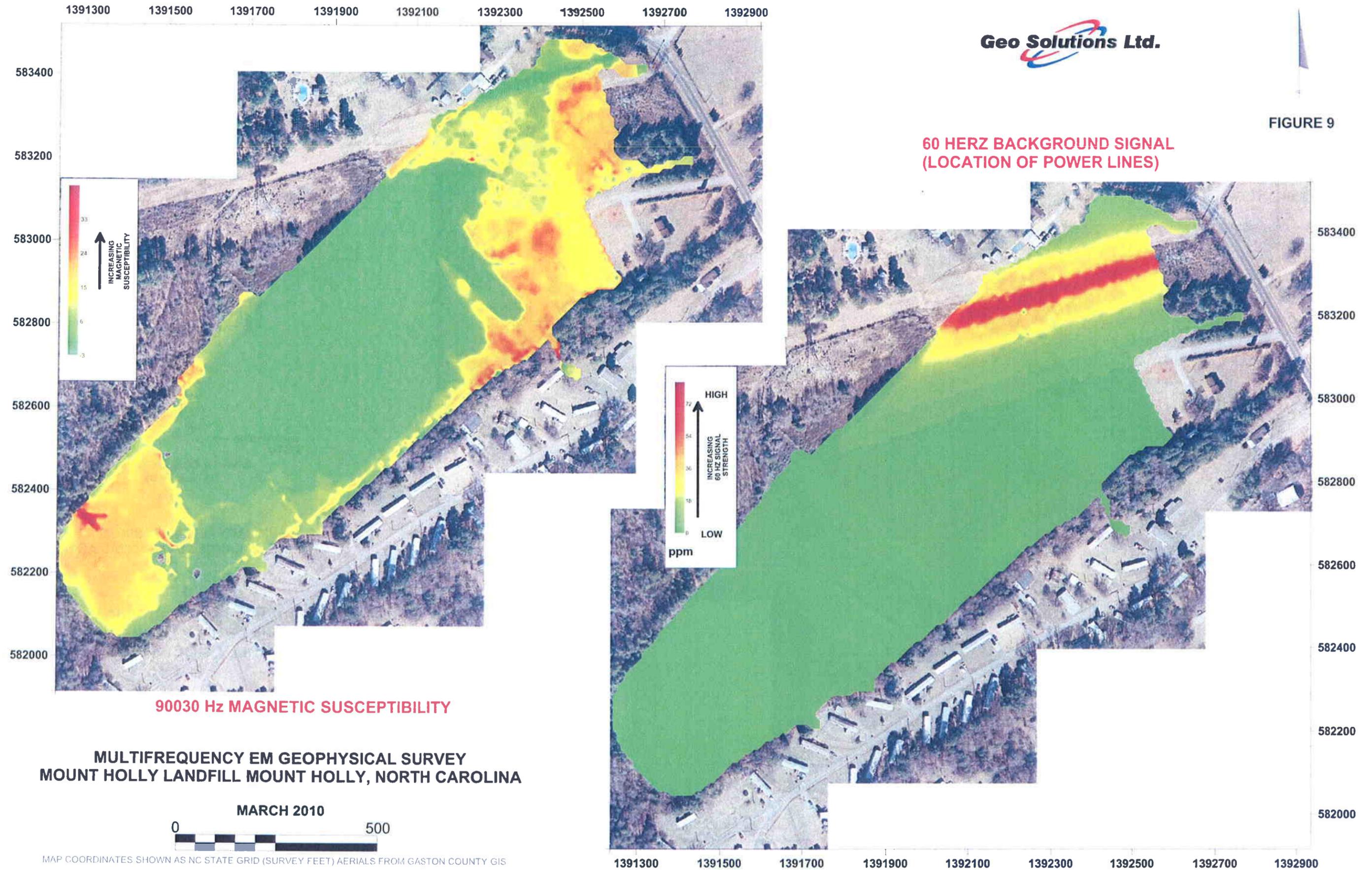
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MAP COORDINATES SHOWN AS NC STATE GRID (SURVEY FEET) AERIALS FROM GASTON COUNTY GIS

FIGURE 9

60 HERTZ BACKGROUND SIGNAL
(LOCATION OF POWER LINES)



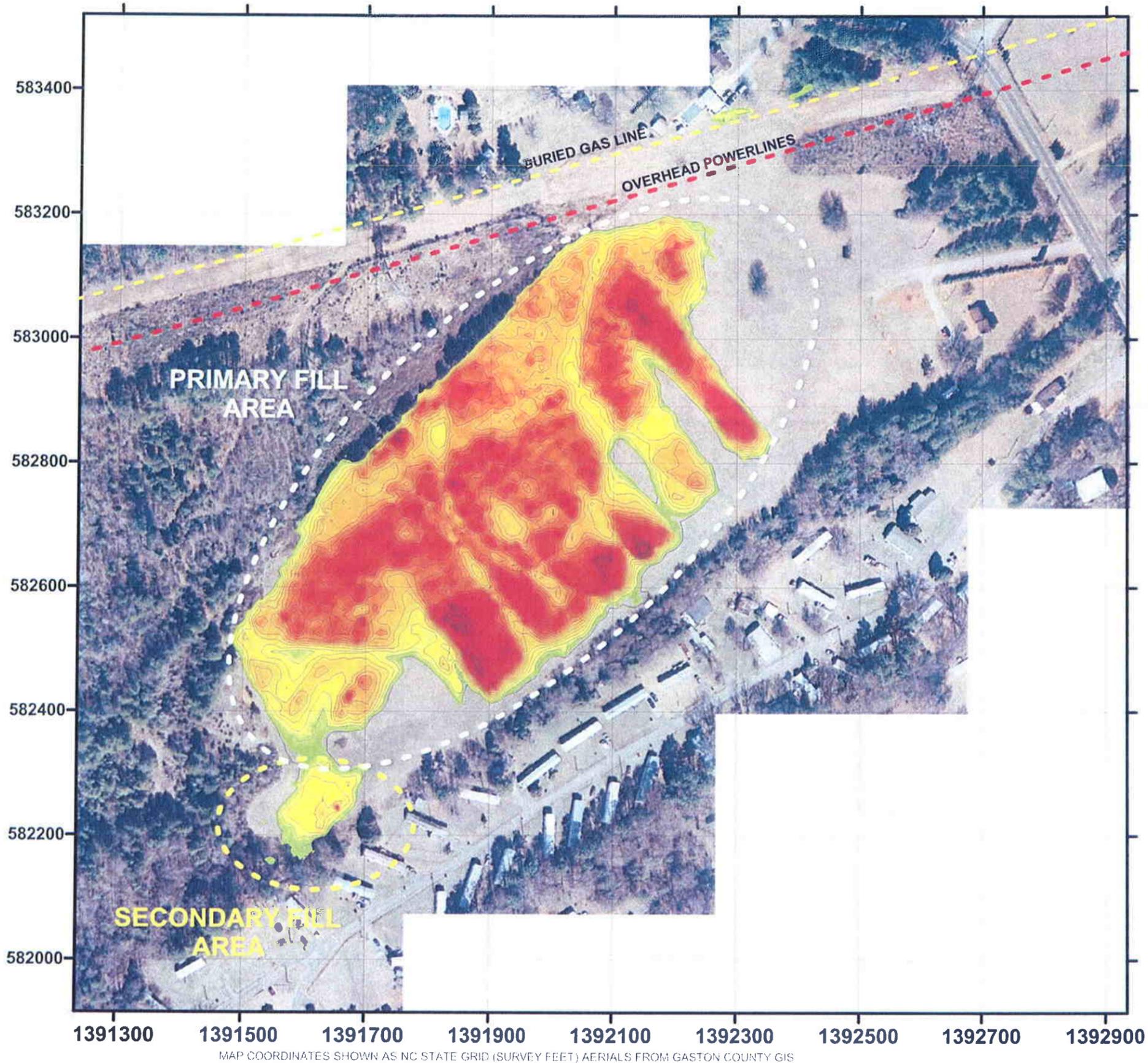
90030 Hz MAGNETIC SUSCEPTIBILITY

MULTIFREQUENCY EM GEOPHYSICAL SURVEY
MOUNT HOLLY LANDFILL MOUNT HOLLY, NORTH CAROLINA

MARCH 2010

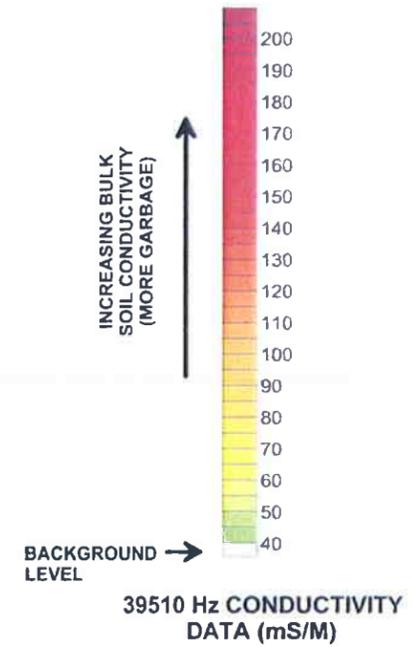


MAP COORDINATES SHOWN AS NC STATE GRID (SURVEY FEET) AERIALS FROM GASTON COUNTY GIS



MAP COORDINATES SHOWN AS NC STATE GRID (SURVEY FEET) AERIALS FROM GASTON COUNTY GIS

FIGURE 10



SUMMARY OF EM FINDINGS
OUTLINE OF LANDFILL DISPOSAL AREA

MULTIFREQUENCY EM GEOPHYSICAL SURVEY
MOUNT HOLLY LANDFILL
MOUNT HOLLY, NORTH CAROLINA



MARCH 2010

