Health Consultation

SECURITY SIGNALS, INC.

OAKLAND, FAYETTE COUNTY, TENNESSEE

Prepared by the
Tennessee Department of Health

FEBRUARY 25, 2011

This document summarizes an environmental public health investigation performed by the Environmental Epidemiology Program of the State of Tennessee Department of Health. In order for the Health Department to answer an environmental public health question, several actions are performed:

Evaluate Exposure: Tennessee health assessors begin by reviewing available information about environmental conditions at a site. We interpret environmental data, review site reports, and talk with environmental officials. Usually, we do not collect our own environmental sampling data. We rely on information provided by the Tennessee Department of Environment and Conservation, U.S. Environmental Protection Agency, and other government agencies, businesses, or the general public. We work to understand how much contamination may be present, where it is located on a site, and how people might be exposed to it. We look for evidence that people may have been exposed to, are being exposed to, or in the future could be exposed to harmful substances.

Evaluate Health Effects: If people have the potential to be exposed to contamination, then health assessors take steps to determine if it could be harmful to human health. We base our health conclusions on exposure pathways, risk assessment, toxicology, cleanup actions, and the scientific literature.

Make Recommendations: Based on our conclusions, we will recommend that any potential health hazard posed by a site be reduced or eliminated. These actions will prevent possible harmful health effects. The role of Environmental Epidemiology in dealing with hazardous waste sites is to be an advisor. Often, our recommendations will be actions items for other agencies. However, if there is an urgent public health hazard, the Tennessee Department of Health can issue a public health advisory warning people of the danger, and will work with other agencies to resolve the problem.

If you have questions or comments about this report, we encourage you to contact us.

Please write to:	Environmental Epidemiology Program Tennessee Department of Health 1st Floor, Cordell Hull Building 425 5th Avenue North Nashville, TN 37243
Or call us at:	615-741-7247 or 1-800-404-3006 during normal business hours
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Glossary of Terms

Acute: Occurring over a short time [compare with chronic].

Acute exposure: Contact with a substance that occurs once or for only a short time (up to 14 days) [compare with intermediate duration exposure and chronic exposure].

Adverse health effect: A change in body function or cell structure that might lead to disease or health problems

Background concentration: An average or expected amount of a substance or radioactive material in a specific environment, or typical amounts of substances that occur naturally in an environment.

Cancer: Any one of a group of diseases that occur when cells in the body become abnormal and grow or multiply out of control.

Cancer risk: A theoretical risk for getting cancer if exposed to a substance every day for 70 years (a lifetime exposure). The true risk might be lower.

Carcinogen: A substance that causes cancer.

Chronic exposure: Contact with a substance that occurs over a long time (more than 1 year).

Comparison value (CV): Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.

Concentration: The amount of a substance present in a certain amount of soil, water, air, food, blood, hair, urine, breath, or any other media.

Contaminant: A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

EPA: United States Environmental Protection Agency.

Epidemiology: The study of the distribution and determinants of disease or health status in a population; the study of the occurrence and causes of health effects in humans.

Exposure: Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [acute exposure], of intermediate duration, or long-term [chronic exposure].

Exposure pathway: The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a source of contamination (such as an abandoned business); an

environmental media and transport mechanism (such as movement through groundwater); a point of exposure (such as a private well); a route of exposure (eating, drinking, breathing, or touching), and a receptor population (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a completed exposure pathway.

Groundwater: Water beneath the earth's surface in the spaces between soil particles and between rock surfaces.

Health consultation: A review of available information or collection of new data to respond to a specific health question or request for information about a potential environmental hazard. Health consultations are focused on a specific exposure issue. Health consultations are therefore more limited than a public health assessment, which reviews the exposure potential of each pathway and chemical.

Inhalation: The act of breathing. A hazardous substance can enter the body this way.

Intermediate duration exposure: Contact with a substance that occurs for more than 14 days and less than a year.

No-observed-adverse-effect level (NOAEL): The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.

Point of exposure: The place where someone can come into contact with a substance present in the environment.

ppb: Parts per billion.

Remediation: 1. Cleanup or other methods used to remove or contain a toxic spill or hazardous materials from a Superfund site; 2. for the Asbestos Hazard Emergency Response program, abatement methods including evaluation, repair, enclosure, encapsulation, or removal of greater than 3 linear feet or square feet of asbestos-containing materials from a building.

Remedial investigation: The CERCLA process of determining the type and extent of hazardous material contamination at a site.

Risk: The probability that something will cause injury or harm.

Route of exposure: The way people come into contact with a hazardous substance. Three routes of exposure are breathing (inhalation), eating or drinking (ingestion), or contact with the skin (dermal contact).

Sample: A portion or piece of a whole. A selected subset of a population or subset of whatever is being studied. For example, in a study of people the sample is a number of people chosen from a larger population [see population]. An environmental sample (for example, a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.

Source Area: The location of or the zone of highest soil or groundwater concentrations, or both, of the chemical of concern. The source of contamination is the first part of an exposure pathway.

Toxicological profile: An ATSDR document that examines, summarizes, and interprets information about a hazardous substance to determine harmful levels of exposure and associated health effects. A toxicological profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.

Toxicology: The study of the harmful effects of substances on humans or animals.

SUMMARY

INTRODUCTION

The Tennessee Department of Health's (TDH) Environmental Epidemiology Program (EEP) wrote this health consultation at the request of the Tennessee Department of Environment and Conservation's (TDEC) Division of Solid and Hazardous Waste Management (DSWM) State Remediation Program (SRP). This health consultation was prepared to evaluate the results of soil and groundwater samples collected from the Security Signals, Inc. site. Security Signals, Inc. is located at 9610 Highway 64, Oakland, Fayette County, Tennessee.

Security Signals, Inc. (SSI) has manufactured pyrotechnic flares for the Department of Defense in Fayette County since 1997. Prior business practices had allowed for soil and groundwater contamination with barium, arsenic, and perchlorate. After analysis of the data provided, barium and arsenic were eliminated as chemicals of concern.

All data supplied for this health consultation were compared to health comparison values provided by the Agency for Toxic Substances and Disease Registry (ATSDR) and the U.S. Environmental Protection Agency (EPA). Comparison values are chemical concentrations based on toxicology below which no adverse health effects are predicted to occur.

CONCLUSIONS

EEP reached one conclusion in this health consultation:

Conclusion 1

EEP concludes that perchlorate in soil and/or groundwater at Security Signals, Inc. should not cause adverse health effects to those working at the site.

Basis for Conclusion

Excavation near Building 10 in 2009 removed soil that was contaminated with perchlorate. Measurements of perchlorate in groundwater during the most recent sampling in July 2010, were below applicable comparison values. Removal of the source of the perchlorate and natural attenuation appear to have remediated the groundwater so that the perchlorate in groundwater should no longer be a potential threat to human health.

Next Steps

Based on the data, there are no recommendations at this time. The source areas for perchlorate have been removed, and natural attenuation of perchlorate in groundwater has remediated the site.

FOR MORE INFORMATION

For more information on this site, call TDEC DOR at 423-854-5400. For health information, call TDH EEP at 615-741-7247 or toll-free at 1-800-404-3006 during normal business hours. You may also e-mail the TDH EEP at eep.health@tn.gov.

Introduction

The Tennessee Department of Environment and Conservation's (TDEC) Division of Solid and Hazardous Waste Management (DSWM) State Remediation Program (SRP) asked the Tennessee Department of Health's (TDH) Environmental Epidemiology Program (EEP) to review the results of numerous environmental investigations related to perchlorate contamination conducted at the Security Signals, Inc. site, located on 258 acres at 9610 Highway 64, Oakland, Fayette County, Tennessee. This health consultation was prepared to evaluate the effectiveness of the cleanup of soil and groundwater that was done at the Security Signals, Inc. site.

Background

Security Signals, Inc. (SSI) is an operating business and has conducted industrial operations in Fayette County since 1997. SSI manufactures pyrotechnic flares for the Department of Defense. The developed portion of the SSI property occupies 58 acres and includes 27 buildings where flares and components of flares are assembled. Approximately 67 people are employed at SSI. Waste burning and material testing was conducted in specific areas of these 58 acres. The developed 58 acres are considered the industrial portion of the property.

The remaining 200 acres of the SSI property is used primarily for agricultural purposes. The northeast and southern portions of these 200 acres are used as locations for powder magazines and testing areas. These areas were not evaluated and will not be addressed in this health consultation.

Land use surrounding SSI is agricultural or residential. A taxidermy business is located north of the property, across Highway 64 (Figure 1). No specific information was provided concerning residential areas in the vicinity of the SSI site.

Treadville Creek, which flows north, is located east of the industrial portion of the property. An unspecified number of creeks with little water also divide the site and flow into Treadville Creek. Groundwater flow at the site is to the northwest. The Memphis Sand lies approximately 20 feet below ground surface in eastern Fayette County where the site is located. The Memphis Sand is a regional aquifer that provides water for most municipal, industrial, and commercial supplies in the City of Oakland. No information was provided concerning the presence or use of any private drinking water wells within a half mile of the site (EnSafe 2009a).

Site History and Previous Environmental Remediation

In July 2005, 8 surface soil samples were collected near a concrete pad and a gravel road where waste had previously been burned. Barium was present in July 2005 in concentrations that ranged from 80 milligrams per kilogram (mg/kg) to 5,220 mg/kg. The concentrations exceeded the regulatory level of 100 mg/kg for disposal of hazardous waste using the Environmental Protection Agency (EPA) Toxicity Characteristic Leaching Procedure standards (EPA 1995). Following the soil sampling, approximately 67 yards of barium-impacted soil were removed and properly disposed of. The excavated soils were replaced with clean fill in 2005 to meet TDEC requirements that soils contain less than 100 mg/kg of barium.

During the October 2008 expanded site investigation, arsenic was identified in four soil samples collected near the north septic field. The arsenic concentrations in these samples ranged from 5.9 to 11.6 mg/kg, all of which were greater than the EPA Regional Screening Level (RSL) of 1.6 mg/kg (EPA 2010a), but are within the range of arsenic concentrations considered normal background in Tennessee. The highest of the four concentrations (11.6 mg/kg) was less than the Agency for Toxic Substances and Disease Registry (ATSDR) health comparison value of 200 mg/kg for chronic exposure of adults. The concentration exceeds the ATSDR cancer risk evaluation guide (CREG) of 0.5 mg/kg and would have a cancer risk of $1x10^{-5}$ or 1 extra cancer in 100,000 people. This risk was within EPA's acceptable range for cancer risk of 1 excess cancer in 1 million people to 1 excess cancer in 10,000 people (EPA 1991). Also, the average concentration of the four samples at 9.3 mg/kg was slightly below the average background concentration for arsenic in Tennessee soils of 10 mg/kg (TDEC 2001). Therefore, no remedial activities were required by TDEC SRP to address these measured arsenic concentrations.

The perchlorate contamination occurred near two buildings at the site. At the first building, Building 10, past business practices had allowed for wash water to be discharged onto the ground on the south side of the building. These practices were believed to have caused perchlorate contamination to soil and possibly groundwater. The second building, Building 1, was a tunnel used for product testing. Perchlorate contamination of storm water was possible due to contact of precipitation with ash residue from product testing. Therefore, following the removal of barium-impacted soil, perchlorate is the primary chemical of concern at the SSI site.

Characteristics and Toxicology of Perchlorate

Perchlorates are a group of chemicals that are colorless and have no odor. Perchlorates are found in the environment in two forms, either as a solid or dissolved in water. If water is present, then solid perchlorate will quickly dissolve. Perchlorates have high mobility in wet soils. In dry soil, perchlorate is immobile. Perchlorates can easily move from soil surfaces into groundwater. Perchlorates do not volatilize from water or soil surfaces. If perchlorates are released to air, then they will eventually settle out of the air, primarily in rainfall. Perchlorates can also form naturally in the atmosphere.

A combination of natural sources and human activities has led to the widespread presence of perchlorates in the environment. Perchlorate is used in rockets and certain military applications. The manufacture, use, and disposal of products like rockets and missiles have led to perchlorate being released into the environment. When rockets undergo successful launches, the intense heat leads to nearly complete reaction of the perchlorate. Therefore, release of perchlorate to the environment often occurs when its intended use does not occur (ATSDR 2008a). Examples of this may include dismantling and disposal of rockets, accidental release from manufacturing facilities, or unsuccessful rocket launches.

The main target organ for perchlorate toxicity in humans is the thyroid gland. However, two studies of people who worked for years in the production of perchlorate found no evidence of alterations in the workers' thyroids, livers, kidneys, or blood. The National Academy of Sciences (NAS) and the EPA concluded that it is unlikely that perchlorate poses a risk of thyroid cancer in humans. Perchlorates have not been classified for carcinogenic effects by the

Department of Health and Human Services (DHHS) or the International Agency for Research on Cancer (IARC) (ATSDR 2008a).

Perchlorate Environmental Sampling and Results

Soil samples were collected around Building 1 and Building 10 in June 2008 and analyzed for perchlorate. Further soil sampling was conducted in July 2008 to determine the extent of perchlorate contamination near Building 10 (EnSafe 2009a).

In June 2008, perchlorate was detected in 2 of 6 soil samples taken at a depth of 2 feet near Building 10. Concentrations of perchlorate at two sampling points near Building 10 were 1,550 mg/kg at sampling point B1001 and 3,230 mg/kg at sampling point B1002. Both concentrations were above the EPA Region 9 industrial preliminary remediation goal (PRG) of 102.2 mg/kg. PRGs were used by TDEC SRP as the regulatory soil screening levels at the time of this sampling. In addition, the concentrations of perchlorate in soil were greater than the most recently published EPA Regional Screening Level (RSL) of 720 mg/kg. The RSLs are now used by TDEC SRP as soil screening values. No other chemicals were found in concentrations above their respective industrial PRG in the soil samples collected near Building 1 in June 2008. Sixteen follow up soil samples were collected from depths ranging from 1 to 4 feet in July 2008. The perchlorate concentrations in soil samples collected in July 2008 ranged from non-detect to 5,680 mg/kg. The concentration of perchlorate was above the RSL at sampling points B1001, B1002 and B1007. Each sample was collected at a depth of 4 feet from the south side of Building 10.

As part of an expanded site investigation done in October 2008, 35 additional soil borings and 8 groundwater monitoring wells were installed at the SSI site to more fully examine the occurrence of perchlorate (EnSafe 2009a).

Eighty-seven soil samples were collected from between 1 and 36 feet in the soil borings and from various depths in the monitoring well borings in October 2008. No perchlorate was detected in eighty-one of the samples. The concentrations of perchlorate detected in 6 soil samples in October 2008 ranged from 0.95 mg/kg at soil boring B1015 at a depth of 4 feet to 2.2 mg/kg, which was found at soil boring B1001 at a depth of 16 feet. Measured perchlorate concentrations in soil samples collected in October 2008 were below the EPA RSL for perchlorate of 720 mg/kg (EPA 2010a).

Also, in October 2008, 3 of the 8 monitoring wells were installed near a dirt road and concrete pad that was a former burn area. One monitoring well was located near Building 10. Groundwater samples were collected from 7 of the 8 wells in November 2008. Perchlorate was found in groundwater samples from two monitoring wells (DRMW01 and DRMW02) which were located beside the dirt road near the middle of the SSI property. Perchlorate concentrations in these two wells were 31.99 µg/L and 45.41 µg/L, respectively. Perchlorate was not detected in 5 of the 7 monitoring wells sampled in November 2008. Subsequent groundwater sampling events have been conducted. Perchlorate has not been detected in DRMW02 since November 2008. The detected concentrations of perchlorate in monitoring well DRMW01 decreased in April and July 2010. The measured concentration of perchlorate in well DRMW01 in July 2010

was 11.8 µg/L (EnSafe 2010). The July 2010 sampling result from this well was below applicable EPA and ATSDR comparison values.

Soil south and west of Building 10 was excavated on August 21 and 22, 2009, to remove perchlorate contamination. Soil was removed to a depth of 6 feet. Clean soil was used to backfill the excavated area (EnSafe 2009b).

Discussion

Introduction to Chemical Exposure

When a substance is released either from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. Such a release does not always lead to exposure. A person can be exposed to a substance only when he or she comes in contact with it. A person may be exposed by breathing, eating, or drinking the substance, or by skin contact (ATSDR 2008a).

To determine whether persons have been or are likely to be exposed to chemicals, TDH EEP evaluates mechanisms that could lead to human exposure. An exposure pathway contains five parts:

- a source of contamination,
- contaminant transport through an environmental medium,
- a point of exposure,
- a route of human exposure, and
- a receptor population.

An exposure pathway is considered complete if there is evidence that all five of these elements have been, are, or will be present at the site. An exposure pathway is considered incomplete if one of the five elements is missing.

Physical contact alone with a potentially harmful chemical in the environment by itself does not necessarily mean that a person will develop adverse health effects. A chemical's ability to affect public health is controlled by a number of other factors, including:

- the amount of the chemical that a person is exposed to (dose),
- the length of time that a person is exposed to the chemical (duration),
- the number of times a person is exposed to the chemical (frequency),
- the person's age and health status, and
- the person's diet and nutritional habits.

Potentially exposed populations at this site include current and future adult workers at SSI. Approximately 67 people are employed at SSI. The various buildings contain research and development, manufacturing and assembly, and testing. There is also an outdoor testing range at this site. Soil and groundwater were evaluated as potential media of exposure. Some employees may have dermal contact with site soils or potentially come into contact with site groundwater containing perchlorate.

Comparison Values for Perchlorate

To evaluate exposure to a hazardous substance, health assessors often use comparison values. If the chemical concentration is below its comparison value, then health assessors can be reasonably certain that no adverse health effects will occur in people who are exposed. If concentrations are above the comparison value for a particular chemical, then further evaluation is needed.

ATSDR uses the no observed adverse effect level/uncertainty factor (NOAEL/UF) approach to derive non-cancer health effect environmental media evaluation guides (EMEGs) for hazardous substances. EMEGs are set below levels that, based on current information, might cause adverse health effects in sensitive people. Exposure to a level above the EMEG does not mean that adverse health effects will occur (ATSDR 2005).

EMEGs are based on conservative assumptions about chemical exposure. EMEGs consider non-cancer adverse health effects. Exposure durations are defined as acute (14 days or less), intermediate (15–365 days), and chronic (365 days or more) exposures.

Cancer risk evaluation guide (CREG) comparison values are established by ATSDR at concentrations by which no more than one theoretical excess cancer in 1,000,000 people exposed during a 70-year lifetime is expected to occur. CREGs are calculated from EPA's cancer slope factors. These values are based on EPA evaluations and assumptions about hypothetical cancer risks at low levels of exposure.

EPA RSLs are screening values, calculated using the latest toxicity values, default exposure assumptions, and physical and chemical properties. The RSL tables provide concentration limits using carcinogenic or systemic toxicity values under specific exposure conditions (EPA 2010a).

In 2008, EPA determined that a national primary drinking water regulation for perchlorate would not present "a meaningful opportunity for health risk reduction for persons served by public water systems." The toxicological profile for perchlorates developed by ATSDR references a Department of Defense policy which states that in the absence of federal or state standards, if perchlorate levels in water exceed 24 ppb, a site-specific risk assessment must be conducted (ATSDR 2008b).

Non-Cancer Comparison Values

The non-cancer RSL for perchlorate in industrial soil is 720 mg/kg (EPA 2010a). The ATSDR EMEG comparison value for perchlorate in soil is 500 mg/kg for chronic exposure to adults (ATSDR 2010). The non-cancer RSL for perchlorate in groundwater is 26 micrograms per liter (µg/L). The ATSDR EMEG comparison value for perchlorate in groundwater is 20 µg/L for adults (ATSDR 2010). The EPA Interim Drinking Water Health Advisory level is 15 µg/L (EPA 2010b). The EPA Interim Drinking Water Health Advisory level will be used as the comparison value because it is the most protective of the three comparison values referenced.

Cancer Comparison Values

According to EPA, perchlorate is not likely to be carcinogenic to humans (ATSDR 2008a). Therefore there are no cancer health comparison values established for perchlorate by the EPA or ATSDR.

Evaluation of Soil and Groundwater Perchlorate Results

The potential for exposure for current and future adult workers to perchlorate at SSI lies in contact with, or incidental ingestion of, soil and/or groundwater. In the reports reviewed for this health consultation, no information was provided on the presence or use of drinking water wells within a half-mile radius of the site. Therefore, the risk to off-site receptors is unknown. However, with the removal of the sources of perchlorate at the site, the amount of perchlorate in groundwater was reduced to well below health comparison values.

Evaluation of Soil Results

Soil with perchlorate above comparison values south and west of Building 10 was excavated on August 21 and 22, 2009. The soil was removed to a depth of 6 feet. Clean soil was used to backfill the excavated area (EnSafe 2010). Removing the soil on the south and west sides of Building 10 removed the source of perchlorate contamination for any potential impact to the health of workers in this area. The removal also eliminated the identified source of the groundwater impact at SSI.

Evaluation of Groundwater Results

In November 2008, perchlorate was found in 2 of 7 samples collected from groundwater monitoring wells. The two wells where perchlorate was measured were located beside a dirt road near the middle of the property. Perchlorate concentrations in these samples exceeded the EPA RSL of 26 µg/L, the ATSDR EMEG of 20 µg/L, and the Interim Drinking Water Health Advisory Level of 15 µg/L. The remaining five monitoring well samples were non-detect for perchlorate. Subsequent groundwater sampling events have been conducted at SSI. The two monitoring wells having measured perchlorate concentrations in November 2008 were sampled again in July 2010. Perchlorate was measured at a concentration of 11.8 µg/L in one sample and the other was non-detect. A measurement of 11.8 µg/L was below applicable EPA and ATSDR comparison values (EPA 2010a, ATSDR 2010). Removal of the soil source area of perchlorate and natural attenuation appear to have positive effect on the groundwater so that the groundwater concentrations of perchlorate are no longer a potential threat to human health.

Other Considerations

Perchlorate was the only chemical investigated in this report. It is recommended that if the SSI Site's land use changes in the future or the property is sold, additional sampling of the soil and evaluation of the results be done. This sampling would determine if concentrations of site-related chemicals would impact the proposed land use.

Child Health Considerations

In preparation of this health document, the health of children was thoughtfully considered. The workers and visitors to SSI are primarily adults. It is highly unlikely that children would spend any time at this facility. All known soil source areas have been removed. Children would only be occasional visitors to this facility, if at all. Therefore, children should not have any adverse health effects.

Conclusions

EEP reached one conclusion in this health consultation:

EEP concludes that perchlorate in soil and/or groundwater at Security Signals, Inc. should not cause adverse health effects to those working at the site. Excavation near Building 10 in 2009 removed soil that was contaminated with perchlorate. Measurements of perchlorate in groundwater during the most recent sampling in July 2010, were below applicable comparison values. Removal of the source of the perchlorate and natural attenuation appear to have remediated the groundwater.

Recommendations

Based on the data present, there are no recommendations at this time. The source areas for perchlorate have been removed, and natural attenuation of perchlorate in groundwater has remediated the site.

Public Health Action Plan

The public health action plan for the SSI site contains a list of actions that have been or will be taken by EEP and other agencies. The purpose of the public health action plan is to ensure that this health consultation identifies public health hazards and offers a plan of action designed to mitigate and prevent harmful health effects that result from eating, drinking, or touching hazardous substances in the environment. Included is a commitment on the part of EEP to follow up on this plan to ensure that it is implemented.

Public health actions that have been taken by TDH's EEP include:

- Review of soil and groundwater data collected by SSI with oversight from TDEC.
- Preparation of this health consultation.

Public health actions that will be taken include:

- This report and any needed explanation will be provided to TDEC.
- This report will also be provided to the property owner by TDEC.

- EEP suggests that the property owner should make this report available to workers at the site.

- TDH EEP will continue to work with TDEC as the site continues through the regulatory process and will be available to review additional data should the need arise

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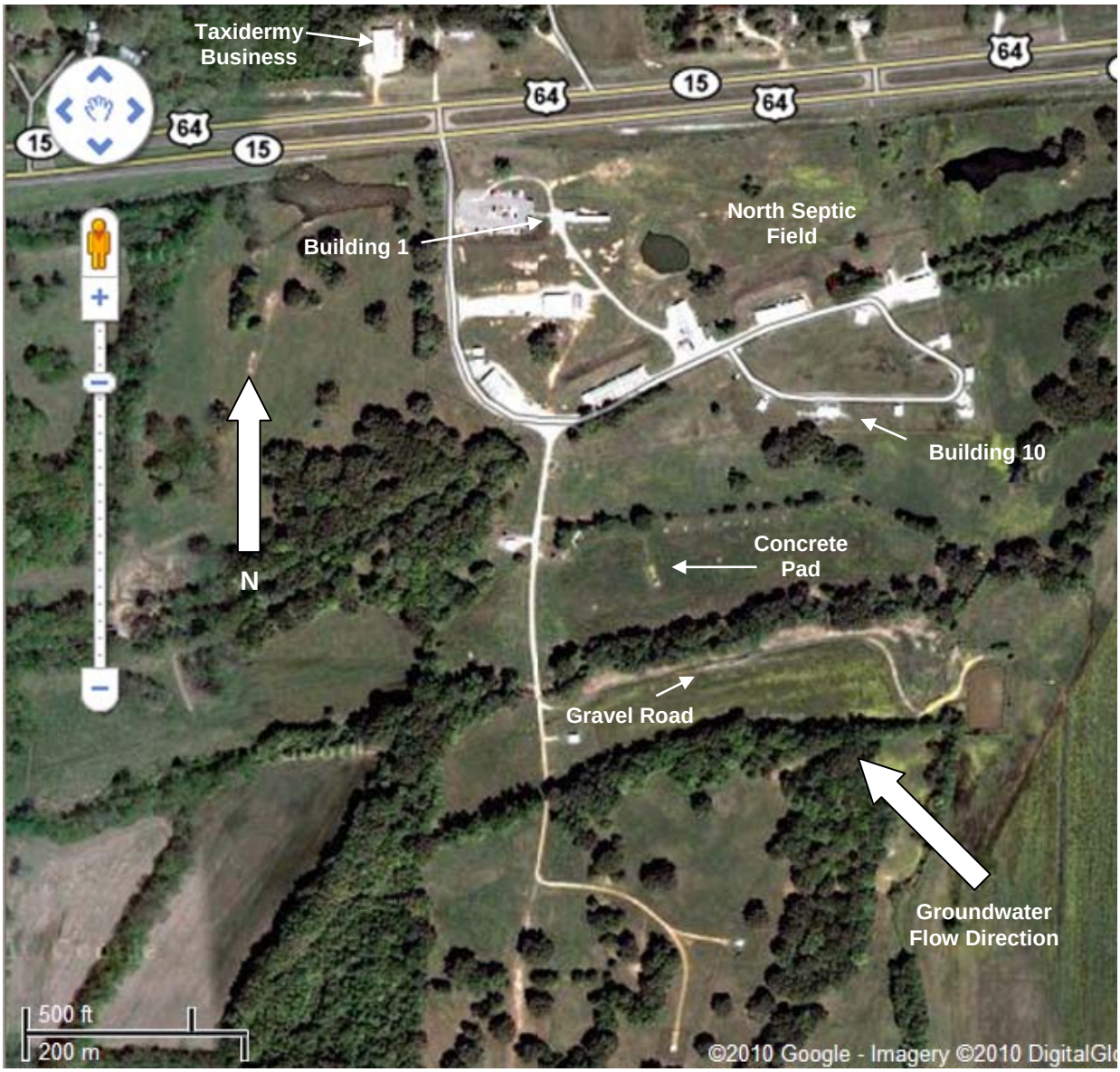
FIGURE 1 - Aerial Image of the SSI site, Oakland, Fayette County, TN where ordnance was made in several buildings on 58 acres. Perchlorate from wastewater contaminated soil and groundwater near Building 1 and Building 10.

Photo credit: Google Maps, December 7, 2010.



Certification

This Public Health Consultation: *Security Signals, Inc. Oakland, Fayette County, Tennessee,* was prepared by the Tennessee Department of Health's Environmental Epidemiology Program. It was prepared in accordance with the approved methodology and procedures that existed at the time the health consultation was begun.

Director of EEP, CEDS, TDH