Health Consultation

Materials Exchange Corporation Construction and Demolition Landfill
(a/k/a West Coast Materials)

MATERIALS EXCHANGE CORPORATION LANDFILL

HOMOSASSA SPRINGS, CITRUS COUNTY, FLORIDA

MARCH 10, 2000

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

You May Contact ATSDR TOLL FREE at
1-888-42ATSDR
or
Visit our Home Page at: http://atsdr1.atsdr.cdc.gov:8080/

HEALTH CONSULTATION

Materials Exchange Corporation
Construction and Demolition Landfill
(also known as West Coast Materials)

Homosassa Springs, Citrus Co., Florida

Prepared by:

Florida Department of Health
Bureau of Environmental Toxicology
through a
Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Background

Materials Exchange Corporation is an operating construction and demolition (C&D) landfill. On April 2, 1999, a resident living near this landfill petitioned the Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate the potential health threat posed by this site. The petitioner included copies of several documents written between 1995 and 1999 by regulatory and health agencies. These documents describe the disposal of unpermitted wastes, odor problems, and the filling of a drainage retention area on the Materials Exchange site. The ATSDR asked the Florida Department of Health (FDOH) to prepare this health consultation.

This health consultation evaluates the available groundwater data (from on and off the site) and addresses issues and questions posed by the petitioner. Air, soil and surface water quality data are not currently available. The FDOH recommends that air quality and additional groundwater quality data be collected. The FDOH will evaluate these data as it becomes available.

The interpretations, advice, and recommendations in this report are site-specific and should not be considered applicable to other sites.

The Materials Exchange Corporation Landfill is privately owned. The landfill is located on the north side of Grover Cleveland Boulevard (address - 5355), about 3.5 miles east of US 19 (Figures 1 & 2). Within 500 feet of the site property boundaries are six single-family homes and five mobile homes (Figure 3). More than 500 feet to the west and northwest of the site are both undeveloped and residential areas. The areas north and east of the site appear to be used for forestry and mining with very few residences. Residential areas extend southeast, south and southwest of the site for several miles (Figure 4).

The site has been a sand mine since the 1970s. Beginning in 1980, mined areas were filled. There are currently two closed (filled) cells and one active cell on the 131-acre property (Figure 5). From 1980 to 1990, the previous site-owner, Monex (also known as Monier Ash) disposed of 1.25 million tons of flyash from a coal-fired power plant in the first cell. This cell closed in 1990.

The Florida Department of Environmental Protection (FDEP) permitted the second cell for construction and demolition waste. Filling of the second cell began in 1993. It received about one million cubic yards of wastes every two years from Citrus County and several other counties to the south. Residents began complaining of odors in 1994. Richard Garrity, former director of the Southwest FDEP district, attributed the odors to rotting drywall (gypsum) which produces hydrogen sulfide. This second cell closed in 1998. The third cell is currently receiving C&D waste.

According to 1990 census data, roughly 5,200 people live within a two-mile radius of the site, with about half using private wells. The FDOH used a two-mile radius because the petitioner indicated that odors can be annoying that distance from the site. Average family incomes in this area range from about $20,000 to $25,000 per year. Most of the population is Caucasian (99%), with the remaining 1% composed of Hispanics, Asians, Native Americans and others. There are four public schools within two miles of the site with about 3,200 students.

A Statement of Issues

In this Health Consultation we address the following issues identified by the petitioner:

1. Can landfill odors, which some government officials suspect may be hydrogen sulfide, cause headaches, irritation of the nose, throat, skin and eyes, dizziness, nausea, vomiting, cough, breathing difficulty, and convulsions? If people in the community have been exposed to hydrogen sulfide, could their neurobehavioral functions be affected?
2. Flyash from one of the closed cells on the landfill could be mined. Could mining and transport of flyash off the site expose people to unacceptable levels of metals via airborne dust? Will the presence of this material on the site cause leaching of metals into the groundwater? Is the flyash material on the Materials Exchange site radioactive and as such does it pose a threat to people's health?
3. Could collapse of karst formations due to the weight of materials in the land-filled cells affect groundwater quality?
4. Were Wellhead Protection requirements complied with during the regulatory permitting process of landfill? Is an Environmental Impact Statement required for the permitting of Class I or C&D landfills?

Site Visit

On the morning of June 30, 1999, Connie Garrett and Beth Copeland, FDOH, John Steward and Ben Moore of ATSDR, and Robert Butera, Professional Engineer of the Southwest FDEP District, met with the petitioner and other residents to discuss their concerns. With the exception of two of the residents, these same people visited the landfill that afternoon. We were met on the site by Marybeth Nayfield, director of the Citrus County Health Department. Ms. Nayfield brought University of South Florida nursing students (Justin Blalock, Liz Mejia and Rafael Trespalacioes) who are surveying the residents' health concerns for a class project. Gail Petersen, Environmental Specialist and private well water sampler for Citrus County Health Department, also toured the site. Also present were Southwest FDEP District permit reviewers hydrologist John Morris (Professional Geologist), and Susan Pelz (Professional Engineer). Lew Hickok, the landfill foreman at the time of the visit, gave us a tour of the site. University of Florida graduate student Sue Lee, who is studying gas emissions from C &D landfills and will be taking readings on and near the site, was present. Ms. Lee demonstrated her

emissions monitoring instrument, a Jerome 631-X (made by Arizona Instruments). An odor that could have been hydrogen sulfide was detected while we were walking on the site. The Jerome 631-X read levels of two to three parts per billion.

Photographs taken during the site visit are included in Appendix A. Figure 6 is an illustration of the landfill site showing where the photographs were taken and the direction the camera was aiming. A picture of the computerized spray-misting system located on the operating cell is included with the photographs. Its purpose is to neutralize landfill odors.

Discussion

For a health consultation we ***evaluate*** data from environmental media on sites known or suspected to have hazardous chemicals. If we find chemicals at levels of concern, we ***assess*** media ***pathways*** for those chemicals to be held on or moved from the sites. If such pathways are present, we ***estimate exposure opportunities*** and ***possible exposure levels*** for people living around these sites. Possible ***health effects*** of the chemicals of concern ***at estimated exposure levels*** are then listed. ***Exposure investigations*** can be carried out if exposures are suspected and biomarkers are known for those chemicals.

Odors

There are no off-site air-quality measurements for hydrogen sulfide or any other gases at this site. This is a critical data gap. We do have information from other Florida landfills and complaint logs from this site that suggest the highest emissions may be experienced at night and in the early morning. This may be due to gases being held near the ground by temperature inversion. Another factor affecting daytime measurements could be photolysis (radiant energy from the sun may cause chemical changes to hydrogen sulfide that speed its breakdown; photolysis would not occur at night). When FDEP first started fielding odor complaints at Pine Ridge Landfill in Orange County, Florida, no hydrogen sulfide levels were detected until they started taking measurements at night (1).

The symptoms reported as associated with exposure to odors from the landfill (2, 3, 4) are consistent with exposure to hydrogen sulfide gas: irritation of the eyes, nose, throat and skin, headaches, dizziness, nausea, coughing, breathing difficulty, vomiting and convulsions (5, 6). The petitioner is concerned that area physicians may not have sufficient information on the health effects of hydrogen sulfide exposure.

Sue Lee and Dr. Tim Townsend of the University of Florida are planning to screen air emissions at this site. FDEP Southwest district staff recommended the collection of weather data for this project. Temperature, wind speed, wind direction, humidity and rainfall influence the formation and dissipation of landfill gas emissions. A weather

station was installed near the site in mid-August 1999. Ms. Lee has developed and distributed a questionnaire to get a qualitative idea about the location, timing and level of emissions. This questionnaire is to be filled out three times a day by nearby residents to indicate relative levels of odors,. Dr. Townsend has provided the Citrus County Health Department with summa canisters which can be deployed and then sent to the lab to measure "snapshot" levels of ambient air when odors are perceived to be offensive. Summa canisters are metal containers with airtight seals for collecting air samples; they can only be used one time. Canisters used in detection of gases like hydrogen sulfide have special noncorrosive interior coatings.

FDEP Division of Waste Management staff in Tallahassee have agreed to fund collection and analysis of air and groundwater samples for the Materials Exchange site. Their contractor will collect and analyze these data. This operation is currently in the planning stages. FDOH will evaluate any data collected by the University of Florida or FDEP for public health significance.

Materials Exchange Corporation staff also plan to review emissions data to determine whether to move the misting system to the other cell. They hope that residents will call and let the landfill manager, Lenny Talmage (352) 628-0075, know when odors are a problem. An answering machine is now available to record information on location and time of odors when no one is at the site.

Flyash

Airborne Flyash

The petitioner expressed concerns about the health affects of airborne flyash. If the flyash cell is mined and flyash is trucked off the site, fugitive dust and particulate matter measure could be taken and an exposure estimate could be made. This estimate would be dependent on prevailing wind speed and direction and the proximity of the exposed resident(s) to the road. No data are currently available to assess the health risks from exposure to flyash. An important assumption for this type of exposure estimate would be that the samples were representative of the vast range of coal types represented by the 1.25 million tons of flyash.

Flyash and Groundwater Issues

There is little indication from review of previously reported and *current* monitoring well data that chemicals are leaching from the flyash cell. Citrus County Health Department water sampler, Gail Petersen, accompanied the Material Exchange Corporation contractors during their latest round of groundwater sampling on September 2, 1999, and took samples at the same time. The contractor's laboratory and the Florida Department of Health Laboratory both analyzed the groundwater samples. This procedure is called splitting samples, and it is used to confirm the results of different laboratories. Both laboratories tested the samples for organic chemicals, nitrates, and metals. We compared these test results with health-based screening values. None were

exceeded. Therefore, we estimate that people drinking groundwater from nearby wells are unlikely to become ill from sulfate, selenium, arsenic, nitrate, nitrate plus nitrite, chromium, mercury, purgeable organic chemicals, and base-neutral acid-extractable organic chemicals.

Monitoring well systems are required by FDEP to determine if landfill contents have been released to groundwater. Monitoring wells are sampled four times a year, even after the landfill cell is closed. To set up a groundwater monitoring system, the groundwater flow direction must be determined so that the wells are down-gradient from the source. In addition, the chemical characteristics of the source are determined so that the correct chemical and physical analyses are performed.

Previous groundwater quality assurance efforts have included the sampling of private wells southwest, west, and northwest of the site. These data are evaluated in a subsequent section.

What Can Be in Flyash Leachate and What are FDEP's Monitoring Requirements?
FDEP Bureau of Solid Waste Southwest District permit for the Monex Class I Landfill (flyash cell) requires **"all groundwater monitor wells shall be sampled annually and analyzed for the Primary and Secondary Drinking Water Parameters including the volatile organic compounds, and quarterly for the Primary metals arsenic, chromium and selenium, and secondary standards pH, iron, and sulfate**." FDEP uses an internal document for determining site-specific groundwater monitoring requirements. This document is called Groundwater Monitoring Parameters and Pollution Sources. In it, the section on Coal-Fired Power Plants states:

> "Coal is a mixture of both organic and inorganic substances. The organic matter in coal is derived from lignin and cellulose in plant material. Principal inorganic constituents are aluminosilicates, sulfur compounds (pyrite, marcasite, galena) carbonates and silica. When coal is burned, bottom ash and flyash are produced" ((7) page 91).

This reference also lists the inorganic components (and their ranges) for flyash leachate. Coal flyash leachate is generally quite basic (pH at 12.6) and may contain sulfates around 700 parts per million (or milligrams per liter, mg/L) and nitrate (as NO_3) above 10 parts per million (mg/L). Metal levels in coal flyash leachate may vary as follows:

Arsenic	0.001- 7.3	mg/L,
Barium	0.02 - 79	mg/L,
Cadmium	0.001 - 0.06	mg/L,
Chromium	0.008 - 0.74	mg/L,
Lead	0.001 - 0.7	mg/L,
Mercury	0.0001 - 25	mg/L,
Selenium	0.0001 - 1.56	mg/L.

In accordance with FDEP solid waste regulations (Rule 62-701), monitoring wells have been installed on the site and have been sampled for the permit-required parameters. The closed flyash burial cell is required to have one background and three down-gradient wells. Closed construction and demolition cells are required to have one background and two down-gradient wells.

Review of Monitoring Well Data
For this report, FDEP supplied FDOH with all of the site monitoring well data (8). Figure 5 shows the monitoring well locations. The monitoring wells for the flyash cell have been monitored four times a year since 1986. In 1990, the permit holder petitioned FDEP to sample the entire list on a yearly basis and to sample for a reduced suite of analytes on a quarterly basis (arsenic, chromium, selenium, total dissolved solids, pH, iron and sulfate). This request was granted by FDEP. The groundwater monitoring results for the closed and currently operating Construction and Demolition cells were also supplied, although samples from these wells have been collected since March 15, 1999, as required by permit.

FDEP requires a Comprehensive Quality Assurance Project Plan for contractors performing water sampling and contract laboratories performing analyses of these samples. These data provide adequate quality assurance and quality control documentation.

We compared monitoring well water data with health-based screening values (which for these chemicals are equivalent to Florida's enforceable Primary Drinking Water Standards). Most of the chemicals detected in the monitoring wells were below these screening values. The chemicals that were detected above screening levels were selenium and chromium.

The only groundwater analyses to exceed screening values were for **selenium** in groundwater samples taken on September 14, 1993 from the two wells:

- the background well (MW10A) at 110 parts per billion (ppb, or μg/L), and
- a down-gradient well (MW11B) at 150 ppb, (selenium screening value is 50 ppb Figure 5 shows well locations).

Selenium has not been identified since in either well nor was selenium detected in either well before that time.

Chromium is twice as high in MW 7 as in the background well MW 10A, but this value has been consistently three to four times lower than the screening value of 100 μg/L (Figure 6). The screening values are conservative and protective; they are set at levels prospectively low enough to allow long-term (70 year) consumption. These levels are protective for different types of health outcomes including increased cancer risk, learning disabilities, specific illnesses, or infant vulnerabilities, generally whichever is lower for the

specific chemical.

Review of Public and Private Well Data
Area private and community wells have also been sampled. Specific well information is discussed below. We have identified no chemicals of concern in these wells.

Three community water system supply wells operated by the Homosassa Special Water District are near this site. Peach Tree wells Numbers 5 and 6 are one-third of a mile southeast of the site. Norin well Number 3 is about 0.65 miles west of the site. FDEP requires the Homosassa Special Water District to submit the results of groundwater sample analyses collected at three-year intervals. In1996, Homosassa Special Water District collected groundwater samples from these three wells and analyzed for inorganics, volatile organics, pesticides/PCBs, and unregulated organics. The analytes at or above detectable concentrations included chromium, fluoride, lead, nitrate and sodium. All other parameters were below the method detection limits. All of the detected parameters occurred well below their respective screening levels.

In addition to these community water system wells, there are about 90 private wells within one-half mile of the site that supply drinking water to homes. While general groundwater flow direction in the area is toward the northwest (9), most of the private wells are southeast, south, southwest and west of the site.

The Citrus County Health Department (CCHP) sampled private wells on three occasions in the area to assess water quality (10). In May 1983, CCHP sampled two private wells in Homosassa for lead. Both analyses were below detection level. In May and June of 1998, CCHP sampled 16 private wells near the site for purgeables. The purgeables method detects very low levels of solvents (degreasers), petroleum products (oil and gasoline constituents) and other chlorinated organic compounds which may have industrial uses. Six of these wells are west of the site and 10 wells are south and southwest of the site. The only parameter detected in these samples was chloroform. All chloroform levels were below screening values. The highest chloroform level was slightly less than 1 part per billion (ppb). On September 9, 1999, CCHP sampled 4 private wells west and northwest of the site for purgeables, and again found only chloroform and dichlorofluoromethane below 1 part per billion.

We have asked the Citrus County Health Department to take additional groundwater samples from drinking water wells west and northwest of the site to be analyzed for metals which could leach from the flyash cell (11).

Radioactive Elements in Coal and Flyash
The petitioner questioned whether the flyash was radioactive. FDEP does not require the leaching potential or radioactivity measurements of flyash for landfill material. However,

the United States Geological Survey (USGS) analyzes the radioactivity of coal ash (12). Their measurements indicate that this material should not contribute to significant air or groundwater enrichment in radioactive elements.

The concentration of radioactive elements in ash is controlled by the amount of radioactive elements in coal since radioactive elements remain in the ash after coal burns. Since ash weight is about 1/10th the weight of the original coal, the concentration of most radioactive elements in solid combustion wastes will be approximately 10 times the concentration in the original coal. The uranium concentration in most flyash will be from 10 to 30 parts per million which is in the range found in naturally occurring rocks such as granites, phosphates, and shales.

In air, the radioactivity of coal flyash has been studied widely. This material has been used in cement products which can come in contact with the general public. The radioactivity of typical flyash is not significantly different from that of more conventional concrete additives or other building materials such as granite or red brick.

In groundwater, the leachability of radioactive elements from flyash has relevance in view of the U.S. EPA drinking water standard for dissolved radium (5 picocuries per liter) and the proposed addition of drinking water standards for uranium and radon by the year 2000. Extremes of either acidity (pH<4) or alkalinity (pH>8) can enhance solubility of radioactive elements. Most leachates of flyash are rich in dissolved sulfate, and this minimizes the solubility of radioactive elements which react with sulfate to form highly insoluble sulfate compounds.

Direct measurements of dissolved uranium and radium in water that has contacted flyash are limited to a small number of laboratory leaching studies, including some by USGS researchers, and sparse data for natural water near some ash disposal sites. These preliminary results indicate that concentrations are typically below the current drinking water standard for radium (5 picocuries per liter) or the initially proposed drinking water standard for uranium of 20 parts per billion.

Karst Questions

Karst is the expression of rock dissolution features on the surface of the land. These features, called karst topography, develop in humid climates where rock layers of limestone, dolomite or gypsum occur at or near the land surface. Probably the best-known karst features are sinkholes. Other karst features are caves, underground drainage ways, closed depressions, and low, rolling hills. The petitioner asked for clarification of issues of structural load on the limestone underlying the site. Specifically the petitioner asked if collapse of karst formations due to the weight of materials in the landfill cells could affect groundwater quality. FDEP provided engineering calculations which show the weight of the C&D cell at 125 feet equals the stress produced by the original soil prior to excavation (Appendix B). Therefore, collapse is no more likely with

fill material than with naturally occurring soil.

Regulatory Requirement Issues
The petitioner questioned whether Materials Exchange Corporation had complied with state Wellhead Protection requirements (13). Materials Exchange Corporation has complied with these requirements. No community well system is within 500 feet of the site. A community water system is a public water system which serves *at least* 15 service connections used by year-round residents or regularly serves *at least* 25 year-round residents.

The petitioner also asked if an Environmental Impact Statement is required for Class I or C&D landfills? At this time, there are no requirements for an Environmental Impact Statement to be performed before a landfill site is permitted (1).

ATSDR's Child Health Initiative
ATSDR and FDOH, through ATSDR's Child Health Initiative, recognize that the unique vulnerabilities of infants and children demand special emphasis in communities faced with the contamination of their environment. Children are at a greater risk than adults from certain kinds of exposure to hazardous substances emitted from waste sites. They are more likely exposed because they play outdoors and because they often bring food into contaminated areas. They are shorter than adults, which means they breathe dust, soil, and heavy vapors close to the ground. Children are also smaller, resulting in higher doses of chemical exposure per body weight. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages. Probably most important; however, children depend completely on adults for risk identification and risk management decisions, housing decisions, and for access to medical care. When air data becomes available, FDOH will evaluate the data with children's health-outcomes in mind.

Conclusions

We classify the Materials Exchange Corporation site as an indeterminate public health hazard because critical data on air quality and water quality are lacking.

1. Air quality information is not currently available to address the community's concerns about health effects community members believe to be related to air emissions from the landfill.

2. Information on possible releases of metals from the flyash cell to groundwater is limited to on-site monitoring wells.

3. Area physicians (and residents) may not have adequate information on the effects of

hydrogen sulfide exposure.

Recommendations

Additional information is needed to fully evaluate the public health threat from exposure to chemicals at this site. We recommend the following:

1. Collect and evaluate air quality data for the site.

2. Sample the four nearest down-gradient private wells for metals, and resample them for metals on a yearly basis.

3. Supply local physicians with information about the health effects of hydrogen sulfide exposure.

Public Health Action Plan

To address these recommendations, FDOH conferred with FDEP, the FDOH Drinking Water Toxics Program and the petitioner. We have progressed toward gathering the needed data and identifying community physicians.

1. FDOH shared this draft health consultation with FDEP Waste Management staff. They agreed to pay for the collection of air monitoring data at the site through funds provided by the EPA. Plans for this work call for the use of instruments that can continuously monitor off-site air emissions levels for a period of one-year. A meeting to plan this work will be held on the site in January 2000. In August 1999, University of Florida investigators Dr. Townsend, Ms. Lee and Mr. Yang installed a weather information collection station on the site and distributed questionnaires to local residents asking about the timing of odor occurrence. They also shared their preliminary air emissions data from the site with FDOH. They began collecting screening data on hydrogen sulfide and other landfill gas emissions from the Materials Exchange Site in the fall of 1999. In four visits, the maximum level of hydrogen sulfide measured on the site was 110 parts per billion. As discussed previously, the petitioner indicated that the highest levels are generally encountered at night. Current planning should produce relevant air-monitoring data in the coming year.

2. Gail Petersen, Environmental Specialist, for the Citrus County Health Department sampled these four wells and an additional well for metals on December 6, 1999. The results are not available yet, but soon will be. The FDOH Drinking Water Toxics section will pay for this sampling.

3. The petitioner supplied the names and addresses of local medical doctors in

Appendix C. If our evaluation of the data show air emissions at levels known to cause illness, local physicians and residents will need information on the health effects of such exposures. FDOH will provide this information. Nearby residents can also receive this information.

SITE TEAM/AUTHORS

Florida Department of Health Author
Connie Garrett
Bureau of Environmental Toxicology
Division of Environmental Health
(850) 488-3385

The ATSDR Technical Project Team
Debra Gable
Division of Health Assessment and Consultation
Betty Phiffer
Division of Health Studies
Teresa Nastoff
Division of Health Education and Promotion

The ATSDR Regional Representative
Bob Safay
Regional Services
Office of the Assistant Administrator

References

(1) Jim Bradner, Professional Engineer with the FDEP Central District Office, Orlando, (personal communication) discussion about hydrogen sulfide emissions from Pine Ridge landfill in Orange County and permit requirements for Class I and C&D landfills.

(2) Petitioner's survey of 28 residents living near the landfill.

(3) The Impact of a Construction and Debris Landfill on the Health of Community, August 7, 1998, Dr. Wayne Westoff, College of Public Health, University of South Florida, Teresa Goodman, Kathleen McNamara, and Nikki Anderson, AHEC Interdisciplinary Rural Scholars Program, University of South Florida. Seventy-six residents from the community near Materials Exchange Corporation participated in a questionnaire on health concerns.

(4) Environmental Exposures to Hydrogen Sulfide and the Impact on a Community: A Research Review, Fall Semester 1998. Una Owens. This was another health concerns study, similar to the previous one of residents near Materials Exchange Corporation by the AHEC Interdisciplinary Rural Scholars Program, University of South Florida.

(5) *Draft* Toxicological Profile for Hydrogen Sulfide, Agency for Toxic Substances and Disease Registry, September 1997, Final, *in Press.*

(6) New York State Department of Health, Bureau of Environmental Toxicology, Hydrogen Sulfide Fact Sheet, from Charlene Thiemann, 518/402-7800
"Foul odors and health effects were investigated in five New York State communities near landfills containing construction and demolition debris. Hydrogen sulfide levels in two of the New York communities ranged up to 4000 parts per billion (4 parts per million) for periods of several months. During these episodes, there were frequent health complaints including eye, throat and lung irritation, nausea, headache, nasal blockage, sleeping difficulties, weight loss, chest pain, and asthma attacks. Although other chemicals may have been present in the air, the effects are consistent with those of hydrogen sulfide."

(7) Florida Department of Environmental Regulation (1989), Groundwater Monitoring Parameters and Pollution Sources, Third Edition, Pollution Source - Coal Fired Power Plants, pages 91-94.

(8) FDEP - Copies of reports that are submitted to FDEP for Closure Permit Requirements include site maps by EnSol, Inc. of Niagra Falls, N.Y. and analytical data from their laboratory US Biosystems, analytical data from Hornton laboratories for the Homosassa Special Water Districts, analytical data from the Department of Health Laboratory in Jacksonville for the private wells in the area, and quarterly reports for the

Monex cell signed by James Merckel from an unidentified lab, although some of the lab reports which contain the full data suites are from Orlando Labs, and have figures of the landfill signed by Raba-Kistner Consultants, Inc.

(9) United States Geological Survey - P.A. Metz, J.A. Mattie, A. E. Torres, and M.A. Corral. Potentiometric Surface of the Upper Floridan Aquifer, West-Central Florida, September 1997 (MAP).

(10) Citrus County Health Department - Two homes' private wells sampled for lead in 1983 and 16 homes' private wells sampled in May and June of 1998 for purgeables (chlorinated solvents, which would be expected to travel quickest from the site, if they were present).

(11) Arthur D. Little, Inc. Full-Scale Field Evaluation of Waste Disposal From Coal-Fired Electric Generation Plants. EPA-6000-7-85-028 (EPA Contract #68-02-3167).

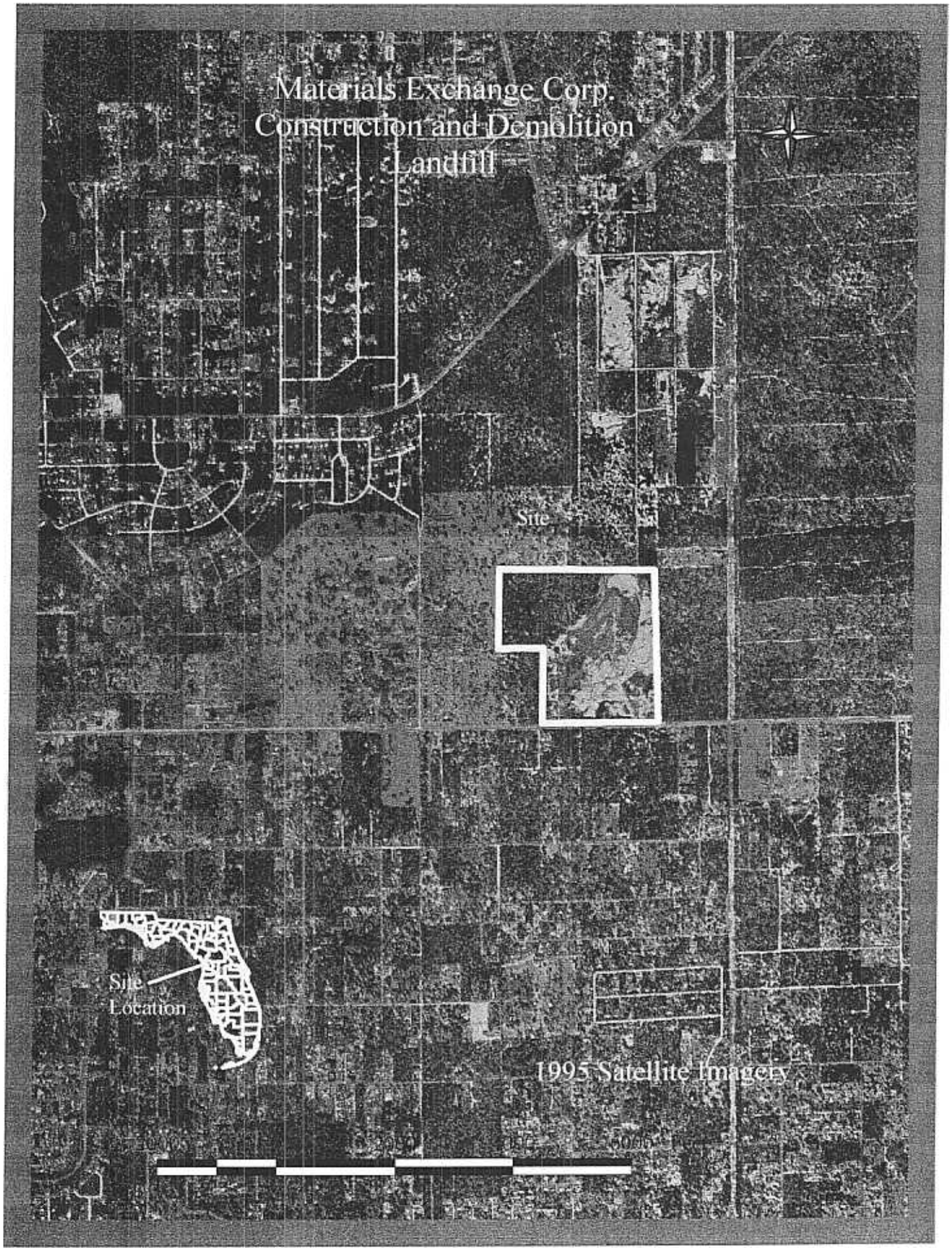
(12). United States Geological Survey, Radioactive Elements in Coal and Flyash, USGS Fact Sheet 163-97, http://energy.cr.usgs.gov:8080/energy/factshts/163-97/FS-163-97.html

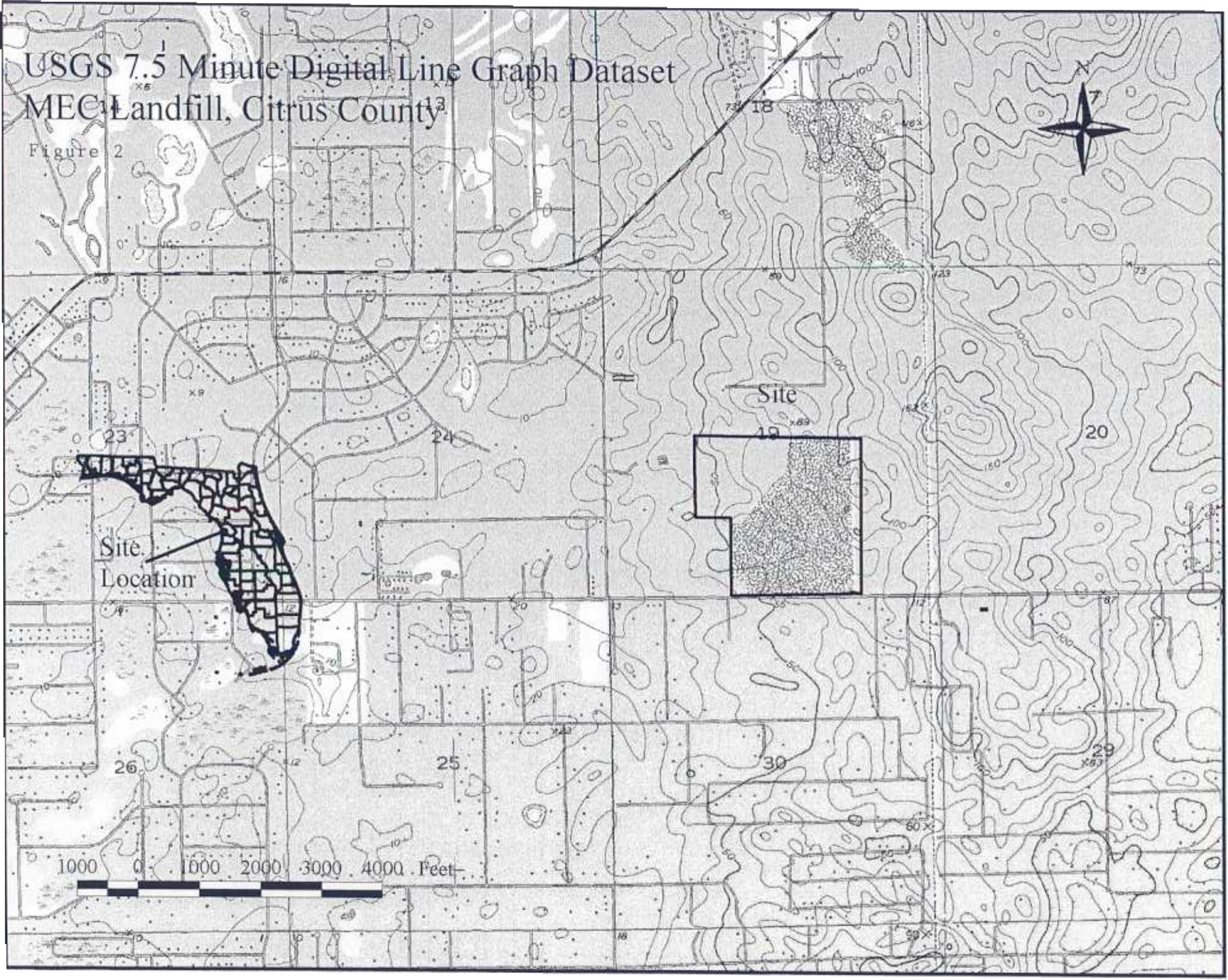
13) FDEP Chapter 62-521, Well Head Protection Rule.

Figures

Figures

gure


Materials Exchange Corp.
Construction and Demolition
Landfill
Site
Site
Location
1995 Satellite Imagery


USGS 7.5 Minute Digital Line Graph Dataset
MEC Landfill, Citrus County
Figure 2
Site
Site
Location
N
18
19
20
23
24
25
26
29
30
1000 0 1000 2000 3000 4000 Feet

CONDITIONAL USE

Application #: CU-98-03

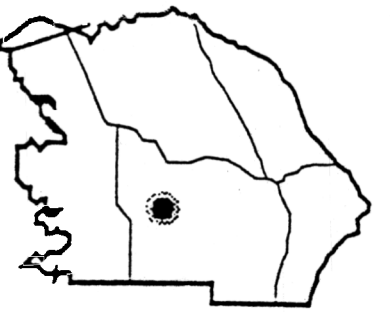
Applicant: Ray Guthrie for West Coast Materials, Inc.

Proposal: Modify Conditions of CU-95-04

Location: 5355 W. Grover Cleveland Blvd., Homosassa

Future Land Use Designation: IND, Industrial and LDR, Low Density Residential

Sec.:	Twn.:	Rge.:	Qtr.:
19	19S	18E	SE & SW



Existing Land Use and Current Land Use Designations

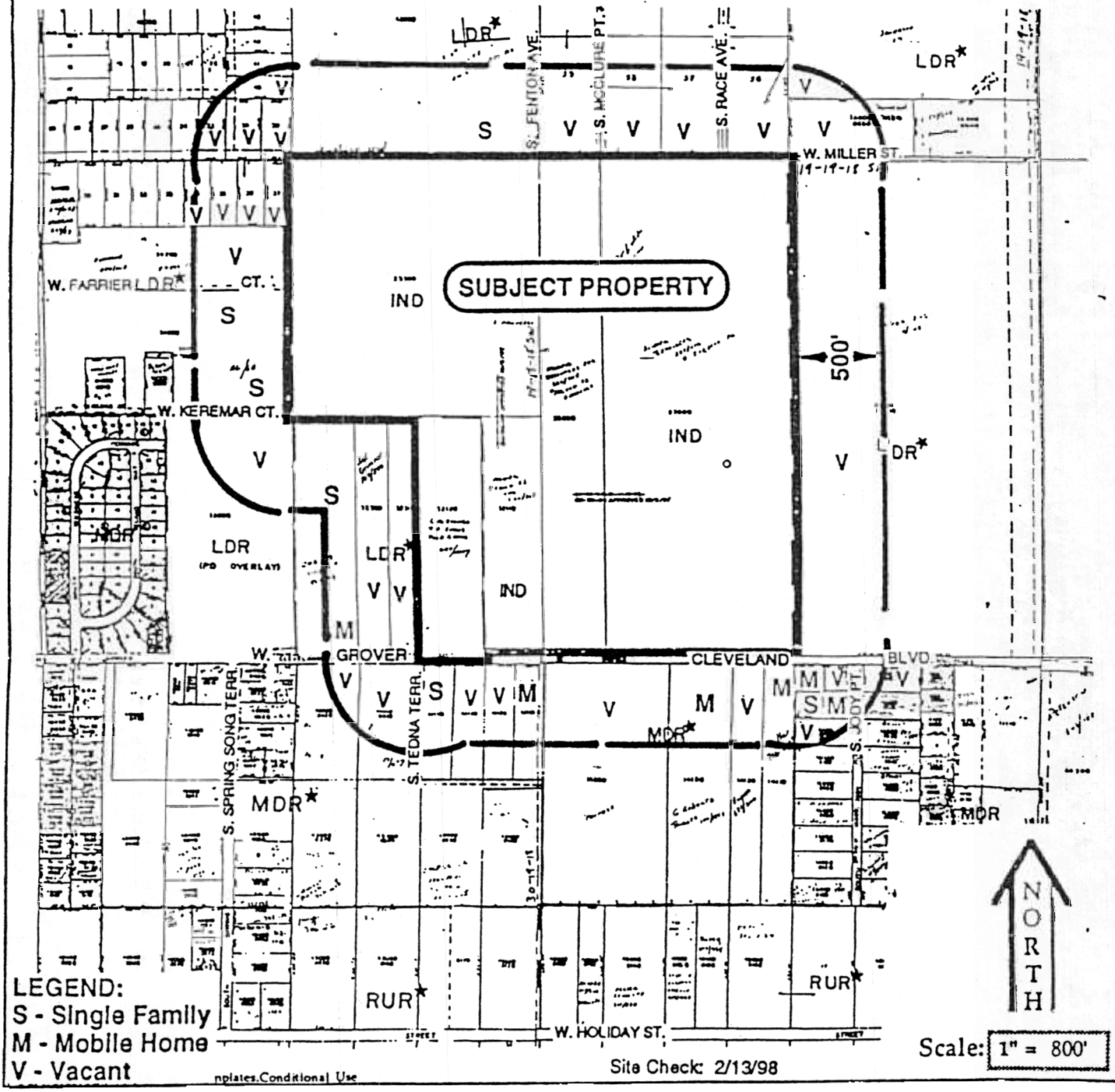


Figure 3

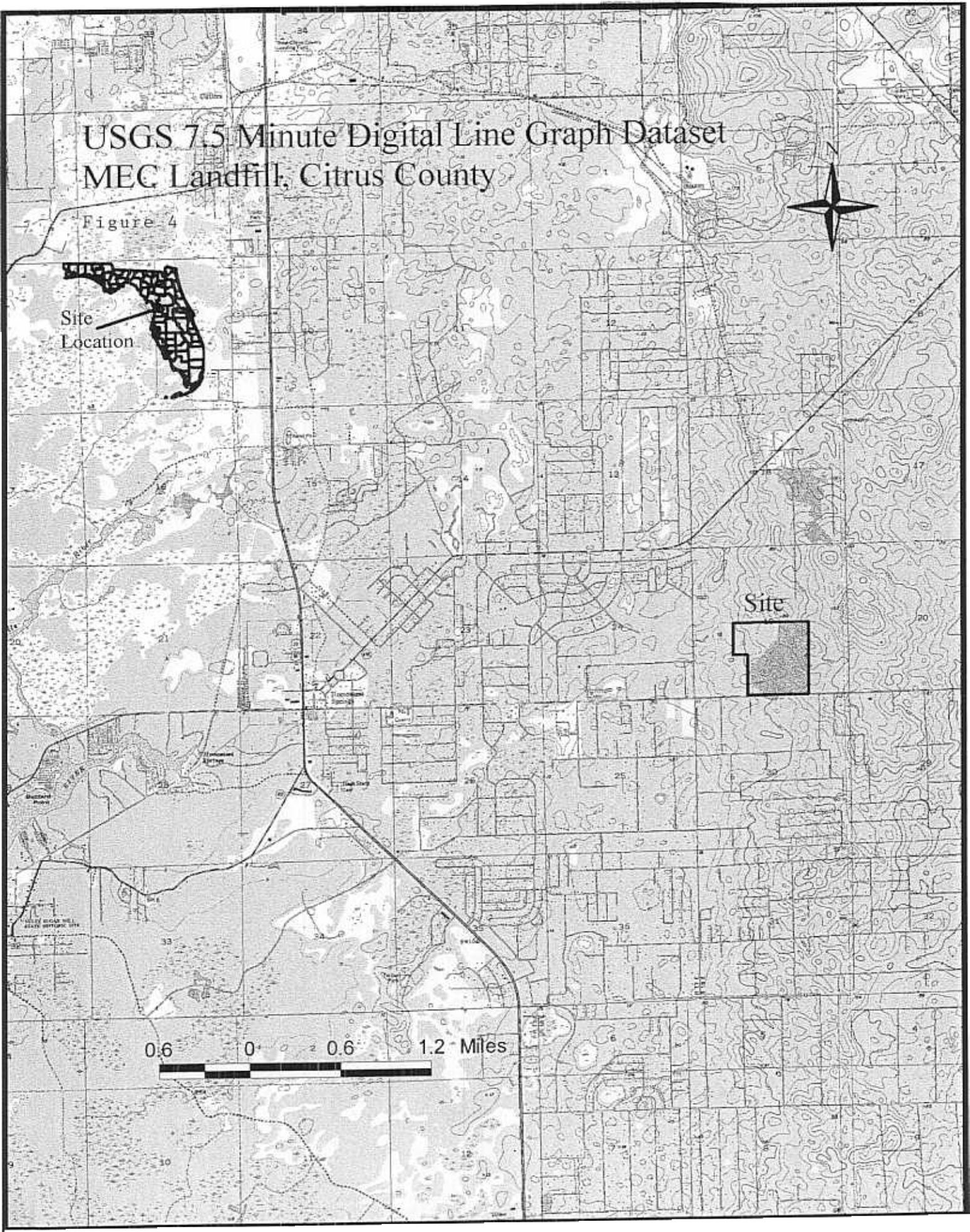
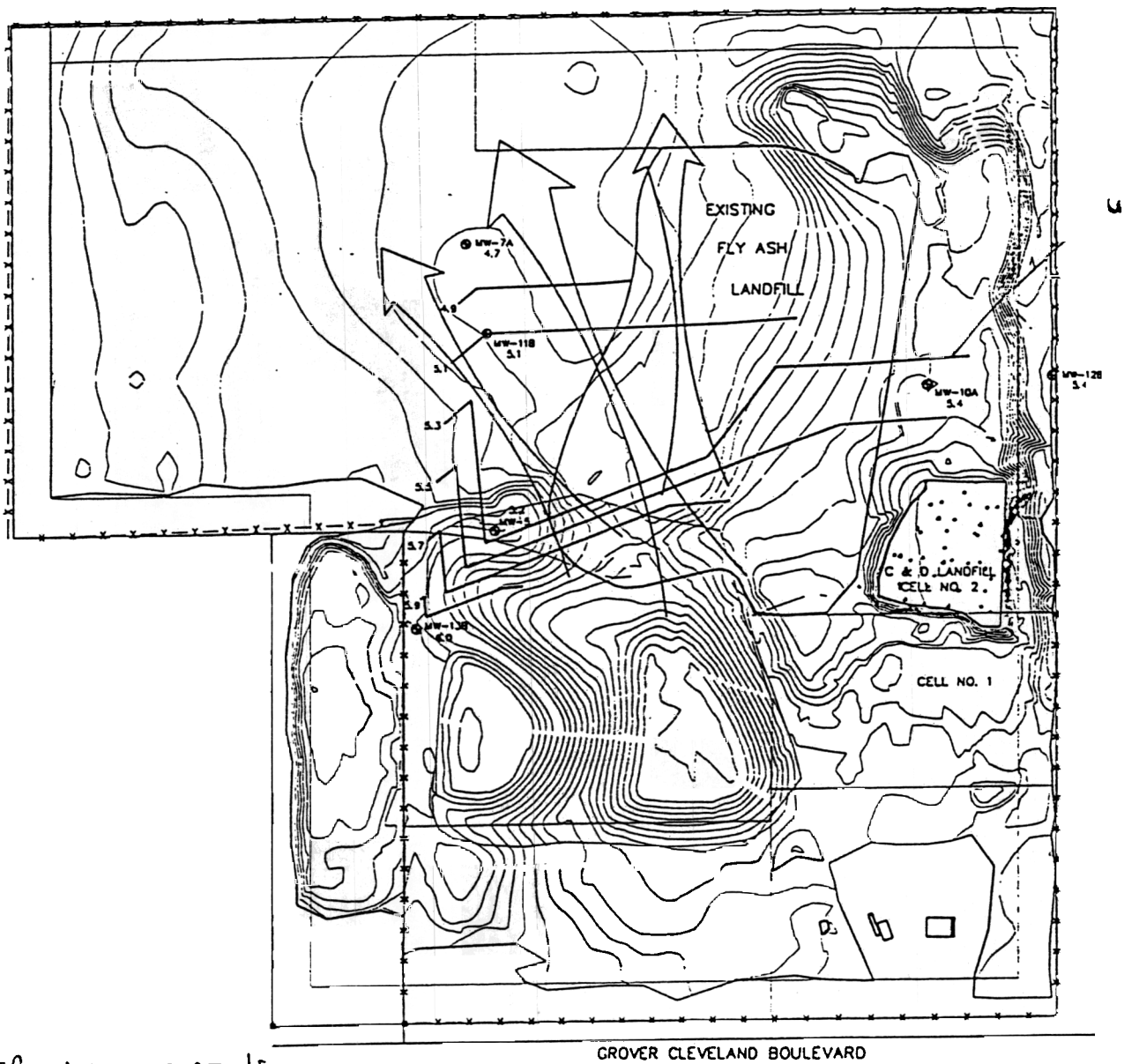

USGS 7.5 Minute Digital Line Graph Dataset
MEC Landfill, Citrus County
Figure 4
Site
Location
N
Site
0.6
0
0.6
1.2 Miles

Figure 5



MONITOR WELL LOCATIONS

MONEX ~~AEA~~
MW-10A – UPGRADIENT
MW-5
MW-7A
MW-11B } DOWNGRADIENT

MAT. EXCHANGE C&D
MW-12B - UPGRADIENT
MW-10A
MW-13B } DOWNGRADIENT

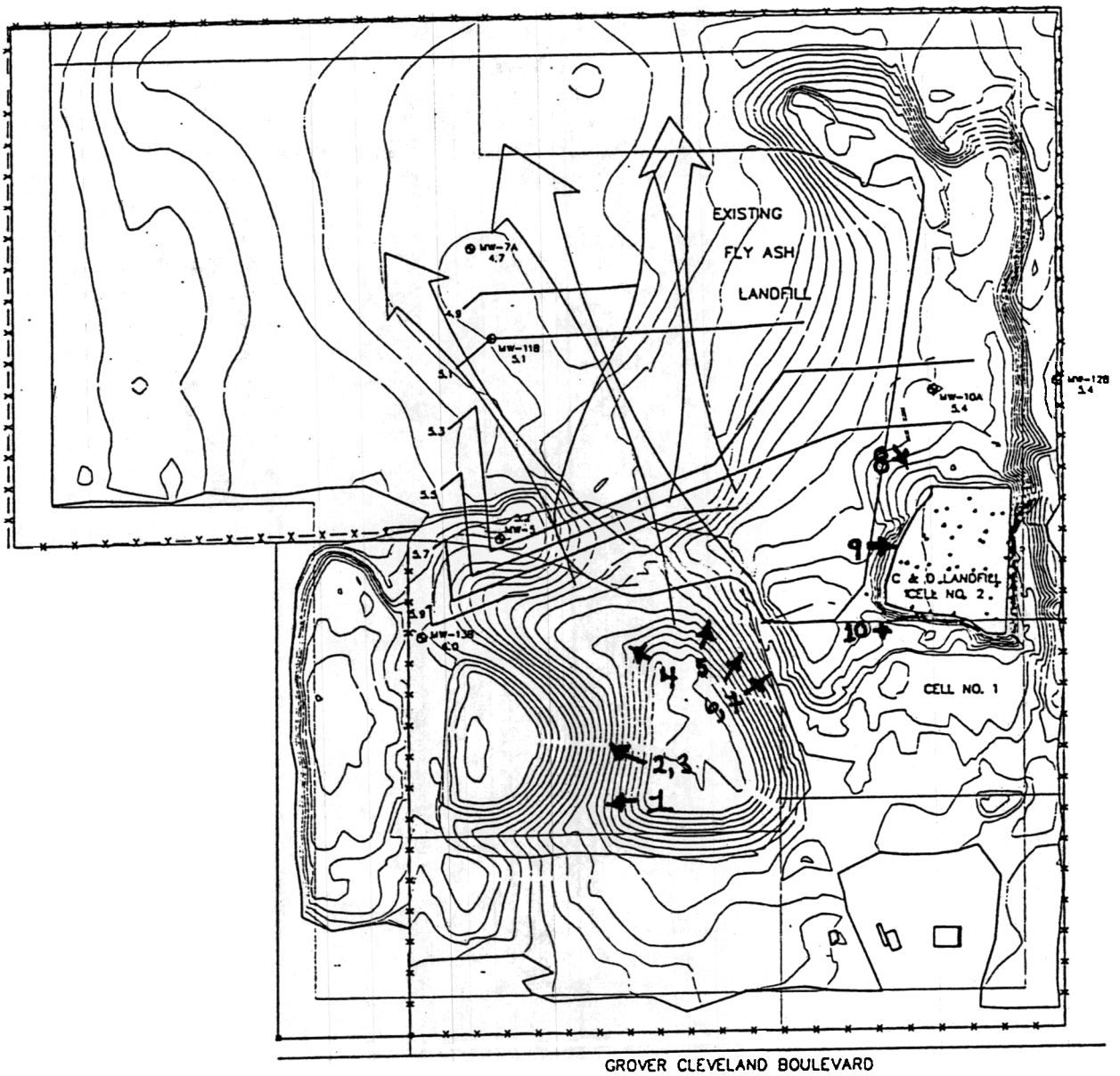
DIRECTION OF GROUNDWATER FLOW

NOTES: BASED ON 3/26/99 REVISED TOPOGRAPHIC SURVEY DATA
BY CENTRAL SURVEYING AND MAPPING, INVERNESS, FLORIDA
CONTOURS ARE BASED ON DATA OBTAINED 3/15/99 AND 3/22/99

GROUNDWATER CONTOUR MAP	
DRAWN BY: KP	REVISED:
SCALE: 1"=500' (APPROX)	

ENSOL, INC.
452 THIRD STREET NIAGARA FALLS, N.Y.
PHONE (716) 285-3920 FAX (716) 285-3928

Figure 6



DIRECTION OF
GROUNDWATER FLOW

NOTES: BASED ON 3/26/99 REVISED TOPOGRAPHIC SURVEY DATA
BY CENTRAL SURVEYING AND MAPPING, INVERNESS, FLORIDA
CONTOURS ARE BASED ON DATA OBTAINED 3/15/99 AND 3/22/99

LANDFILL SITE

GROUNDWATER CONTOUR MAP

DRAWN BY: KP	REVISED:
SCALE: 1"=50	(APPROX)
CHKD. BY:	

ENSOL, INC.
452 THIRD STREET NIAGARA FALLS, N.Y.
PHONE (716) 285-3920 FAX (716) 285-3928

CERTIFICATION

This Materials Exchange Corporation Health Consultation was prepared by the Florida Department Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

Debra Gable
Technical Project Officer, SPS, SSAB, DHAC
ATSDR

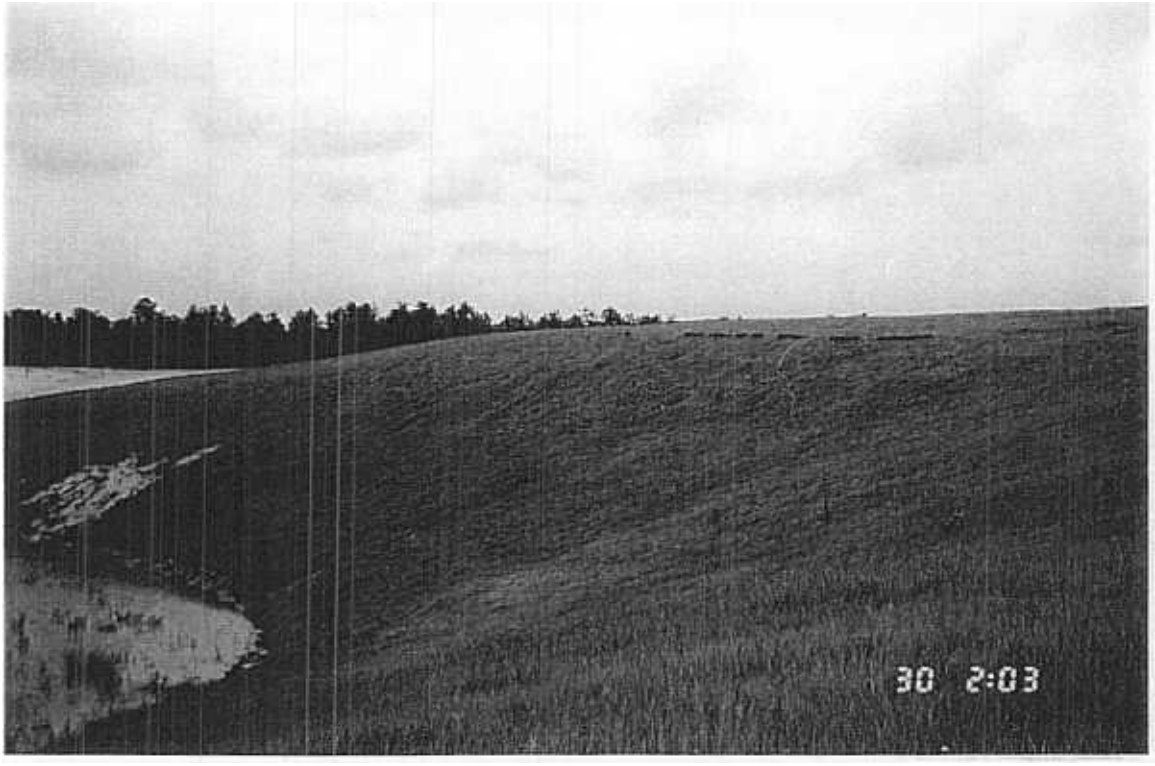
The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

Richard Gillig
Chief, State Program Section, DHAC, ATSDR
ATSDR

Appendix A

Photograph 1. View to the west from the southwest edge of the closed C & D cell.

Photograph 2. View to the northwest from the southwest edge of the closed C & D cell.



Photograph 3. Closeup view of the southwest side of the closed C & D cell.

Photograph 4. View to the northwest from the northwest edge of the closed C & D cell

Photograph 5. View to the north (flyash mound) from the northern edge of the closed C & D cell.

Photograph 6. View to the northeast from the northeast edge of the closed C & D cell, view into the DRA and operating C & D cell.

Photograph 7. Odor control misting setup on the edge of the currently operating C & D cell.

Photograph 8. View of the working face of the currently operating C & D cell.

Photograph 9. Erosion on the west side of the currently operating C & D cell.

Photograph 10. Closeup of the mister control panel on the south side of the operational C & D cell.

Appendix B

Florida Department of
Memorandum Environmental Protection

TO Robert Butera, P.E., Solid Waste Manager

FROM: Susan Pelz, P.E.

DATE July 14, 1999

SUBJECT Material Exchange Foundation Analysis

I. "Revised Foundation Analysis for the C&D Disposal Facility," dated November 20, 1997 (received December 22, 1997), prepared by CTL.

Assumed Unit weight of C&D = 60 lb/cf.
Unit weight of compacted C&D & cover = 65 lb/cf
Unit weight of original soils = 100 lb/cf
Natural grade @ 90 feet NGVD
Depth of excavation @ 65 feet

Concluded: 125 ft of C&D equals stress produced by original soils (prior to excavation)

Initial stress due to original soil = 94.5 ft x 100 lb/cf = 9450 psf
Stress due to C&D loading = 94.5 ft x 65 lb/cf = 6142.5 psf
This is much less than the original stress imposed by original soils. So to achieve stress less than or equivalent to that imposed by original soils, landfill can go to 125 ft NGVD. 9450 lb/sf x 1/65 lb/cf = 145 feet of waste. If bottom of cell is at 20 feet NGVD, then maximum elevation is 165 feet NGVD. So the limitation to 125 feet NGVD is conservative.

The assumption of soils unit weight (100 lb/cf and C&D unit weight (65 lb/cf) are within the ranges in published data

Material	Density range lb/cf	Density typical lb/cf
Sands (coarse, medium, fine)	85 - 140	
Clay/silt	70 - 120	
C&D-mixed demolition (noncombustible)	62 - 100	89
C&D-mixed demolition (combustible)	19 - 25	
C&D-mixed construction (combustible)	11 - 23	17
Broken concrete	75 - 113	96

Sources:
Standard Handbook for Civil Engineers, 3rd Ed., 1983 Frederick Merritt Editor page 7-77.
Civil Engineering Reference Manual, 5th ed., 1992, Michael Lindeburgh, P.E page 9-11.
Integrated Solid Waste Management, 1993, George Tchobanoglous page 71

II. Response to RAI, dated February 18, 1997 (received February 18, 1997), prepared by Mike Rooks.

The information in Part K, "Foundation Analysis," prepared by Mike Rooks/Jerry Huston, P.E., received November 8, 1996, was subsequently revised by the CTL information listed above. However, the bulk density for the mixed C&D materials as determined by actual load weights at the site is within the range(s) published in the literature.

Material	Density, lb/cf, range	Density, lb/cf, typical
Sand & Clay	93 - 100	96
Roofing	35 - 62	49
Land Clearing Debris	22 - 63	43
Mixed C&D	46 - 124	62

III. Potential for subsurface failure due to development of a sinkhole.

Although evidence of relic sinkhole activity was found at the site (see Miller's submittal dated August 21, 1997 (received September 16, 1997, as well as others), the relic sinks did not exhibit recent activity, e.g. raveling or loose sands.

Although future sinkhole development is possible, since there does not appear to be current sinkhole development, the existence of relic sinkholes (which have been in-filled) presents a potential for unimpeded discharge of leachate into groundwater, but not a realistic potential for subsurface failure. This unimpeded discharge potential has been addressed by the installation of a 2-foot constructed clay liner. The purpose of the liner is to impede the discharge of leachate into groundwater.

It is well known that sinkholes may form in karst areas. However, the location of the occurrence cannot be accurately predicted with currently available technologies. Further, the size of a sinkhole occurrence cannot be reasonably predicted. Currently, foundation analyses which consider a hypothetical sinkhole occurrence of an unknown or theoretical size and depth are not required for permit applications. This is particularly true for sites where there has been no recent sinkhole activity.

In the case where recent sinkhole activity had occurred, a reasonable analysis could be performed based on the size (and depth) of the recent occurrence. However, this would by no means be conclusive with regards to the possible formation of a larger (or smaller) sinkhole, or the probability that the waste (or liner system) would effectively bridge the opening and prevent the discharge of waste or leachate into the sinkhole.

sjp

Appendix C

FDOH Supplied Information on Hydrogen Sulfide To These Physicians:

Dr. Ira Fialko (PED)
6171 W. Gulf to Lake Hwy.
Crystal River, FL 34429
352-563-0220
Fax 352-563-0706

Dr. Monojkumar Shukla (PUL.)
5616 W. Norvell Bryant Hwy.
Crystal River, FL 34429
352-795-1999
Fax 352-795-2269

Dr. V. Rama Nathan (E.N.&T)
820 S. Bea Ave
Inverness, FL 34452
352-637-1919
Fax 352-637-6487

Dr. Dorn
Primary Care @ Hospital
511 West Highland Blvd.
Inverness, FL 34452
(352) 726-2351

Dr. Michael Wiggins
7955 S. Suncoast Blvd.
Homosassa, FL 34446
(352) 382-5000