

**Town of Oyster Bay
Department of Public Works**

2003 Annual Report

**Summarizing the Results of
Landfill Gas Monitoring Programs at the
Old Bethpage Solid Waste Disposal Complex
and Adjacent Areas**

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SECTION 1

BACKGROUND

1.1 General

The Old Bethpage Solid Waste Disposal Complex (OBSWDC) is located between Winding and Claremont Roads, south of Bethpage-Sweet Hollow Road in the Town of Oyster Bay, Nassau County, New York. The OBSWDC consists of a total of 134 acres which contain a closed and capped landfill, inactive incinerators, an inactive baler, a municipal solid waste (MSW) Transfer Facility, a Groundwater Treatment Facility, a Leachate Treatment Facility, Landfill Gas Control and Recovery Systems, a periodically operated New York State Department of Environmental Conservation (NYSDEC) approved Clean Fill Disposal Site, a Recycling Facility, scalehouse, recharge basins, stockpile areas and vehicle maintenance facilities.

1.2 Presence of Combustible Gas

On March 7, 1979, pursuant to inspections performed by the Nassau County Fire Commission, a violation was issued to the Nassau County Fireman's Training Center (NCFTC) and an order was given to remove all sources of ignition at the NCFTC because an explosive atmosphere was reported to exist in certain enclosed areas on-site (the NCFTC borders the OBSWDC on the southeast). In order to prevent landfill gas (LFG) from contributing to the creation of an explosive atmosphere at the NCFTC, the Town installed a landfill gas control and recovery system. Subsequent to this event, the Town has and continues to conduct regular combustible gas monitoring at the NCFTC, along the perimeter of the OBSWDC, in on-site buildings and at various off-site locations.

1.3 Authority

The presence of migrating gases in the vicinity of the OBSWDC was factored into the "SPECIAL CONDITIONS" category attached to the Permit to Operate No. 0013, Application 30-S-15, dated August 14, 1979. This permit was issued by the New York State Department of Environmental Conservation (NYSDEC) to the Town as per the requirements of 6 NYCRR Part 360. Special Conditions 2 and 4 of the permit required that the Town submit the following three (3) reports, respectively:

- Old Bethpage Landfill, Fireman's Training Center, % Combustible Gas, Sampling Data Summary, LKB, August 31, 1979;
- Old Bethpage Landfill, Fireman's Training Center, % Combustible Gas, Sampling Data Summer-v, LKB, January 29, 1981; and
- Old Bethpage Landfill Land Use Plan, LKB, December 1, 1979.

Both the August 31, 1979 and January 29, 1981 reports and The Land Use Plan included

capital improvement programs for the collection and treatment of landfill gas (LFG) and ongoing LFG sampling programs. The Land Use Plan and monitoring programs received Town approval as per Town Board Resolution No. 136-80 (TBR 136-80) on February 9, 1980 and NYSDEC approval on January 31, 1981. Renewal of the 6 NYCRR Part 360 permit to operate was applied for by the Town on July 6, 1982. This renewal permit was issued by the NYSDEC to the Town on June 1, 1984 as per the requirements of 6 NYCRR Part 360.

As part of the renewal permit conditions, the Town was required to develop a monthly monitoring program acceptable to the NYSDEC and the Nassau County Department of Health (NCDH). The monitoring program was conducted along all boundaries of the OBSWDC and in all on-site facility structures. Monitoring results were required to be submitted in the form of a report to the NYSDEC and the NCDH. In April 1986, the landfill ceased operations and all MSW subsequently has been hauled off-site for disposal or recycling.

Additionally, the Town was required to submit an annual engineering report prepared by a licensed professional engineering firm for the purpose of summarizing the status of all landfill gas monitoring programs, including the zero percent gas migration limitations. Authorization for work summarized in this report was granted on March 22, 1994 and April 26, 1994 by passage of TBR No. 217-94 and 323-94, respectively, and is outlined as follows:

- annual site monitoring program exploring the radial migration of landfill gas;
- evaluation of the monthly monitoring data which are obtained by Town personnel;
- submission of an engineering report evaluating the results from both the site monitoring and monthly monitoring programs;
- transmission of all the evaluated combustible gas monitoring data to the Town, which are then sent to the regulatory authorities;
- coordination of all the Town landfill gas monitoring programs outlined in Section 6 of the Comprehensive Land Use and Operations Plan, (LKB, October 1983).

On June 30, 1988, the Town of Oyster Bay and the New York State Department of Law (NYS DOL) entered into a Final Consent Decree for the remediation of the Old Bethpage Landfill (83 CIV. 5357). Incorporated into the Consent Decree was a Remedial Action Plan (RAP) which detailed the actions to be undertaken by the Town in compliance with the Final Consent Decree.

Appendix A, Section I(H) of the RAP obligates the Town to continue to operate and maintain the existing gas control systems in compliance with the requirements of 6 NYCRR Part 360 and maintain a zero percent gas migration limitation at the OBSWDC property boundary. The RAP further states that in order to demonstrate such compliance, the Town will have to conduct the monitoring program described in the Lockwood, Kessler & Bartlett Report entitled 1986 Annual Report Summarizing the Status of Landfill Gas Monitoring Programs and the Establishment of the Zero Percent Gas Migration Limitation at the Old Bethpage Landfill (LKB, April 1987).

In addition, the same section of the RAP requires the Town to supplement this monitoring program with data obtained from the following:

- quarterly ambient volatile organic compound (VOC) air sampling to be taken at three (3) selected locations during the first year of remediation and if approved by the New York State Department of Law (NYSDEL), annually thereafter;
- quarterly subsurface VOC gas sampling to be collected at fourteen (14) selected sampling locations at a depth of 30" during the first year of remediation and if approved by the NYSDOL, on an annual basis thereafter;
- quarterly subsurface VOC gas sampling at location M-9 (Figure 1) at depths of 10', 20', 30' and 40' during the initial year of remediation, and if approved by the NYSDOL, on an annual basis thereafter;
- quarterly thermal oxidizer emission sampling for VOC levels during the initial year of remediation. These results will be related to the thermal oxidizer temperatures during the initial year of sampling. Thereafter, the oxidizer temperatures will be monitored on a monthly basis to insure that temperatures needed to volatilize the organics are being maintained in the oxidizer. The oxidizer emissions will continue to be sampled on an annual basis for VOC content;
- quarterly pressure readings at three (3) locations during the initial year of remediation and if approved by the NYSDOL, on an annual basis thereafter.

In 1990-91, four quarterly rounds of ambient air and subsurface gas sampling were performed. An interpretive report prepared by LKB entitled Evaluation of Ambient Volatile Organic Compounds in Air and Soils concluded that, based on the test results generated that the landfill does not have a significant adverse impact on the ambient air.

This report was submitted to NYSDEC in early 1992 with a recommendation to reduce the testing frequency from quarterly to annually on the basis of these findings. The NYSDEC denied the Town's recommendation and directed the Town to continue quarterly testing. The only quarterly test (second year of monitoring, first quarterly test) was conducted on October 26-27, 1992. The results of this test confirm the findings of previous testing.

Pressure sampling indicated that all pressure probes were under zero or negative pressure at the time of the test. This supports data obtained as part of the annual zero migration line which shows that as a result of the effectiveness of the Town's landfill gas control system that no off-site landfill gas migration is occurring at the OBSWDC. This report was released for agency review shortly after inconsistencies in the applicable guideline values were resolved with NYSDEC.

The Consent Decree provided for an automatic reduction in the quarterly testing frequency of the thermal oxidizer stack emissions after the initial year on monitoring to annually. This

annual testing of the stack emissions took place on November 10, 1992. The results of the testing indicated that the thermal oxidizer emissions were well below the acceptable ambient guideline concentrations (AGCs) as stipulated by the NYSDEC.

In 2003, four quarterly rounds of ambient air and subsurface soil gas sampling and the thermal oxidizer emissions test were performed. The results have been submitted to the Town in separate reports and therefore will not be addressed in 2003's Annual Report.

1.4 Background of Gas Detection and Control Programs

The Town of Oyster Bay has initiated several detection and control programs to monitor and prevent the off-site migration of landfill gas in the vicinity of the OBSWDC. Initially, the Town installed permanent sampling probes around the perimeter of the OBSWDC to detect potential off-site landfill gas migration. Next, field data were collected to help locate areas possibly troubled by off-site landfill gas migration.

Upon analysis of the data collected during the field measurements and based on the calculations presented in the Engineering Report entitled Preliminary Engineering Design Report: Phase 1 Gas Control and Recovery Program (LKB, June 1980), the Town prepared final Contract Documents for public bid (April 1981) to prevent the potential for off-site migration of landfill gas onto NCFTC property. The Phase 1 Gas Control and Recovery System became operational in June 1982. These actions were immediately undertaken by the Town thereby alleviating off-site landfill gas migration onto the NCFTC.

As part of the conclusions and recommendations presented in the Preliminary Engineering Design Report (LKB, June 1980) and based on additional monitoring data obtained by the Consultants, which revealed that gas migration was occurring across Winding Road, the Town prepared final Contract Documents for public bid (May 1983) and constructed the Phase 2 Gas Control System.

The Phase 2 System was constructed by the Town to control the off-site migration of landfill gas along Winding Road. To monitor the effectiveness of the Phase 2 System, the Town installed new permanent sampling probes adjacent to and across the road from the system along Winding Road. The Phase 2 System and the permanent sampling probe construction was completed in April 1984.

The Town also installed an additional vent well, approximately 300 feet south of LGV-5, to further guard against possible migration of landfill gas onto the NCFTC from the Phase I Landfill (western portion of NCFTC). As discussed in detail in Section 3, the utilization of the Phase 2 System has effectively alleviated the off-site migration of landfill gas along Winding Road.

Based on the results of past site monitoring data obtained by the Consultants over a five year period (between 1982 and 1986), which revealed that gas migration was possibly occurring in the vicinity of the northwestern corner and western portions of the OBSWDC, the Town prepared final Contract Documents (October 1985) and constructed the Phase 3

Gas Control System. Construction of the Phase 3 Gas Control System was completed in early March 1987 and the system was placed in full operation in April 1987.

The Phase 3 system, which is similar in design to the Phase 1 and 2 Systems, was designed to prevent the migration of landfill gas in the northwestern and western portions of the OBSWDC. In 1994 some landfill gas migration was occurring in the vicinity of Briden Construction, which is located in the western portion of the OBSWDC. The Town took remedial action to prevent methane gas migration to this area. The existing landfill gas extraction wells along the Phase 3 Gas Control System (LGV-19, LGV-20 and LGV-21) were cleaned/scoured and restored to proper operation.

To prevent any future migration in this area, the Town constructed a passive methane relief trench along Briden's southern property boundary and installed a series of landfill gas extraction wells along Briden's eastern and southern property boundaries. These wells (LGV-29, 30, 31 and 32) tie into the existing Phase 3 gas extraction system to further guard against the possible migration of LFG in this area.

In addition to the previously mentioned detection and control programs, the Town has implemented several other detection and control programs to monitor and prevent the off-site migration of landfill gases.

Following is a brief description of these programs as well as additional landfill gas/condensate related projects:

- In December 1985, the Town granted and leased all rights to landfill gas, which is produced within the existing portions of the OBSWDC to Energy Tactics, Inc. (ET). As part of this lease, ET designed a system to convert high quality landfill gas into energy for sale to the Long Island Power Authority (LIPA). Upon the sale of energy to LIPA, the Town receives a royalty payment from ET. This lease remains in force for twenty-five years. Presently, ET has suspended energy production. The landfill gas from their facility is being sent to the thermal oxidizer.

It should be noted that during the course of landfill capping, ET has had to remove/relocate portions of their system to accommodate these operations. ET submitted an application to operate a Solid Waste Management Facility to the NYSDEC in September 1989 and received a permit in June 1992.

- In order to maintain a safe environment for training activities at the NCFTC, the County and the Town had previously agreed to jointly study the occurrence of subsurface combustible gas on the NCFTC and recommend appropriate remedial measures. That agreement was formed in a document entitled, Town of Oyster Bay Landfill/Fireman's Training Center Subsurface Gas Sampling Program Work Scope, Malcolm Pirnie, Inc., November, 1988, (the Work Scope). After completion of the Phase I activities outlined in the Work Scope, the parties agreed that sufficient data resulting from the above was obtained to allow the remediation to proceed directly to the design phase of this project, thereby accelerating the remediation program.

In 1992, the County and Town signed a betterment agreement wherein both parties will jointly share in upgrading the Town's facilities in the areas of joint concern. The projected design of the improvements provided for the installation of a skid mounted blower, a water separator package and three (3) landfill gas vents in the vicinity of the common border of the NCFTC/OBSWDC. The three landfill gas vents (LGV-5A, 5B, 7A) were installed in November, 1992. Installation of a skid mounted blower and water separator package were completed in the spring of 1993. Pilot testing and design of a groundwater treatment facility were completed by the County in 1994. The groundwater treatment facility has been in operation since 1996.

In summary, the County and Town have concluded that with the improvements to the Town's facilities and the construction of the County's remediation facilities, all subsurface landfill gas along the common border of the NCFTC/OBSWDC have been effectively controlled.

SECTION 2

SAMPLING

2.1 General

Sampling was performed by the following organizations:

- Town of Oyster Bay (TOB);
- Hazen and Sawyer, P.C. (H&S);
- RTP Environmental Associates, Inc. (RTP);
- Camp Dresser and McKee (CDM).

RTP and CDM were contracted by LKB to assist in the preparation of necessary reports to comply with all of the requirements stipulated in the Consent Decree - RAP Attachment 2. RTP personnel conducted the sampling and analysis of ambient air and soil gases as well as the pressure sampling in the areas at and surrounding the OBSWDC. CDM conducted the emission measurement programs to characterize the air emissions of the LFG Thermal Oxidizer at the OBSWDC. H&S was contracted by TOB to conduct the annual landfill gas migration survey.

2.2 Monitoring Equipment Operation

Specific monitoring equipment used by the parties are as follows:

- TOB: MSA Model 60 Combustible Gas Indicator.
- H&S: MSA Model 62S Combustible Gas Indicator.
- RTP: Monitoring equipment and sampling protocols utilized by RTP for the Ambient Air Quality and Soil Gas Quality Surveys are presented in Appendix C, (attached herewith).
- CDM: Monitoring equipment and sampling protocols utilized by CDM for the Landfill Gas Thermal Oxidizer Emissions Tests was presented in the report entitled "Annual Emissions Test Report-Landfill Gas Thermal Oxidizer".

The sampling protocols utilized by both the Town and H&S include the following:

Prior to sampling, certain monitoring equipment instructions are to be read and precautions undertaken to assure proper equipment (MSA Model 60 and 62S Combustible Gas Indicators) operation. First, the instrument is calibrated (prior to sampling) using a check gas cylinder with a known methane gas concentration. Second, the aspirator bulb is squeezed to purge the instrument with fresh air so that readings do not reflect contamination

from prior readings. Lastly, excessive liquid quantities are prevented from entering the instrument during sampling (these instruments contain water traps which prevent liquids from being inadvertently drawn). In addition to the above, the Town and H&S regularly send their instruments to the manufacturer for calibration, maintenance and repairs to assure proper equipment operation.

Sampling data collected by TOB and H&S personnel, using the MSA Model 60 and 62S Combustible Gas Indicators, yield readings that are expressed on a scale which measure the concentration of combustible gas present by volume.

The sampling procedures, utilized by TOB and H&S personnel, were performed according to the monitoring schedule recommended in the 1994 Annual Report Summarizing the Results of Landfill Gas Monitoring Programs at the Old Bethpage Solid Waste Disposal Complex and Adjacent Areas (LKB, May, 1995). This report developed sampling programs in potentially hazardous areas on the NCFTC grounds, and areas on-site and off-site of the OBSWDC.

2.3 Current Gas Monitoring

There are presently a number of gas monitoring programs at the OBSWDC implemented to locate and/or detect areas of off-site LFG migration. The annual facility and site survey, conducted by H&S personnel, presents data used to ascertain the extent of LFG migration along the OBSWDC boundary. The site survey also assesses the effectiveness of the Phase 1, 2 and 3 gas control and recovery systems in preventing off-site landfill gas migration onto NCFTC property and buildings adjacent to Winding, Round Swamp and Claremont Roads. Data obtained in the site survey are ultimately used to develop remedial programs for the modification and expansion of gas control and recovery systems, if necessary. Also, H&S personnel annually monitor the boundary and adjacent areas of the Nassau County Department of Parks and Recreation Battle Row Campground (the Campground) for the presence of off-site LFG migration.

Town of Oyster Bay personnel monitor the permanent sampling probes (Monthly Monitoring Survey) on a monthly basis to provide early warning in the event any off-site migration occurs onto NCFTC property or beyond the OBSWDC property boundary (Figures 1, 2 and 3). The monthly monitoring survey is also used to determine subsurface landfill gas concentrations.

In addition to the previously mentioned TOB survey, Town of Oyster Bay personnel monitor (on a monthly basis) various locations at commercial properties immediately adjacent to the OBSWDC along Winding, Round Swamp and Claremont Roads, and in buildings located at the OBSWDC (Figures 4, 5, 6 and 7). This survey (Adjacent Building Structures and Incinerator Complex Survey, ABSIC) was initiated as a result of the reported elevated levels of combustible gas on May 31, 1983, at the Key Way Concrete Supply Corp. Plant located at 100 Battle Row.

Lastly, Town of Oyster Bay personnel monitor (on a monthly basis) various points located

in the interior and exterior of five (5) building structures immediately adjacent to the OBSWDC. This survey (Senior Citizen Housing Combustible Gas Survey) is conducted at the Senior Citizen Complex (Figure 8) which is located west of the OBSWDC. The Senior Citizen Complex is bounded by the property boundary of the OBSWDC, Round Swamp Road and Battle Row.

In early November 1987, Nassau County personnel installed two (2) groundwater monitoring wells (to the groundwater table) at the NCFTC. The wells were constructed to determine the possible levels of groundwater contamination caused by the NCFTC's use of petroleum products over the years in their fire fighting drills. During the course of this work, aside from the few inches of petroleum products found in the upper portion of the groundwater, the County also discovered the presence of significant levels of combustible gas in the two wells and notified the Town of this occurrence. After apparently finding steady combustible gas levels in the wells for 48 hours, a meeting was held to discuss the situation.

In an effort to better appraise the extent and cause of the problem, the Town initiated a daily monitoring on November 6, 1987 of the Town's sampling probes at the NCFTC as well as the two (2) groundwater wells and an on-site manhole. In April 1988, subsequent to the daily monitoring program, the Town as part of the subsurface soil boring program installed ten (10) new cluster wells (varying depths) along the western property boundary of the NCFTC to generate additional data. These locations were monitored daily by Town personnel until August 30, 1989. Subsequent sampling at these locations was conducted weekly by TOB personnel.

The Town has voluntarily conducted a considerable amount of landfill gas monitoring (at various times on a daily, semi-weekly and weekly basis), in and around the vicinity of the NCFTC. This voluntary sampling was conducted at locations within the NCFTC and at the cluster wells located along the western property boundary of the NCFTC. This monitoring was over and above that which was required for these locations, namely a monthly monitoring.

As of the week of November 12, 1990, the Town reverted to a monthly sampling of these locations since these areas and gas concentrations are well defined. As with all other monitoring, the Town will continue to monitor these locations on a monthly basis unless conditions warrant a more frequent sampling schedule, in which case the Town will revert to a sampling schedule consistent with the warranted conditions (as has always been the Town's policy).

The above site and monitoring programs conducted by TOB, H&S and LKB personnel will continue at the OBSWDC so that any changes in landfill gas migration will be detected and further remedial actions initiated, if necessary. The monitoring locations and their associated monitoring frequencies are listed in Appendix A.

SECTION 3

DISCUSSION OF RESULTS

3.1 General

Two types of sampling programs were developed in the Comprehensive Land Use and Operations Plan, (LKB, October 1983). These programs were conducted at:

- various site locations in the vicinity of the Old Bethpage Solid Waste Disposal Complex, and;
- areas where potential safety hazards exist (buildings, facilities, etc.).

A program of the first type, developed for the Old Bethpage Solid Waste Disposal Complex and vicinity, is described in Section 3.2. A program of the second type, developed for the NCFTC, adjacent building structures, incinerator complex, Nassau County Campground and the Senior Citizen Housing is described in Section 3.3.

Sampling data generated from these programs are used to detect potential problematic areas and develop design parameters for modification and expansion of LFG control and recovery systems, if necessary. At present, these LFG control systems extend along the northern and western sides of the NCFTC, along Winding Road and along the northwestern portion of the OBSWDC adjacent to Claremont Road (see Figure 9).

3.2 Landfill Gas Migration

The following LFG surveys were conducted to establish the extent of landfill gas migration both on and off-site of the Old Bethpage Solid Waste Disposal Complex:

- site survey; and,
- monthly monitoring survey.

3.2.1 Site Survey

A site monitoring program, consisting of sampling points exploring the lateral migration of LFG around the outer boundary of the OBSWDC site, was conducted by H&S personnel during October, November and December 2003. Three-quarter inch (3/4") bar holes were punched approximately 12 inches deep and spaced 50 feet apart along the outer boundary of the OBSWDC. The survey was continued radially inward or outward, depending upon whether a positive or zero percent combustible gas reading was obtained at the perimeter sampling points. The collected data was then used to plot the combustible gas migration contour line of zero percent combustible gas readings) around the OBSWDC.

The data compiled in this current study is presented graphically on Drawing No. 1 (Old Bethpage Solid Waste Disposal Complex - Zero Percent Combustible Gas Migration Contours 2002 Annual Site Survey). This data compares the combustible gas migration contour compiled this year with the previously established 2002 contour.

Drawing No. 1 illustrates the extent of off-site LFG migration at the OBSWDC site in this year's survey:

- The results of the 2003 Annual Site Survey demonstrate that landfill gas migration has been contained within the entire OBSWDC boundary. As shown on Drawing No. 1, the line has retreated slightly in some areas. Combustible gas was not detected at any of the sample locations within the OBSWDC property. This included the northwestern portion of the OBSWDC property (adjacent to the eastern property boundary of Briden Construction) which had combustible gas detections in the previous annual site surveys. As stated in Section 1.4, this area has been vented and new landfill gas extraction wells had been installed to which prevented the gas migration.
- All other off-site areas, which in the past may have been experienced LFG migration, no longer experience landfill gas migration. The Town, however continues to monitor off-site areas at the NCFTC for the possibility of migration.

3.2.2 Monthly Monitoring Survey

As recommended in the 1994 Annual Report (LKB, May 1995), a monthly monitoring survey is conducted at the OBSWDC and the NCFTC to provide early detection in the event any off-site LFG migration occurred both onto NCFTC property or beyond the OBSWDC property boundary. Readings measured by TOB personnel were taken from one-inch diameter single point sampling probes most of which are installed 30 inches deep (except for four (4) which are set 8 feet deep (Figure 10)), pressure probes at depths of 10 and 20 feet (Figure 11), cluster wells ranging in depth from 10 to 40 feet (Figure 12) and varying depth cluster wells (Figure 13).

In this year's monthly monitoring survey, locations along the OBSWDC property boundary and at the NCFTC were monitored for the presence of combustible gas. Data obtained by Town personnel in this survey were then recorded on standard monthly monitoring forms (Figures 1, 2 and 3) and sent to LKB for analysis and evaluation.

Upon completion of data analysis and evaluation, a monthly letter report is transmitted by LKB to the Town. Comments include possible causes of LFG readings at specific locations as well as present and future remedial actions, which may be required to prevent any off-site migration of LFG, if encountered.

3.3 Facility Surveys

Additional combustible gas readings were measured at the following facilities:

- buildings adjacent to the OBSWDC;
- former incinerator complex;
- the groundwater remediation facility;
- scalehouse;
- the Nassau County Campground; and
- Senior Citizen Housing.

All sample locations pertaining to these facilities are shown on Drawing No. 1 and Figures 1 through 8.

3.3.1 Adjacent Building Structures and Incinerator Complex Survey

As recommended in the 1994 Annual Report (LKB, May 1995), monthly monitoring was conducted by TOB personnel at building structures immediately adjacent to the OBSWDC and on-site building structures. Monitoring was initiated to provide early warning in the event any off-site LFG migration occurred at adjacent buildings and businesses or combustible gas concentrations were detected at the former incinerator complexes, the compactor-baler facility, the groundwater remediation facility and scalehouse.

Combustible gas readings for the Adjacent Building Structures and Incinerator Complex Survey were measured by TOB personnel at monthly intervals from points located in the interior and exterior of 15 building structures (see Figures 4, 5, 6 and 7). The readings were taken from sensors, drains, well pits and loading docks located in and around these structures. Readings measured by TOB personnel in the survey were then sent to LKB for analysis and evaluation. In this year's survey, zero percent combustible gas concentrations were measured at all sampling locations.

3.3.2 Nassau County Campground Survey

The Nassau County Department of Parks and Recreation Battle Row Campground (The Campground), located on the western side of Claremont Road, was monitored for possible LFG migration during the annual site survey by H&S personnel. The survey consisted of sampling points (3/4" bar holes punched approximately 12 inches deep) parallel to the western boundary bordering Claremont Road. All sampling locations monitored indicated zero percent combustible gas.

3.3.3 Senior Citizen Housing Survey

The Senior Citizen Housing complex is located west of the OBSWDC bounded by the property boundary of the OBSWDC, Round Swamp Road and Battle Row. Monthly combustible gas readings were measured by TOB personnel from points located in the interior and exterior of five (5) building structures located immediately adjacent to the OBSWDC. The readings were taken from drains and the ambient air. All sampling locations monitored indicated zero percent combustible gas.

3.4 Phase 1 Gas Control and Recovery System

The Phase 1 Gas Control and Recovery System was authorized by the Town in compliance with 6 NYCRR Part 360, as a result of the lateral migration of LFG at the southeastern portion of the OBSWDC (for additional background information, see Section 1.4).

The initial venting system design consisted of four basic components: vents, header, blower and a test flare burner. Seven vents are located along the southeast section of the OBSWDC contiguous to the NCFTC. Six of these vents (LGV-1 through LGV-6) are located adjacent and parallel to the northern property boundary of the NCFTC. The seventh vent (TGV-1) is situated perpendicular to the line of the other vents and approximately 115 feet north of the NCFTC into the landfill. The general arrangement of this system is presented in Figure 9.

As indicated in the migration contour developed by H&S based on our monitoring results, the Phase I System appears to have prevented any major lateral migration of landfill gas onto NCFTC property, providing suitable protection for the NCFTC.

3.5 Phase 2 Gas Control System

As a result of off-site gas migration occurring across Winding Road along the eastern portion of the OBSWDC, the Town authorized the design and construction of the Phase 2 Gas Control System (for additional background information, see Section 1.4).

The Phase 2 System is an extension of the then existing Phase 1 System, located along the eastern edge of the OBSWDC, adjacent to Winding Road (Figure 9). Improvements were incorporated into the design of the Phase 2 System, based on the evaluation of the Phase I System operation, and included an improved condensate collection system, and a more rigid header support system.

The Phase 2 System consists of seven vents (LGV-8 through LGV-14) installed approximately 250 feet apart extending north along Winding Road and terminating near Recharge Basin No. 2. As part of the overall Phase 2 design, an additional vent (LGV-7) was installed about 300 feet south of LGV-5 to guard against the possible off-site migration of landfill gas onto the NCFTC from the Phase I landfill.

As indicated in the migration contours, the Phase 2 System has prevented the lateral migration of LFG at building structures along Winding Road, thereby providing suitable protection for businesses located in this area.

3.6 Phase 3 Gas Control System

Results of past site monitoring data obtained between 1982 and 1986 have indicated that off-site gas migration had extended beyond the OBSWDC property boundary at the northwestern portion of the site. As a result of this off-site LFG migration, the Town authorized the design and construction of the Phase 3 Gas Control System (for additional background information, see Section 1.4).

The Phase 3 System is a further extension of the then existing Phase 1 and Phase 2 Systems and consists of eight vents (LGV-15 through LGV-22) located at the toe of slope of the landfill along the northwestern and western portion of the site. This system incorporated the basic design elements and improvements developed in the previous system designs.

As indicated in the migration contour developed by H&S (Drawing No. 1), no off-site landfill gas migration was detected in the vicinity of Briden Construction. The Phase 3 System has prevented lateral migration of LFG into building structures located on Claremont Road, thereby providing suitable protection for businesses located in this area.

In addition to the cleaning/scouring of the LFG extraction wells, and the construction of a passive venting trench in this area of the site, the Town has constructed a series of landfill gas wells in this area which are tied directly to the existing gas extraction system. A condensation well was also added to the system to enhance the system's reliability. These measures should prevent any possibility of future off-site landfill gas migration in the vicinity of Briden Construction.

SECTION 4

CONCLUSIONS

4.1 Landfill Gas Migration

4.1.1 Site Survey

This year's annual zero migration line site survey data, obtained by H&S personnel collected during October, November and December, 2003 indicated that the zero percent combustible gas migration contour (Drawing No. 1) remained stable as compared to last year's survey.

The following conclusions are based on the site survey data obtained in this year's annual site survey:

- During this year's annual site monitoring, no combustible gas was found south of the Briden Construction Company property, which is located in the northwestern portion of the OBSWDC. The area previously contained pockets of combustible gas. The Town's remedial actions have prevented future gas migration. The additional landfill gas extraction wells (LGV-29, 30, 31, and 32) installed as an extension of Phase 3 Gas Control System which will continue to control any future gas migration.
- Both the southern (contiguous to the NCFTC) and eastern portions of the OBSWDC, which in the past experienced off-site migration of landfill gas, continue to show that the zero percent combustible gas contour is confined to areas located within the property boundaries of the OBSWDC. Again, these results are due to the successful operation of the Phase 1 Gas Control System, which continues to protect the NCFTC facilities from the lateral migration of landfill gas and the Phase 2 System, which has prevented landfill gas migration along Winding Road.
- All other sampling locations monitored in this year's annual site survey (specifically the northern and southwestern portions of the OBSWDC), continue to show that the zero percent combustible gas migration contour has remained stable and within the OBSWDC property boundaries.

4.2 Monitoring Program Conclusions

In conclusion, this year's monitoring programs at the OBSWDC support efforts previously completed by the Town indicating the abatement of landfill gas migration by the Town's landfill gas control systems. These monitoring programs (Annual Site Survey, Monthly Monitoring Survey, Nassau County Campground Monitoring, Adjacent Building Structures

Incinerator Complex Survey and Senior Citizen Housing Survey) were successfully conducted and completed, yielding valuable monitoring data used to aid in the early detection of LFG migration. The Monthly Monitoring Survey results has been reported separately.

If, in the future, landfill gas migration is detected and located, remedial measures, design modifications and/or expansion of existing landfill gas control and recovery systems can be developed to assure that no hazards to health and safety are present in the vicinity of the OBSWDC.

SECTION 5

RECOMMENDATIONS

5.1 General

Based on the conclusions set forth in this report, the consultants recommend that the Town implement the additions and/or modifications outlined in Sections 5.2 through 5.5 inclusive. These programs represent a continuation of programs developed in previous reports, specifically the Comprehensive Land Use and Operations Plan, and the 1986 Annual Report Summarizing the Status of Landfill Gas Monitoring Programs and the Establishment of the Zero Percent Gas Migration Limitation at the Old Bethpage Landfill (LKB, April 1987), and are an integral part of the Final Consent Decree and the regulations governing the operation of the OBSWDC.

In addition to regulatory compliance, these programs provide the Town with essential LFG data and should be continued through 2004. The consultants further recommend that the Town submit this report and the programs outlined in the following sections to NYSDEC, NYSOL, NCDH and NCFTC for their information and files.

5.2 Monitoring Programs

The monitoring programs outlined in this report consist of a modification of the monitoring schedule set forth in the 1993 Annual Report (LKB, May 1994) and we recommend that the Town implement this modified schedule for its 2004 monitoring. Refer to Appendix A for details of these programs.

5.3 Presence of Combustible Gas at the Nassau County Fireman's Training Center

The presence of combustible gas at the NCFTC prompted the Town to participate in several investigative and monitoring programs at the NCFTC as well as areas adjacent to the NCFTC and OBSWDC grounds. The programs included the installation and sampling of twelve (12) cluster wells located along the western property boundary of the NCFTC, sampling of monitoring probes located within the NCFTC and an investigation of the operation and performance of the Town's Gas Control System.

In 1992, the County and Town signed a betterment agreement wherein both parties will jointly share in upgrading the Town's facilities in the areas of joint concern. These improvements included the installation of a skid mounted blower, a water separator package and three (3) landfill gas vents in the vicinity of the common border of the NCFTC/OBSWDC.

As noted in Section 1.4 of this Report, the County and Town have concluded that, the gas control facilities completed in the spring of 1993 adequately control the potential for gas

migration along the common border of the NCFTC/OBSWDC. With the completion of additional work designed by the County, all subsurface landfill gas along the common border of the NCFTC/OBSWDC has been effectively controlled.

5.4 Gas Extraction System Condensate Discharge

The Town has been permitted by the Nassau County Department of Public Works to discharge condensate from the gas extraction system into the Nassau County Sewer System. This connection discharges condensate from the Phase 1 and 2 Gas Control Systems and some carryover of condensate mist from the Phase 3 Gas Control System through a bed of lime chips prior to discharge. Most condensate generated by the Phase 3 Gas Control System is discharged by gravity to leachate collection well 'A' and ultimately pumped to and treated at the Town's Leachate Treatment Plant, prior to discharge to the Nassau County Sewer System.

5.5 Inspection and Maintenance of Existing Extraction Wells

LKB has recommended that the Town periodically inspect all the existing extraction wells of the Town's Gas Control System for the presence of siltation and/or blockage. Siltation of the extraction wells or the presence of biological growth could lead to a loss of control efficiency around each well by blinding the well screens thereby allowing the possible off-site migration of landfill gases as was noted in this report (in the vicinity of Briden Construction). If siltation of the wells or biological growth is observed, the Town will take all necessary steps (air/water scouring) to remediate and restore wells to their original operating conditions. The Town has previously cleaned the landfill gas wells along the NCFTC/OBSWDC property line and also cleaned the wells along the Phase 3 gas extraction system.

APPENDIX A

RECOMMENDED MONITORING SCHEDULE FOR 2004

APPENDIX A

RECOMMENDED MONITORING SCHEDULE FOR 2004

<u>Sample Points</u>	<u>Frequency of Monitoring</u>	<u>Monitoring Performed by</u>
Monthly Monitoring Survey	Monthly	TOB personnel
Nassau County Fireman's Training Center Monitoring	Monthly	TOB personnel
Adjacent Building Structures and Incinerator Complex Survey	Monthly	TOB personnel
Senior Citizen Housing Survey	Monthly	TOB personnel
Supplemental Gas Monitoring Program	Quarterly	LKB personnel
Ambient VOC Air Sampling*	Quarterly	LKB personnel
Subsurface VOC Gas Sampling*	Quarterly	LKB personnel
Thermal Oxidizer Emissions Sampling for VOCs**	Annually	LKB personnel
Pressure Readings*	Quarterly	LKB personnel
Zero Migration Limits	Annually	H&S personnel
Nassau County Campground Survey	Annually	H&S personnel

NOTES:

- * This sampling will be performed on a quarterly basis unless permission is received by the NYSDOL to perform this monitoring on an annual basis.
- ** Upon completion of the initial year of quarterly sampling (February 1991), thermal oxidizer emissions sampling for VOCs was conducted annually. The oxidizer temperatures, however, are monitored on a continuous basis. Note that the Consent Decree requires monthly temperature monitoring.

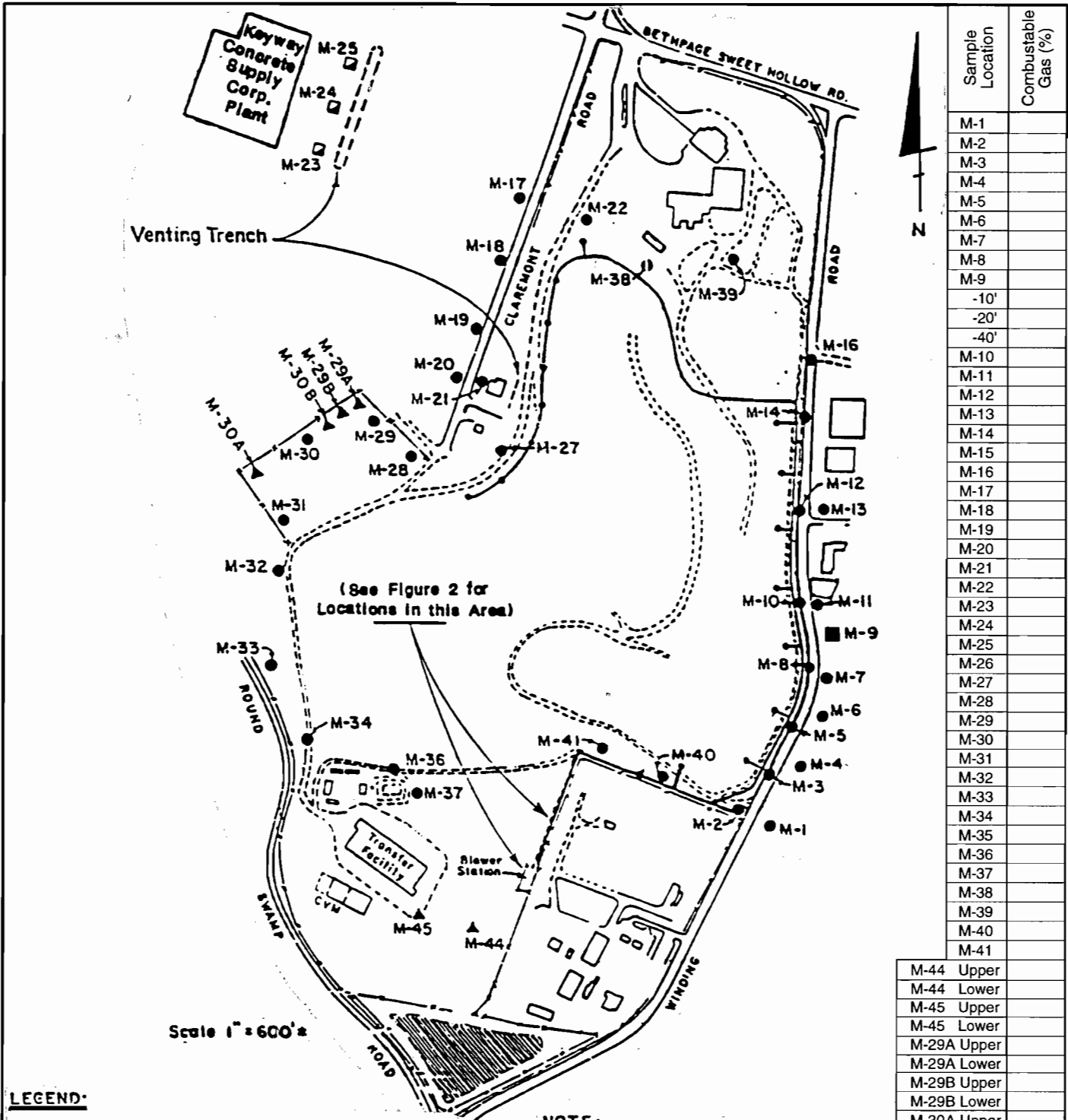
APPENDIX B

**IDENTIFICATION OF MONITORING BUILDINGS
ADJACENT TO OBSWDC**

APPENDIX B

IDENTIFICATION OF MONITORING BUILDINGS ADJACENT TO OBSWDC

<u>Identification Point</u>	<u>Identification Title</u>	<u>Building Location</u>
A	Park Riding Stables	499 Winding Road
B	Associated Rigging and Hauling Action Crane Company	459 Winding Road
C	Mr. Bar-B-Q, Inc. Keromate	455 Winding Road
D	P & P Recycling	311 Winding Road
E	G & S Investors	303 Winding Road
F	Aluminum Louver Company	310 Winding Road
G	New Dimensions	161 Bethpage-Sweethollow Road
I	Briden Construction	90 Battle Row
J	Key Way Concrete Supply Corp.	100 Battle Road
K	Scalehouse	OBSWDC
L	Incinerator No. 2	OBSWDC
M	Compactor/Baler Building	OBSWDC
N	Incinerator No. I	OBSWDC
P	Groundwater Treatment Facility	OBSWDC



Sample Location	Combustible Gas (%)
M-1	
M-2	
M-3	
M-4	
M-5	
M-6	
M-7	
M-8	
M-9	
-10'	
-20'	
-40'	
M-10	
M-11	
M-12	
M-13	
M-14	
M-15	
M-16	
M-17	
M-18	
M-19	
M-20	
M-21	
M-22	
M-23	
M-24	
M-25	
M-26	
M-27	
M-28	
M-29	
M-30	
M-31	
M-32	
M-33	
M-34	
M-35	
M-36	
M-37	
M-38	
M-39	
M-40	
M-41	
M-44 Upper	
M-44 Lower	
M-45 Upper	
M-45 Lower	
M-29A Upper	
M-29A Lower	
M-29B Upper	
M-29B Lower	
M-30A Upper	
M-30A Lower	
M-30B Upper	
M-30B Lower	

LEGEND:

- Denotes Single Point Sampling Probe, Depth 30'
- Denotes Cluster Well. Depth 10', 20', 30' and 40'
- ▲ Denotes Cluster Well, Varying Depth.
- Denotes Single Point Sampling Probe, Depth 8'
- NS Denotes that No Sample was Obtained Due to Water in Sampling Location.

NOTE:

Cluster well is color coded as follows:
 10' - Blue
 20' - Green
 30' - Red
 40' - Yellow

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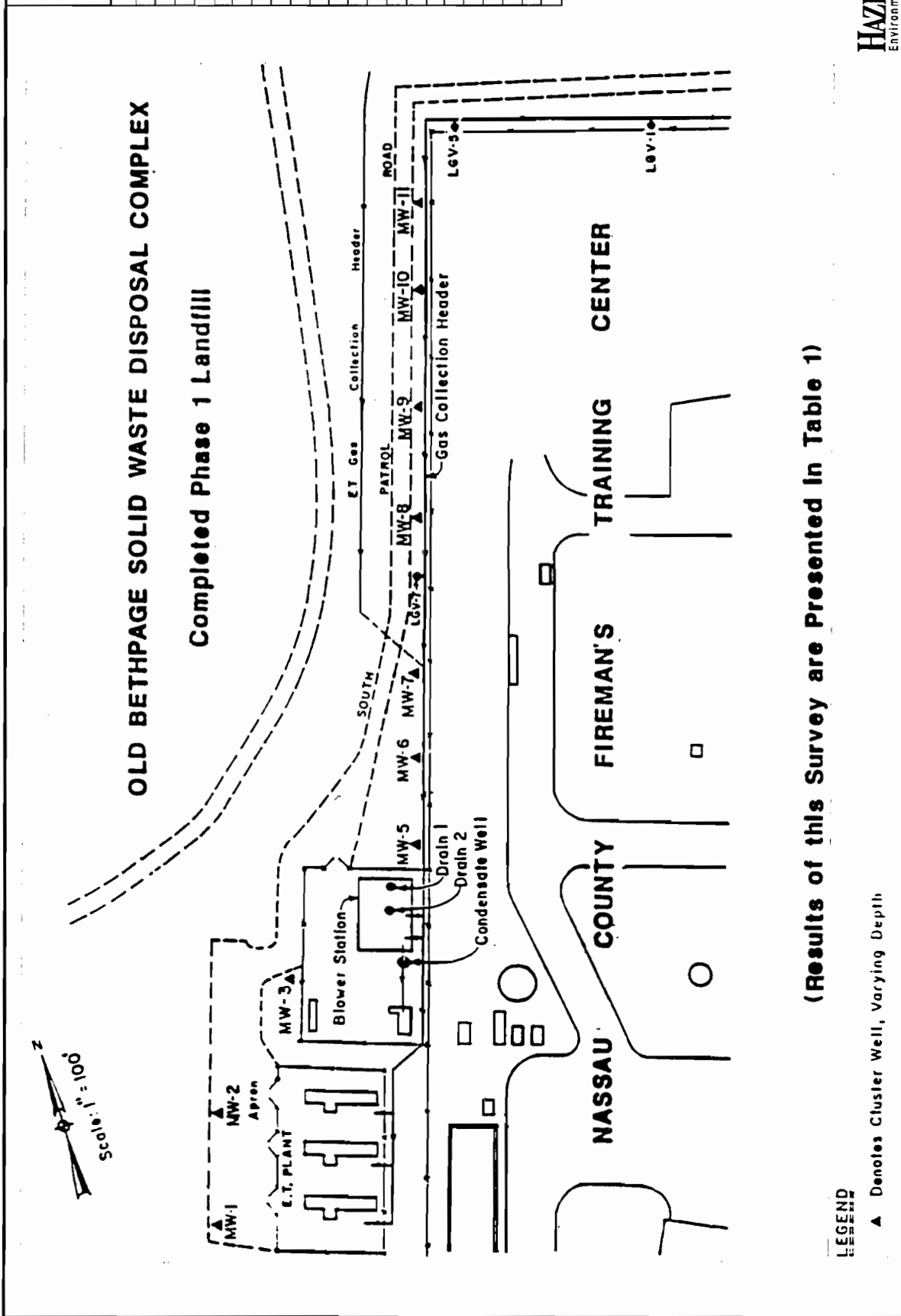
TOWN OF OYSTER BAY
DEPARTMENT OF PUBLIC WORKS

PERIMETER MONITORING POINTS AT OBSWDC

FIGURE 1

DATE: 11/14/00 BY: J. W. HAZEN

Sample Location	Combustible Gas (%)
MW-1 Upper	
MW-1 Lower	
MW-2 Upper	
MW-2 Lower	
MW-3 Upper	
MW-3 Lower	
MW-5 Upper	
MW-5 Lower	
MW-6 Upper	
MW-6 Lower	
MW-7 Upper	
MW-7 Lower	
MW-8 Upper	
MW-8 Lower	
MW-9 Upper	
MW-9 Lower	
MW-10 Upper	
MW-10 Lower	
MW-11 Upper	
MW-11 Lower	
Drain 1	
Drain 2	
Condensate Well	



(Results of this Survey are Presented in Table 1)

LEGEND

▲ Denotes Cluster Well, Varying Depth

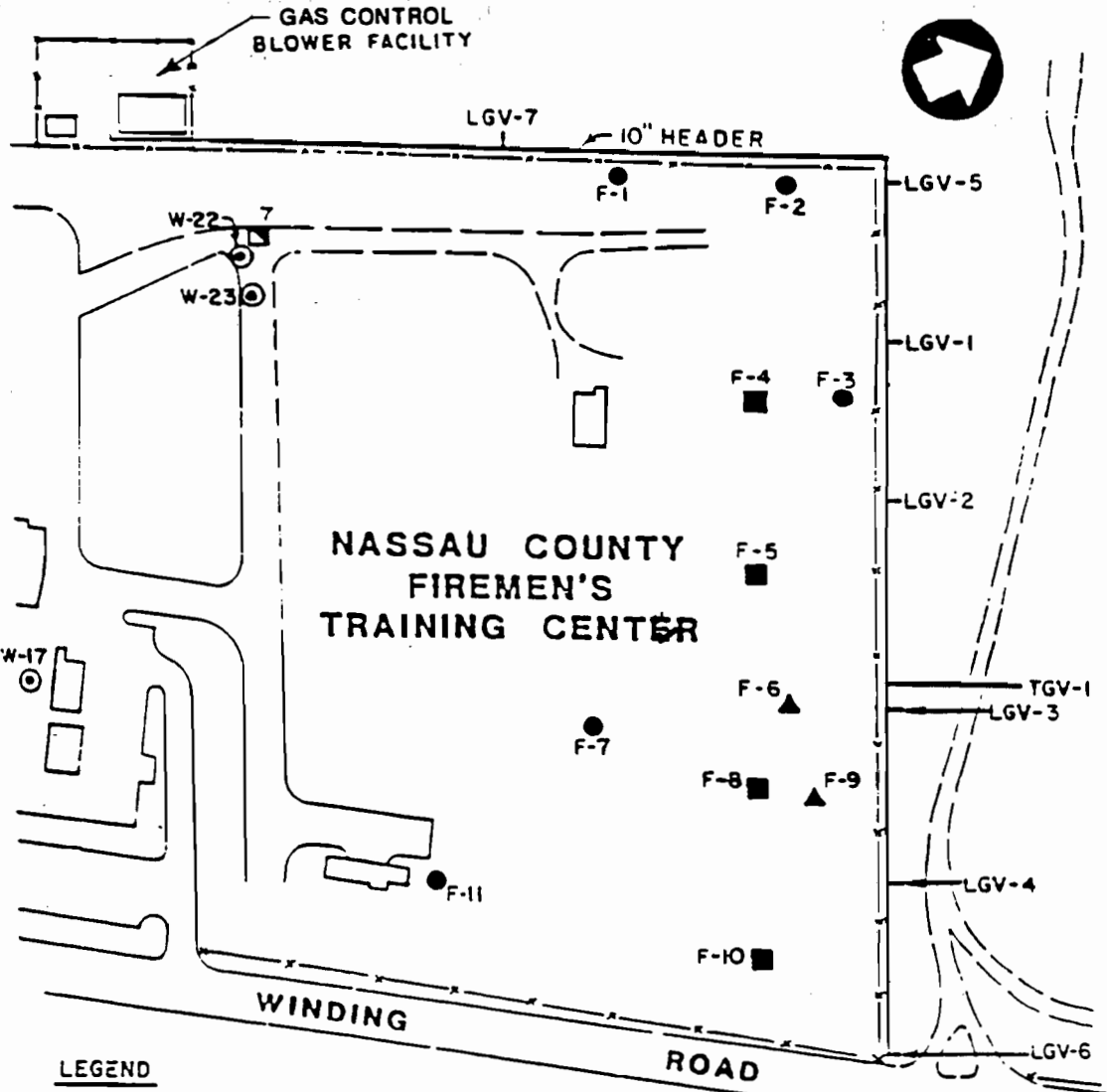
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PERIMETER MONITORING
POINTS AT OBSWDC

FIGURE 2



Sample Location	Combustible Gas (%)
F-1	
F-2	
F-3	
F-4	
At 10'	
20'	
30'	
40'	
F-5	
10'	
20'	
30'	
40'	
F-6	
10'	
20'	
F-7	
F-8	
10'	
20'	
30'	
40'	
F-9	
10'	
20'	
30'	
40'	
F-10	
10'	
20'	
30'	
40'	
F-11	
W-17	
W-22	
W-23	
7	

LEGEND

- ▲ DENOTES PRESSURE PROBES, DEPTH 10' & 20'
- DENOTES CLUSTER WELLS, DEPTH 10', 20', 30' & 40'
- DENOTES SINGLE POINT SAMPLING PROBES, DEPTH 30"
- DENOTES PHASE I GAS SYSTEM

- NS DENOTES THAT NO SAMPLE WAS OBTAINED DUE TO WATER IN SAMPLING LOCATION
- ⊙ DENOTES NASSAU COUNTY MONITORING WELL
- ⊠ DENOTES NASSAU COUNTY MONITORING DRYWELL

NOTES

- 1.) CLUSTER WELLS ARE COLOR CODED AS FOLLOWS
10'-BLUE, 20'-GREEN, 30'-RED, 40'-YELLOW
- 2.) PRESSURE PROBES ARE COLOR CODED AS FOLLOWS
10'-BLUE, 20'-GREEN

Scale: 1" = 150'

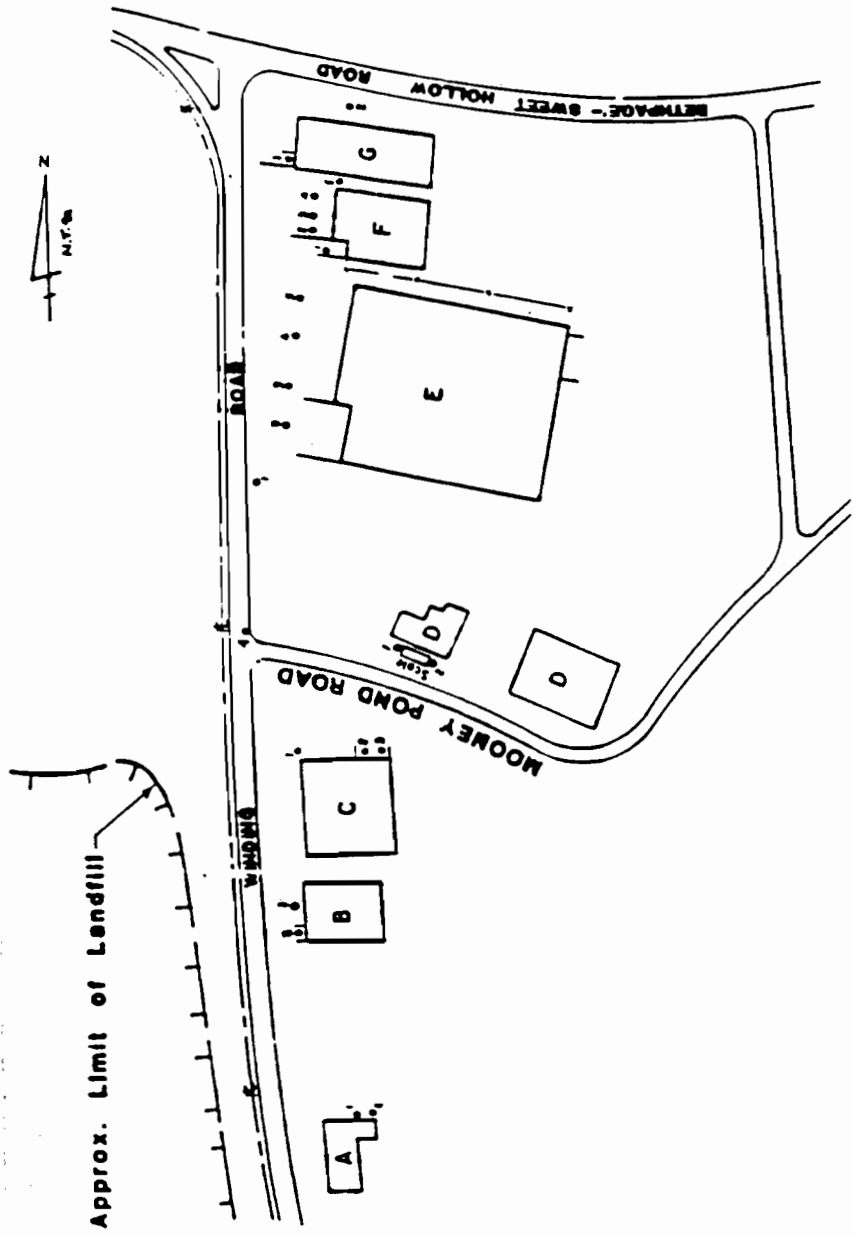
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**MONITORING POINTS AT
THE FIREMANS TRAINING CENTER**

FIGURE 3



NOTE:
 NS-Denotes that no sample was obtained due to water in sampling location.

Sample Location	Sample Description	Combustible Gas (%)
(A) 499 Winding Rd.		
1	Hole	
2	Hole	
(B) 459 Winding Rd.		
1	Drain	
2	Dock	
(C) 445 Winding Rd.		
1	Drain	
2	Drain	
3	Drain	
4	Drain	
(D) 311 Winding Rd.		
1	Scale	
2	Scale	
(E) 303 Winding Rd.		
1	Drain	
2	Drain	
3	Drain	
4	Drain	
5	Drain	
(F) 310 Winding Rd.		
1	Drain	
2	Drain	
3	Drain	
4	Drain	
5	Drain	
(G) 161 Bethpage Sweet Hollow Rd.		
1	Drain	
2	Drain	

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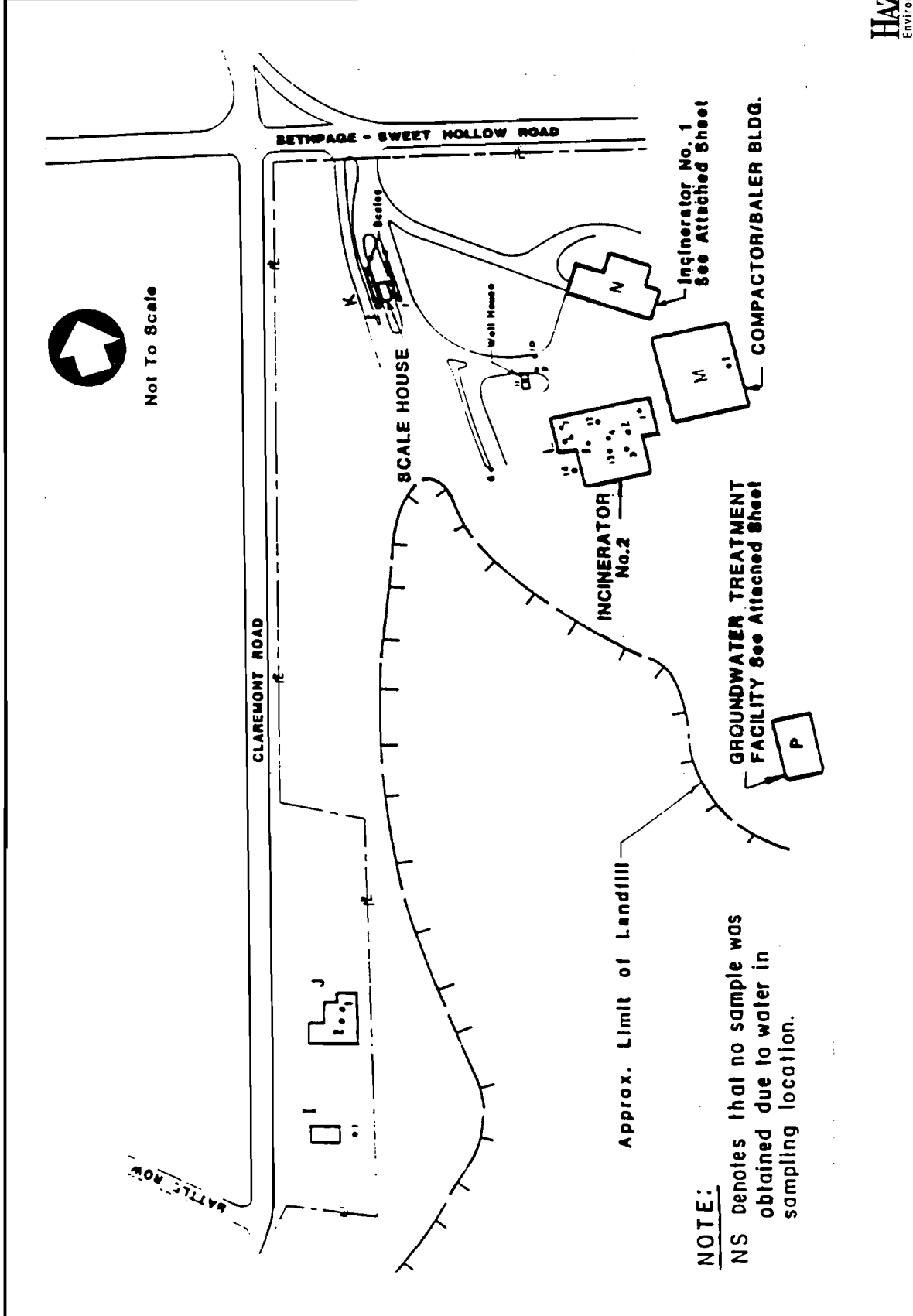


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ADJACENT BUILDING STRUCTURES
 AND INCINERATOR COMPLEX SURVEY

FIGURE 4

Sample Location	Sample Description	(%) Combustible Gas
(I) 90 Battle R/W		
1	Drain	
(J) 100 Battle R/W		
1	Drain	
2	Hole	
(K) Scale House		
1	Scale	
2	Scale	
(L) Incinerator Plant No. 2		
1	Drain	
2	Drain	
3	Drain	
4	Drain	
5	Hole	
6	Drain	
7	Drain	
8	Drain	
9	Drain	
10	Drain	
11	Pit	
12	Grate	
13	Drain	
14	Drain	
(M) Compactor/Baler Building		
1	Drain	



NOTE:
 NS denotes that no sample was obtained due to water in sampling location.

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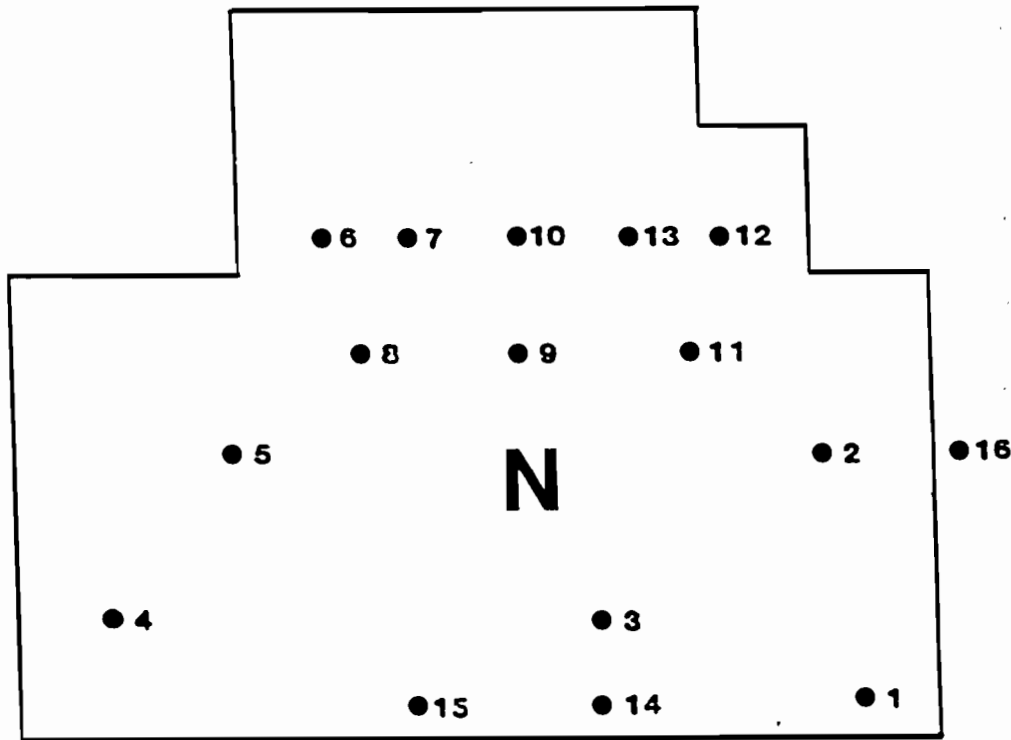


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 DEPARTMENT OF PUBLIC WORKS

ADJACENT BUILDING STRUCTURES
 AND INCINERATOR COMPLEX SURVEY

FIGURE 5

Sample Location	Sample Description	Combustable Gas (%)
(N) Incinerator Plant No. 1		
1	Drain	
2	Drain	
3	Hole	
4	Drain	
5	Drain	
6	Drain	
7	Hole	
8	Drain	
9	Drain	
10	Drain	
11	Hole	
12	Drain	
13	Drain	
14	Hole	
15	Hole	
16	M.H.	



ASH FLOOR

INCINERATOR No. 1

(Results of this Survey are presented in Table 3)

NOTE:

NS Denotes that no sample was obtained due to water in sampling location.

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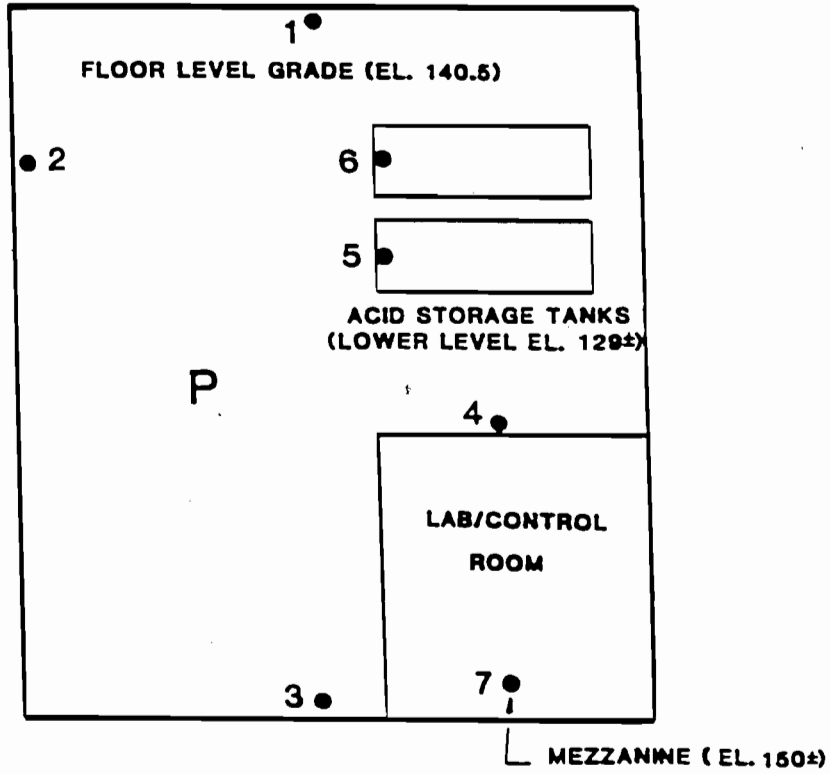
**ADJACENT BUILDING STRUCTURES
AND INCINERATOR COMPLEX SURVEY**

FIGURE 6

Sample Location	Sample Description	% Lower Explosive Limit (L.E.L.)
1	Sensor	
2	Sensor	
3	Sensor	
4	Sensor	
5	Sensor	
6	Sensor	
7	Sensor	



Not To Scale



GROUND TREATMENT FACILITY

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ADJACENT BUILDING STRUCTURES
AND INCINERATOR COMPLEX SURVEY

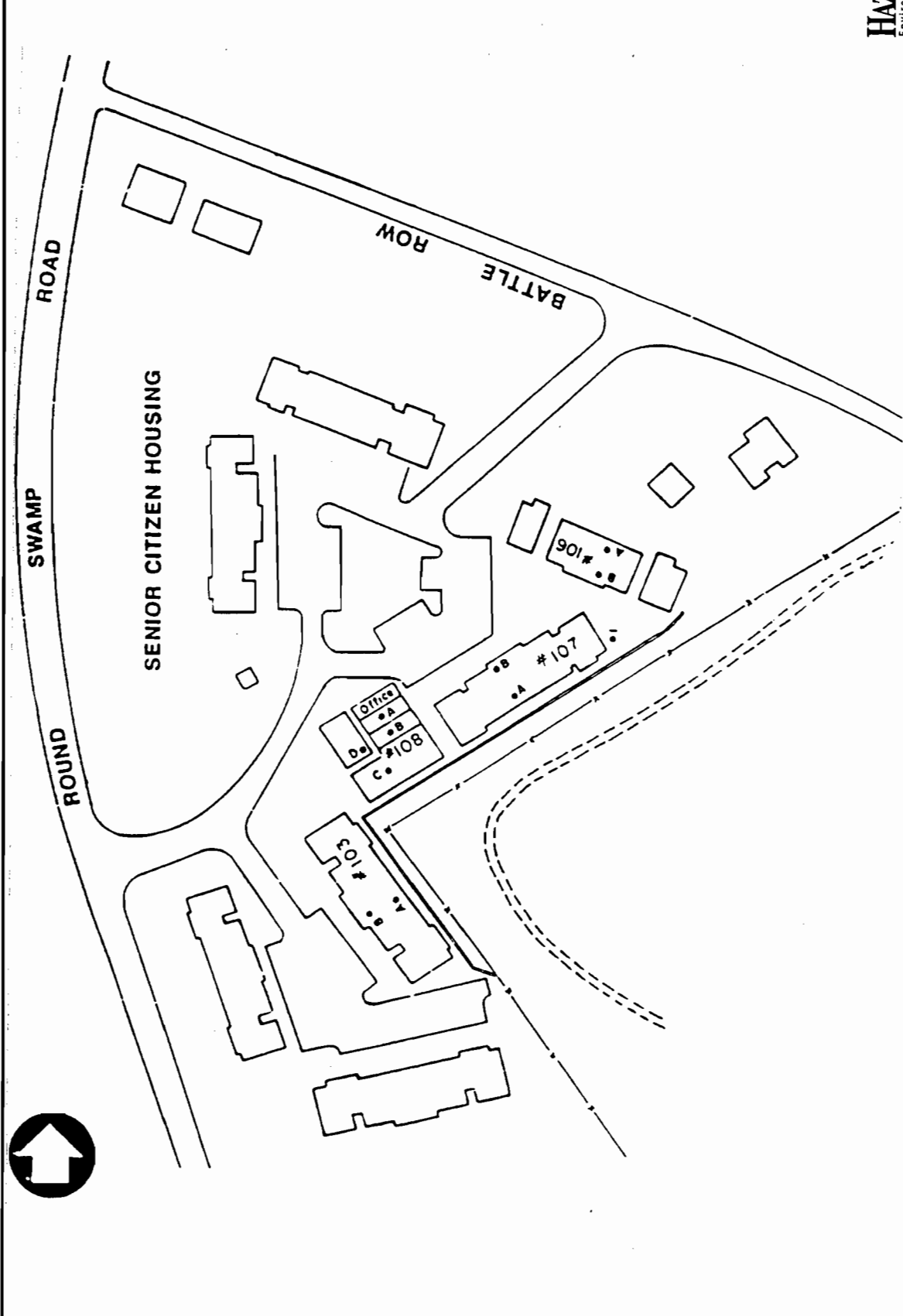
FIGURE 7

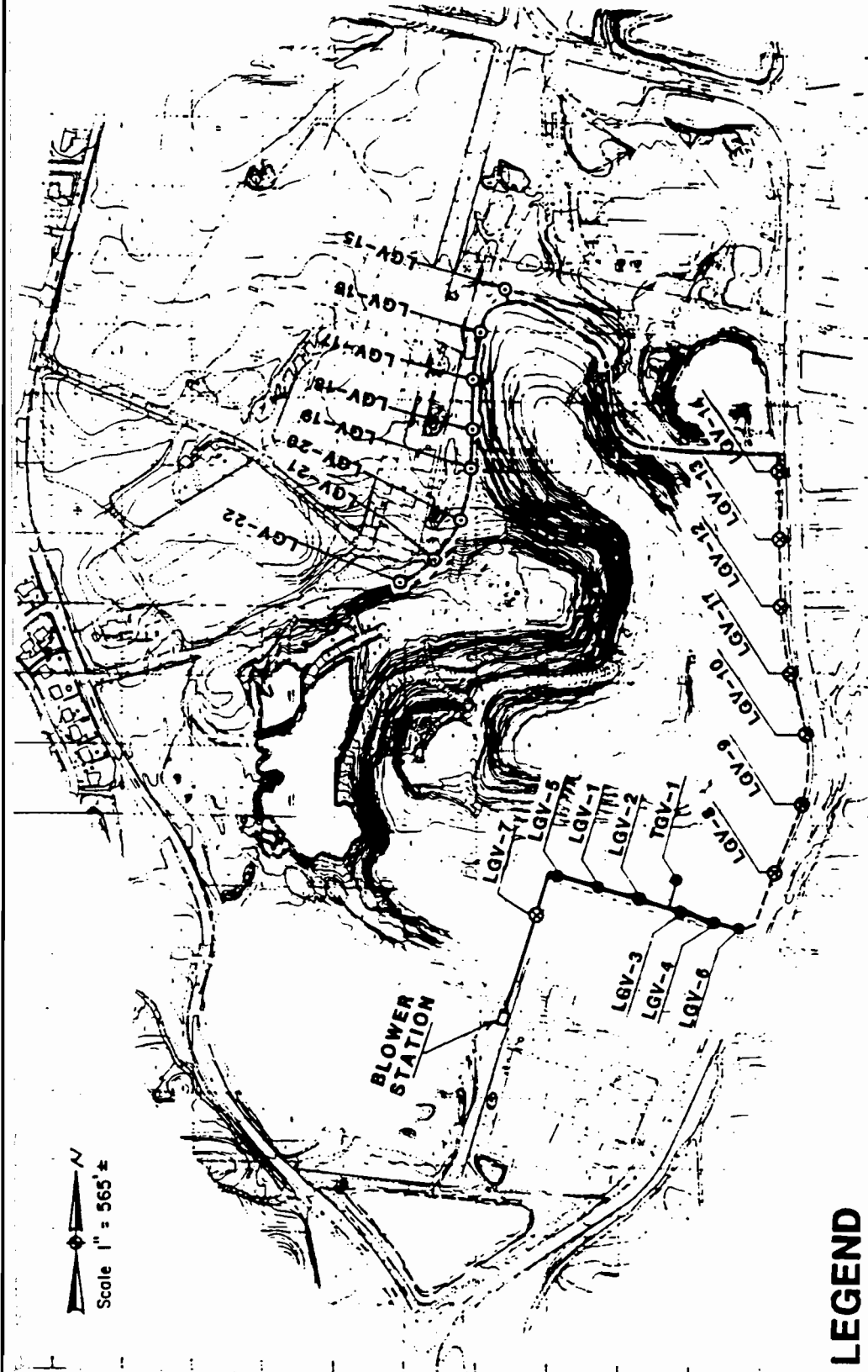
**TOWN OF OYSTER BAY
SENIOR CITIZEN HOUSING COMBUSTIBLE GAS SURVEY**

**TOWN OF OYSTER BAY
DEPARTMENT OF PUBLIC WORKS**

FIGURE 8

Sample Location	Sample Description	(%) Combustible Gas
103A	Drain	
103B	Drain	
106A	Drain	
106B	Drain	
107A	Drain	
107B	Drain	
108A	Drain	
108B	Drain	
108C	Ambient	
108D	Drain	
1	Drain	





LEGEND

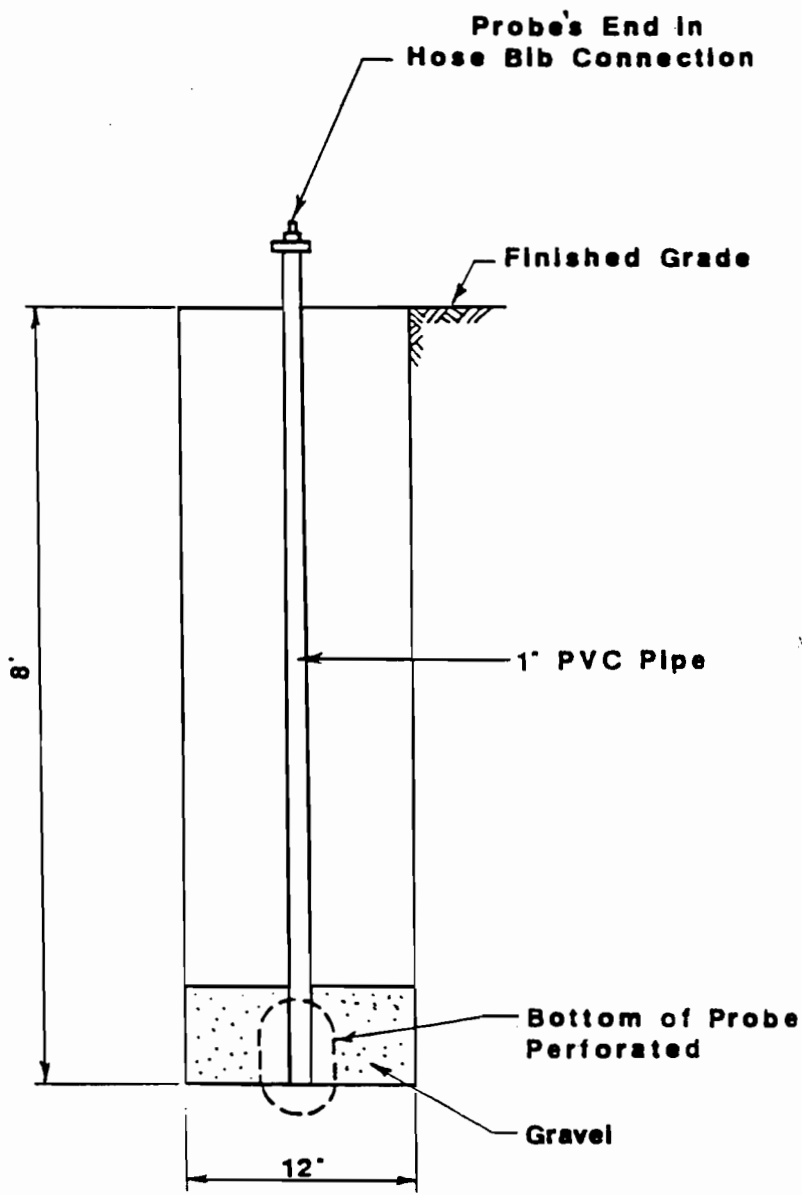
- Existing Phase 1 System
- - -●- - - Existing Phase 2 System
- - -○- - - Existing Phase 3 System



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LOCATION OF PHASE 1, 2 AND 3
GAS CONTROL AND RECOVERY SYSTEMS

FIGURE 9



Not to Scale
All Dimensions Approximate

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SINGLE POINT SAMPLING PROBE

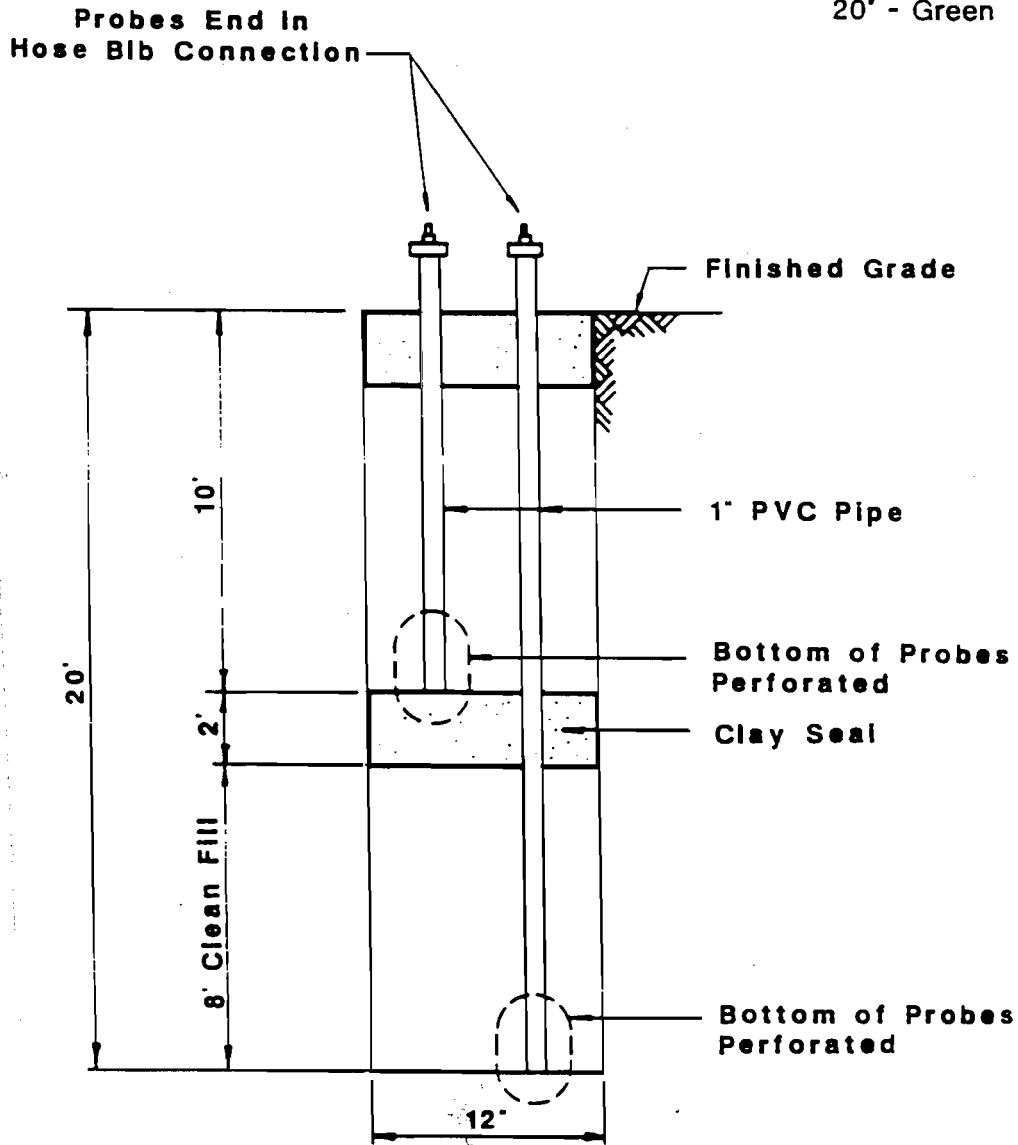
FIGURE 10

NOTE:

Each probe shall be color coded with waterproof tape as follows:

10' - Blue

20' - Green



Not to Scale
All Dimensions Approximate

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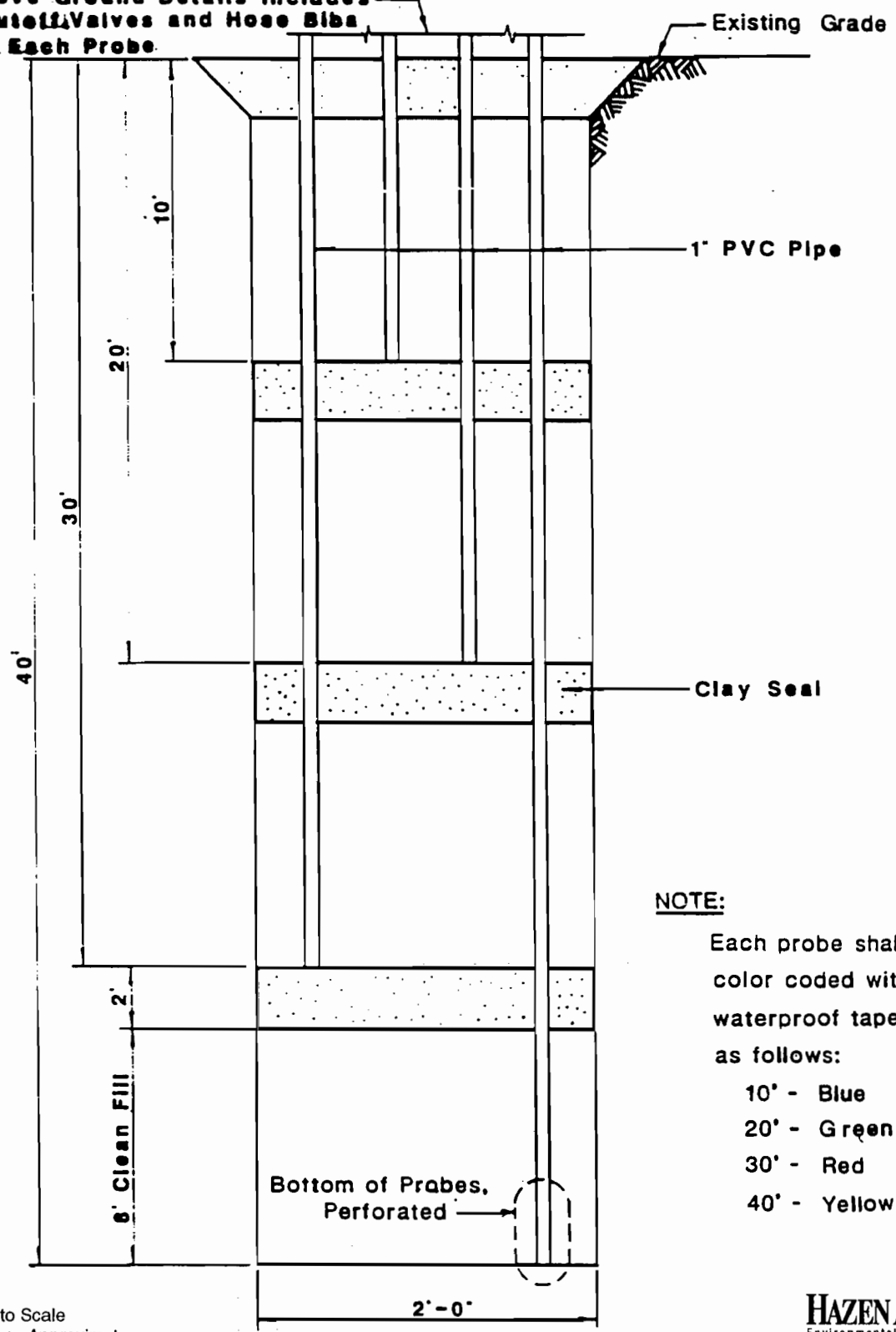


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PRESSURE PROBE

FIGURE 11

Above Ground Details Includes
Shutoff Valves and Hose Bibs
on Each Probe.



NOTE:
Each probe shall be
color coded with
waterproof tape
as follows:
10' - Blue
20' - Green
30' - Red
40' - Yellow

Not to Scale
All Dimensions Approximate

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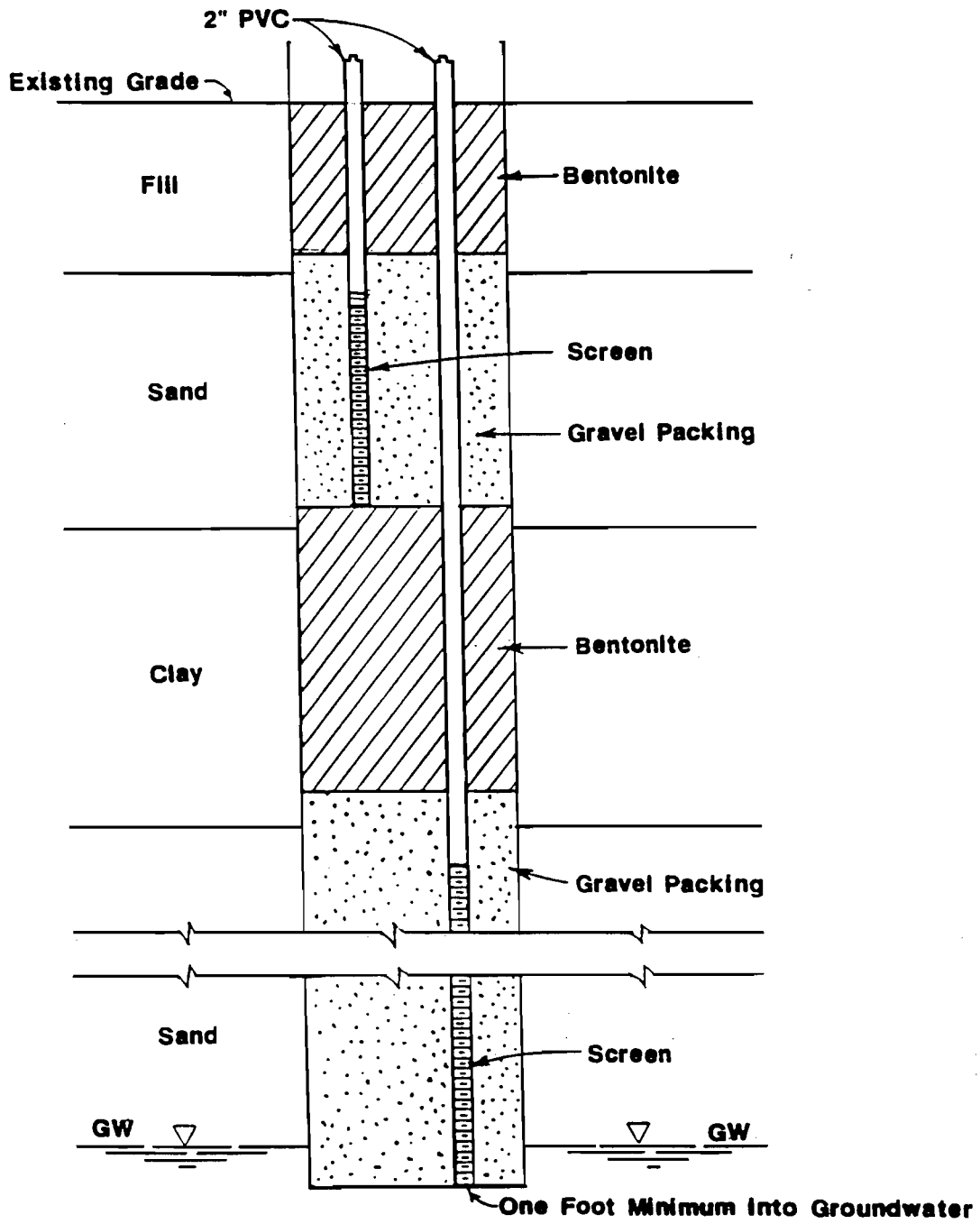


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CLUSTER WELL

FIGURE 12

648601001 SE-T-MP-LJUH 4-1996



Not to Scale
All Dimensions Approximate

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VARYING DEPTH CLUSTER WELL

FIGURE 13

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