P-358

DRAFT ENVIRONMENTAL IMPACT STATEMENT

REALCO PROJECT SITE

PROPOSED SHOPPING CENTER DEVELOPMENT

PROJECT LOCATION:
Jerusalem Avenue in Uniondale
Town of Hempstead
Nassau County

LEAD AGENCY:
Town of Hempstead
Department of Conservation and Waterways
Lido Boulevard
P.O. Box J
Point Lookout, New York 11569

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DATE OF PREPARATION: December, 1988

DATE OF ACCEPTANCE: ________________________

COMMENT DEADLINE DATE: ________________________

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SECTION 1

EXECUTIVE SUMMARY

1.1 Proposed Action

A 128,814 square foot shopping complex has been proposed to replace an abandoned bowling alley and driving range on a 10.7 acre site located off of Jerusalem Avenue in Uniondale, Nassau County. The shopping center will offer a supermarket, small restaurant, and retail stores to the well developed community.

1.2 Environmental Impacts

In the course of preparing this report, several potential environmental impacts were examined. These impacts include: increased water usage, affecting groundwater supplies; visual, noise and erosion impacts on the neighboring wetland; high methane generation in the subsurface; increased traffic volume; air pollution impact; and an aesthetic impact on the adjacent residential community. This development will have minor impacts on the wetlands, traffic volume, and residential community.

SECTION 2

DESCRIPTION OF THE PROPOSED ACTION

2.1 Project Purpose and Need

The site has been occupied by industrial and commercial facilities for the past 58 years. In 1930 a cement manufacturing plant began operations. The company used the natural sand and gravel in the northern portion of the site as a resource for the cement operations. According to 1960 aerial photos, the resulting pit was filled with water, creating a small pond. In 1962 the site was divided; the cement manufacturing plant occupied the southeast portion of the site, while a bowling alley (Plander Lanes) was constructed on the southwest portion. The bowling alley was later expanded in 1970. Records show that the pit was filled with construction debris in 1973, followed by the installation of Sunrise Golf driving range on the eastern portion of the site in 1975. Currently the site is closed to the public, with the bowling alley and driving range abandoned in-place.

The proposed project will meet the public's needs by developing: commercial stores; aesthetic buildings; and overall integration of the area's landuse. The need is an implied need because it fits in with the landuse plan zoning.

The objective of the project sponsor is to create a small community hub, increase the tax base and remove the presently abandoned buildings. The project will also supplement the area's employment opportunities; approximately 200 people will be employed during construction and 188 people following the project's completion.

2.2 Site Location

The project site is located in the southeast portion of the unincorporated community of Uniondale, within the Town of Hempstead, Nassau County, New York. Figure 2.2.1 shows that the site is designated as lots 263, 265 and 266, Section 50, Block G on the Nassau County Land and Tax Map. As shown on Figure 2.2.2, the project is located just north of Jerusalem Avenue (Nassau County Route 105), West of the Meadowbrook Parkway and southeast of the Winthrop Manor residential community (Winthrop Drive and Mitchell Street).

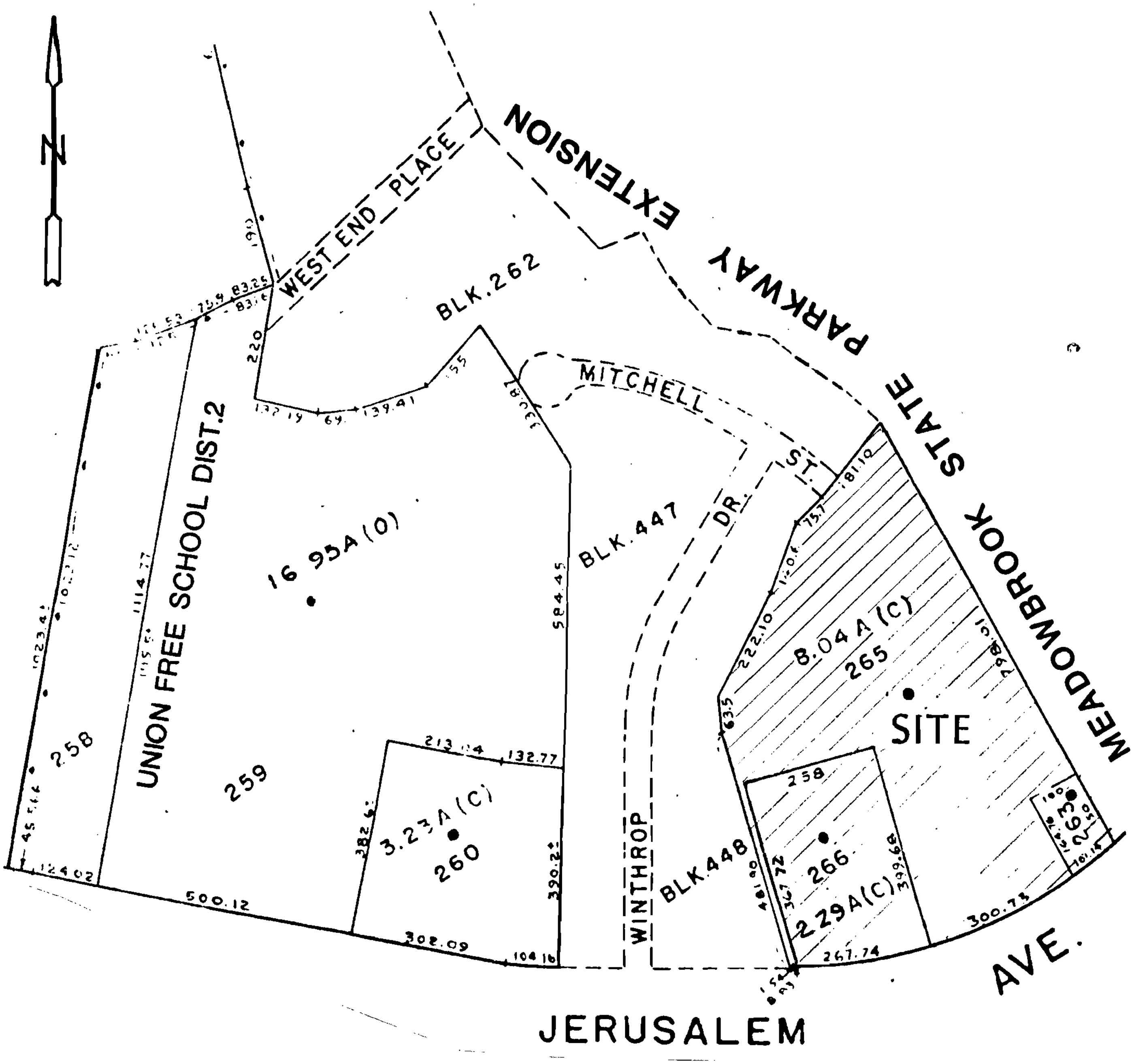
The site is currently accessible from two inlets on Jerusalem Avenue; the proposed project will utilize the same inlets for the proposed parking lots and one inlet for deliveries.

The dominant zoning in a quarter mile radius of the site is Residential B-2 story; the current zoning classification for the project site is Business. There will be no change of zone for this project.

2.3 Design and Layout

The total area of the site is 10.66 acres. The proposed project will include approximately 10.3 acres of impervious surface area (roofs, roads, parking lots, etc.) and approximately 0.4 acres of grass, trees and plants. In order to accomplish the proposed project, approximately 5 acres of trees, shrubs and groundcover will be removed; however, no natural material such as rock and earth will be removed.

The proposed project will include approximately 128,814 square feet of building area; 60,353 square feet for the proposed one story supermarket and 68,461 square feet for the proposed one story retail



SCALE: 1"=300'

SOURCE: NASSAU COUNTY LAND & TAX MAP

FIGURE 2.2.1-LAND MAP AND TAX MAP FOR SECTION 50 BLOCK G

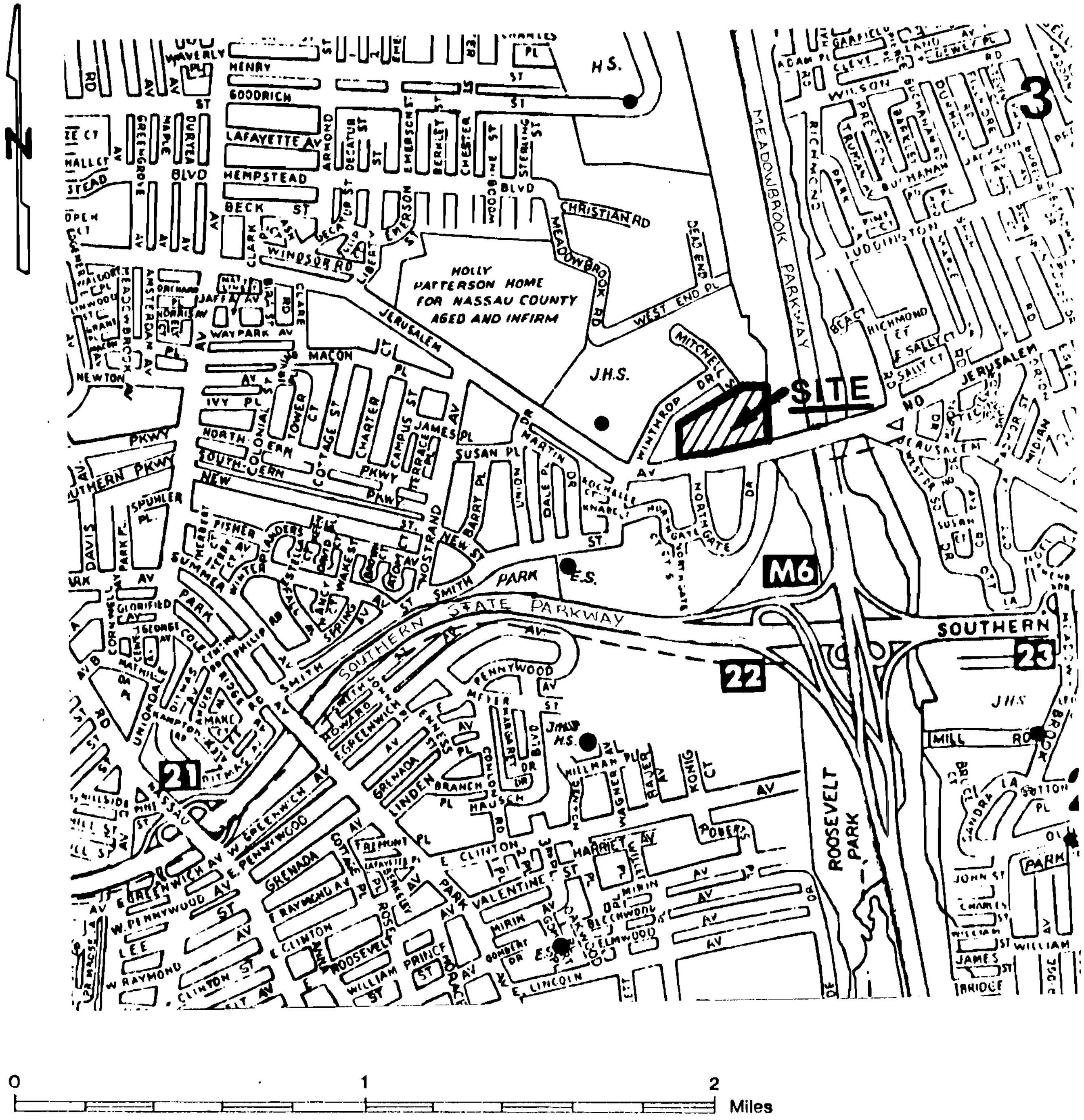


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FIGURE 2.2.2-SITE LOCATION

stores. One story will be maintained in all areas of this development in order to "fit" in and not be overbearing on the community. The development also includes the placement of a 9,000 square foot building at the southeast corner of the site (Figure 2.3.1). Therefore, the total gross leasable area (GLA) is 137,814 square feet. As can be seen from Figure 2.3.1, the buildings are all attached with the exception of "Building D."

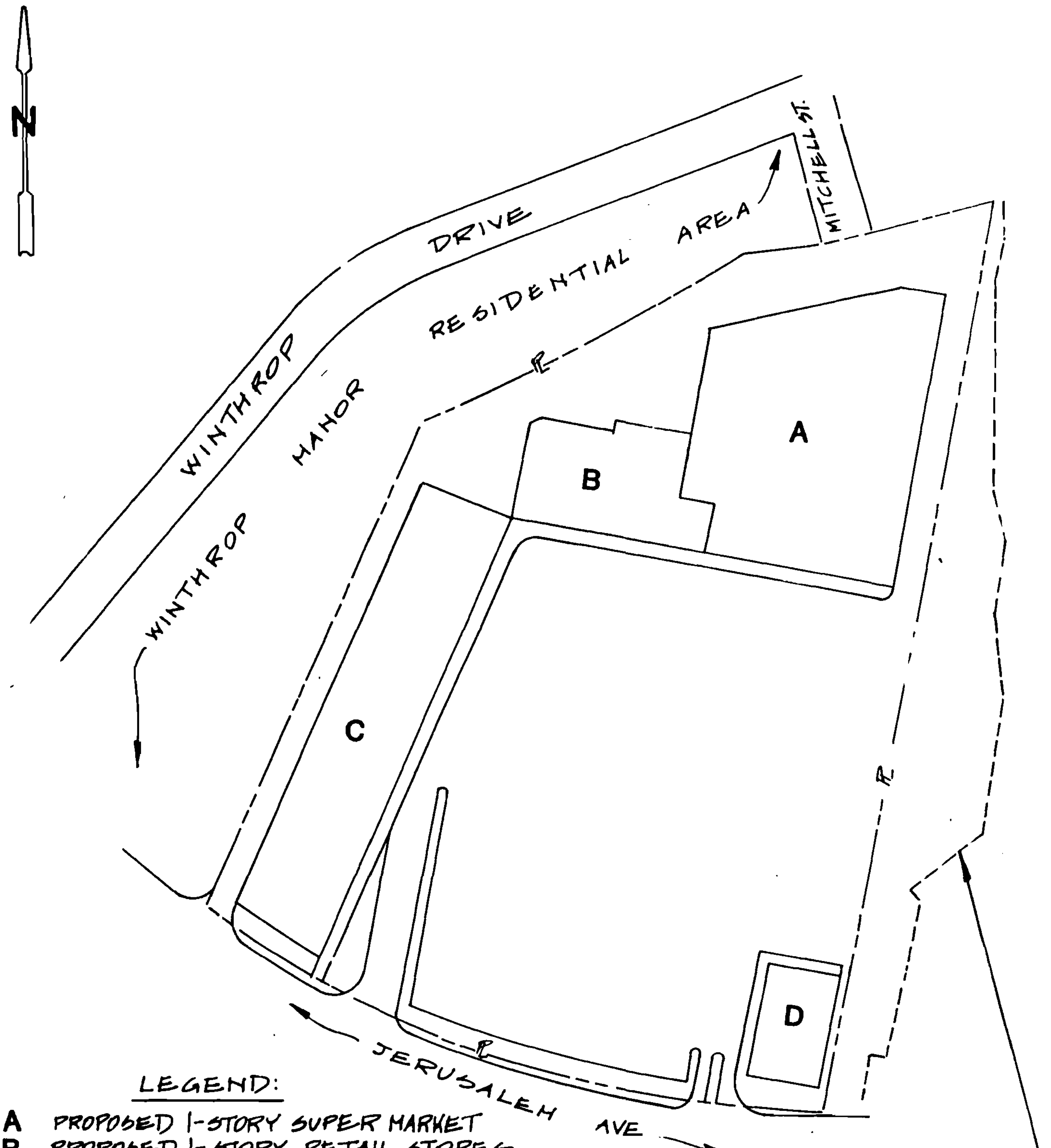
The proposed parking area available (including access roads, inlets and outlets) is approximately 7.1 acres. The total number of spaces required, based on total building floor area is 689 spaces. The proposed plan provides 691 spaces including 10 handicap spaces. The parking lot layout can be seen on Figure 2.3.2

2.4 Construction and Operation

The construction of the proposed project will begin once a building permit has been obtained. With the use of good weather in the summer and fall months, the majority of the development will be completed in seven months. Final site construction, including the interior tenant work, will require approximately five months. The total duration of construction will be approximately one year.

The major stages of construction will include: site clearing; foundations; structural steel; masonary; site drainage; mechanical; electrical; roofing; completion of the site work including paving, curbs and sidewalks; major tenant work (proposed supermarket); and satellite tenant work (proposed retail stores).

Final construction is shown in Figure 2.3.3; a rendering of the project.



LEGEND:

A PROPOSED 1-STORY SUPER MARKET
B PROPOSED 1-STORY RETAIL STORES
C PROPOSED 1-STORY RETAIL STORES
D PROPOSED 1-STORY RETAIL STORES

APPROX. SCALE: 1" = 145'

LIMIT OF WETLANDS AS PER N.Y.S.D.E.C. & TOWN OF HEMPSTEAD DEPARTMENT OF CONSERVATION & WATERWAYS

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FIGURE 2.3.1-PROPOSED SITE PLAN

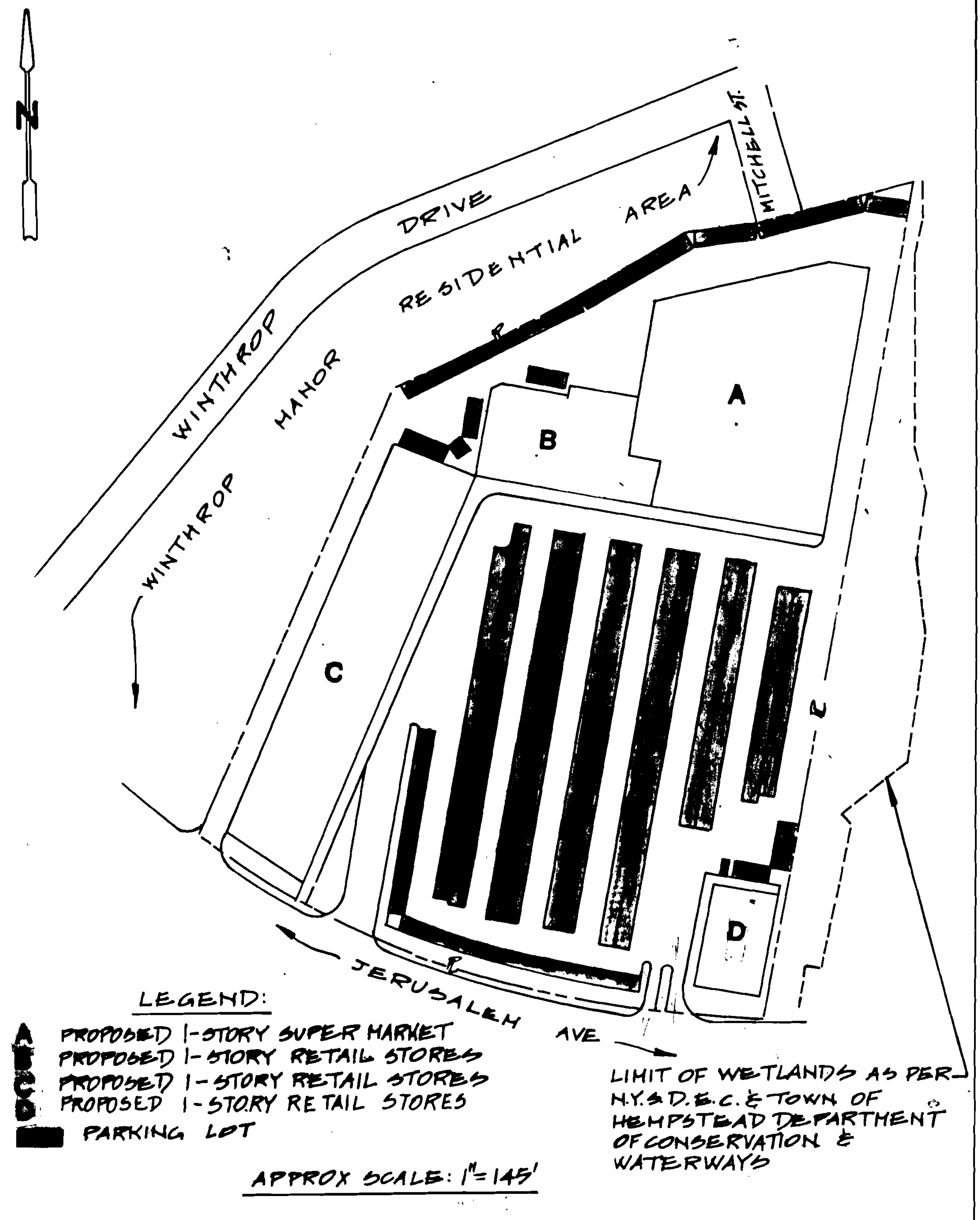

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FIGURE 2.3.2-PARKING LOT LAYOUT

FIGURE 2.3.3-RENDERING OF PROPOSED PROJECT

SECTION 3

ENVIRONMENTAL SETTING

The purpose of this section is to describe the existing environmental setting for the proposed site and the neighboring areas.

Section 3 has been divided into the two parts: Natural Resources and Human Resources. Part 1, Natural Resources, will consist of four chapters including: Geology (3.1), Water Resources (3.2), Air Resources (3.3) and Terrestrial and Aquatic Ecology (3.4).

Part 2 of Section 3 explores the existing Human Resources. The topics in this chapter will include: Transportation (3.5.1), Land Use and Zoning (3.5.2), Community Services (3.5.3), Cultural Resources (3.5.4) and Demography (3.5.5).

3.1 Geology

The existing geological conditions at the proposed site will be described according to its subsurface geology, surface geology/soils, soil quality and soil gas, and topography/drainage.

3.1.1. Subsurface Geology

Geologically, Long Island is composed of consolidated Lower Paleozoic and/or Precambrian Bedrock overlain by loose unconsolidated sediments. These sediments were deposited on the bedrock surface in a southerly direction during the Cretaceous period and from Pleistocene glaciation. There is approximately 1150 feet of these unconsolidated sediment deposits over the bedrock layer beneath the proposed site.

The Cretaceous sediments are composed of marine and terrestrial coastal-plain deposits and are divided into two formations called the Raritan formation and the Magothy formation. The older formation, the Raritan, is divided into two members, the Lloyd sand member (Lloyd Aquifer) and an upper clay member (Raritan Clay). The younger Magothy formation lies above the Raritan and consists of alternating fine sands, clays, silts and some coarse beds of sand and gravel (Suter, 1949).

Over the Cretaceous deposits are sediments deposited by Pleistocene glaciation. Glacial deposits of late Pleistocene age and local deposits of Holocene age form the Upper Glacial Aquifer. These undifferentiated deposits overlie the older deposits and abut them in buried valleys. The upper surface of the glacial deposits form the present land surface.

The following is an analysis of the above mentioned geology in the vicinity of our site.

- Bedrock

  The bedrock throughout the area is composed of igneous and metamorphic rocks ranging from Pre-Cambrian to Paleozoic times. It consists of mainly gneiss and schist. Over this bedrock, the later Cretaceous sediments were deposited unconformably. Depth to the bedrock beneath the site is approximately 1150 feet.

- Lloyd Sand Member (Lloyd Aquifer)

  The Lloyd Sand member is part of the Raritan formation and lies nonconformably above the bedrock. It is Cretaceous sediment composed of discontinuous layers of fine to coarse sand and gravel, sandy clay, silt and clay. The sand and gravel beds are composed of yellow, white and gray quartz and contain minor amounts of chert and other stable minerals. White, gray and buff silt and clay lenses are common. Thin lenses and scattered particles of lignite also occur. The Lloyd Sand member lies approximately 880 feet below the site and is approximately 270 feet thick beneath the site. It is moderately permeable and contains the Lloyd Aquifer. The Lloyd Aquifer is the equivalent of the Lloyd Sand member of the Raritan formation of Late Cretaceous age.

- Raritan Clay Member (Raritan Clay)

  The Raritan Clay member is the other member of the Raritan formation and lies directly over the Lloyd Sand member and is in turn overlain by the Magothy. It is also Cretaceous sediment and consists mainly of clay and silt with interbedded layers of sand. The clay may contain concentrations of pyrite and lenses of lignite. The Raritan Clay is relatively impermeable and, therefore, forms an aquiclude (barrier) between the Lloyd Sand the overlying Magothy formation. The Clay is located about 550 feet below the site and is approximately 330 feet thick.

- Magothy Formation (Magothy Aquifer)

  The Magothy Formation is the youngest of the late Cretaceous deposits found beneath the site. The Magothy Aquifer is composed of Upper Cretaceous sediments that overlie the Raritan Clay. It is in turn overlain by deposits of Pleistocene Age that form the Upper Glacial Aquifer.

  The Magothy Aquifer consists mainly of lenticular and discontinuous beds of very fine to medium sand, commonly clayey or containing thin clay lenses, that are interbedded with clay and sandy clay, silt and some sand and gravel. Beds of coarse sand and gravel commonly occur in the lower 100-150 feet of the aquifer. The sediments in the aquifer seem to grade upward from coarser grained at the base to finer grained at the top. The greater proportion of the clay and sandy clay occurs in the upper half of the aquifer. Thick beds of clay occur locally at the top of the aquifer and seem to be distributed irregularly throughout the area (Kilburn, 1979).

It is possible that the uppermost part of the Magothy contains deposits of Pleistocene Age or, conversely, that the lower part of the Upper Glacial Aquifer contains Cretaceous deposits because the boundary between the Cretaceous and Pleistocene deposits in some areas is indistinguishable. In the vicinity of the site it is difficult to differentiate between the upper glacial aquifer and the upper part of the Magothy Aquifer because Pleistocene deposits rest upon Cretaceous sediments of similar composition and show no significant lithologic differences that drillers would be likely to note (Kilburn, U.S.G.S., 1979). Thus, it is estimated that the top of the Magothy is located approximately 40 feet below the site. Its thickness at this location is approximately 510 feet.

- Upper Pleistocene/Glacial Deposits (Upper Glacial Aquifer)

  The Glacial or Upper Pleistocene deposits lie unconformable above the Magothy formation and compose all the surficial deposits. The upper surface of the aquifer and these deposits form the present land surface, except where they are overlain by deposits of Holocene Age or by landfill.

The Upper Pleistocene deposits consist of beds of fine to coarse stratified sand and gravel, boulder clay or till consisting of unstratified mixtures of clay and boulders, and some freshwater lake deposits composed of silt and clay (Perlmutter, 1949). The Upper Pleistocene deposits in Nassau County form two hydrologically significant areas - a northern area of glacial moraine and a southern area of glacial outwash (Kilburn, 1979). The site is located in a glacial outwash area. Outwash areas are underlain by stratified deposits of sand and gravel and may contain clay lenses. The areas absent of clay lenses are characterized with high permeability. These Glacial/Upper Pleistocene deposits are approximately 0-40 feet thick beneath the proposed site.

3.1.2 Soils/Surface Geology

The Glacial or Upper Pleistocene deposits compose all of the surficial deposits. These weathered glacial deposits form the soils of the area. According to the Soil Survey of Nassau County, by the U.S.D.A. Soil Conservation Service, the soils at the site are classified in two groups: Urban land - Riverhead complex with 0-3 percent slopes in the southern half of the site and Udipsamments with nearly level slopes in the northern portion. Urban land soil complexes are areas which have been intensively developed for housing and typically are more than 50 percent covered with buildings and pavement. The grading operations may have altered the surface layer content, however, the soils generally exhibit the properties of the Riverhead Series (USDA SCS, 1982).

The Riverhead Series consists of deep, well-drained, moderately coarse textured soils that formed in a mantle of sandy loam or fine sandy loam over thick layers of coarse sand and gravel. These soils occur throughout the County in rolling to steep areas on moraines and in level to gently sloping areas on outwash plains (such as this site).

Riverhead soils have moderate to high available moisture capacity. Internal drainage is good. Permeability is moderately rapid in the surface layer and in the subsoil and very rapid in the substratum (USDA SCS, 1982).

In a representative profile, the southern portion of the site is comprised of the following characteristics: 6 inches of asphalt and stone; 1 to 3 feet of organic silts and organic silty clays of low plasticity; followed by a thick layer of poorly graded sands or gravely sands with little or no fines. These soils are predominantly classified as a 8-65 material; capable of allowing a bearing of 2-4 tons per square foot (Soil Mechanics Drilling Corp., Dec., 1987).

The northern portion of the site has been classified as undisamments, nearly level. These are level to gently sloping areas which have been cut and filled for nonfarm uses. The soil's texture is dominantly loamy fine sand or coarser textured material throughout (USDA SCS, 1982).

Upon inspection of the site, it appeared that this area of the site could have soils that may be classified as Udorthents-waste substratum. Udorthents-waste substratum are soils of landfill areas. These soils may be present in some areas in the northern portion of the site where a cement manufacturing company filled open pits with debris in 1973 (Nassau County Tax Assessors Office).

A representative profile of this area indicates that the soils are characterized as a fill material typically consisting of: sand, silt, gravel, wood, concrete, plastic, metal, glass and cinder. The fill is rated as an 11-65 material; nominally unsatisfactory bearing material (Subsoil Investigation, Soil Mechanics Drilling Corp., Drawing Number 87R8444-A, 87L8449 and 88L1889). Hence, the foundations for the proposed buildings will have to consider piles for support.

In general, it appears that approximately 1/2 of the soils on the entire site, especially in the lower elevations or southern half of the site, can be considered natural and undisturbed.

The estimated engineering properties of the soils are shown in Table 3.1.1. Soil drainage should be acceptable since the gravels and sands of the area provide high infiltration/ percolation rates.

3.1.3 Soil Quality and Soil Gas

An environmental audit was completed in October of 1986 in order to characterize the soil quality and gas at the site. A Supplement and two Amendments to the initial study were added at

TABLE 3.1.1

ESTIMATED ENGINEERING PROPERTIES OF SOILS

Series Name	Depth to Seasonal High Water Table	Hydrologic Group*	Depth Inches From Surface	USDA Texture	Permeability Inches/Hour	Erodibility** ("K" Value)
Riverhead	20 ft.	B	0-30	Sandy loam	2.0-6.0	.28
			30-60	Sand, loam sand stratified sand and gravel	> 6.0	.17
Udipsamments	Variable					
Udorthents	Variable					

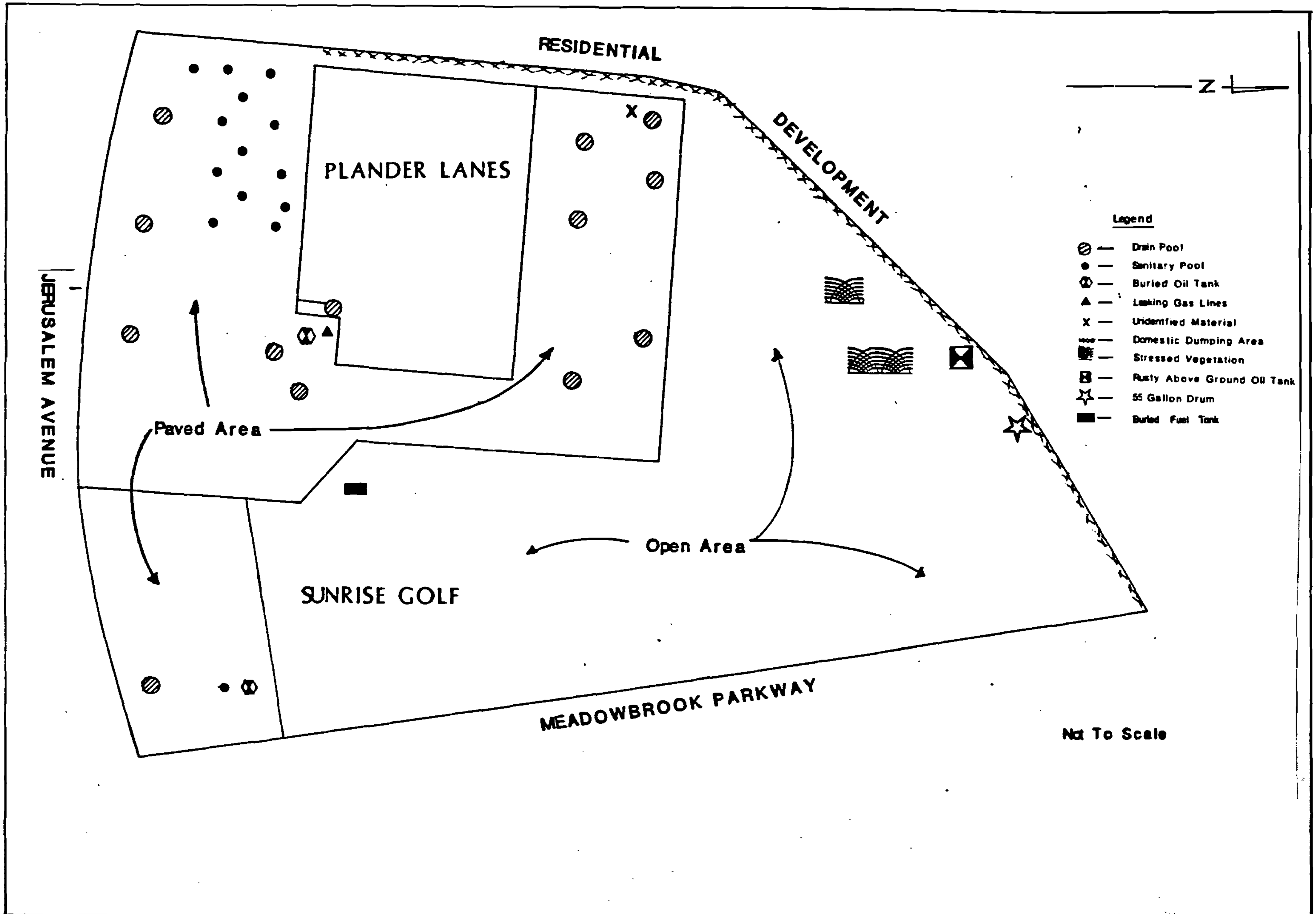
* The hydrologic groups are defined as follows:
A - High infiltration rate (low runoff potential)
B - Moderate infiltration rate
C - Slow infiltration rate
D - Very slow infiltration (high runoff potential)

** Erodibility Values
K = .10 - .20 Low erodibility
K = .24 - .32 Medium erodibility
K = .37 - .49 High erodibility
K = .55 - .64 Very high erodibility

(Ref: Suffolk County Soil Survey and General Soil Map and Interpretations, Nassau County) later dates (see Appendix 1 for the Characterization Study, Supplement and Amendments 1 and 2).

A version of Figure 3.1.5 was presented in the Characterization Study and updated in Amendment 2 identifying locations of potential contamination. The following reviews the items of concern presented in Figure 3.1.5.

- All drainage pools are suspected of high Total Petroleum Hydrocarbons (TPHC) contamination. Of four drainpools sampled, concentrations range from 2,200 - 7,200 ppm. TPHC in the top foot of sediment. The results from this sampling are shown in Table 3.1.2. The supplemental report contains the results from the analysis of volatile organic compounds (VOCs) listed under the EPA's "129 Priority Pollutant" list. As can be seen in Table 3.1.2, all drainpools analyzed had undetected levels of the VOCs on the 129 priority pollutant list.
- Fourteen sanitary drainpools are located on the site; 13 in front of Plander Lanes and 1 near the pro shop.
- There are two buried oil tanks on site; one near the golf pro shop and one near Plander Lanes.
- Amendment 2 of the report disclosed information of a third underground storage tank (UST) on site. This tank is approximately 6 feet in diameter and 25 feet long. Based on the results of the OVA survey, the tank does not leak.
- In the initial Characterization study, an unknown substance was found near Plander Lanes. Amendment 1 is the laboratory analysis of the substance. Based on laboratory results, the



F,P&M FIGURE 3.1.5-SITE PLAN AND LOCATIONS OF POTENTIAL CONTAMINATION

TABLE 3.1.2

SUMMARY OF OVA/GC AND LABORATORY ANALYSIS OF SAMPLES ON SITE

(1) Sample Location	OVA/GC	Laboratory Analysis for Petroleum Hydrocarbon (Parts Per Million)	(2) Laboratory Analysis of Volatile Organic Compounds Listed Under EPA's "129 Priority Pollutants" Exceeding Maximum Levels (Parts Per Billion)	
			Surface	3' Depth
DP-1	High	5,900	X (3)	X
DP-2	High	Not Analyzed	Not Analyzed	Not Analyzed
DP-3	High	Not Analyzed	X	X
DP-4	High	2,300	X	X
DP-5	High	2,200	X	X
DP-6	High	7,200	X	X
DP-7	Low	Not Analyzed	Not Analyzed	Not Analyzed
DP-8	No Peak	Not Analyzed	Not Analyzed	Not Analyzed
B-1	No Peak	Not Analyzed	Not Analyzed	Not Analyzed
B-2	High	350	X	Not Analyzed
B-3	Low	Not Analyzed	Not Analyzed	Not Analyzed
B-4	No Peak	Not Analyzed	Not Analyzed	Not Analyzed
B-5	No Peak	Not Analyzed	Not Analyzed	Not Analyzed
B-6	High	Not Analyzed	X	Not Analyzed
B-7	No Peak	Not Analyzed	Not Analyzed	Not Analyzed

(1) See Figure 1 for sampling locations

(2) Laboratory analysis performed on 5 samples according to proposal and highest recorded OVA/GC readings

(3) "X" indicates undetected levels

sample did not exhibit the characteristic of a hazardous waste.

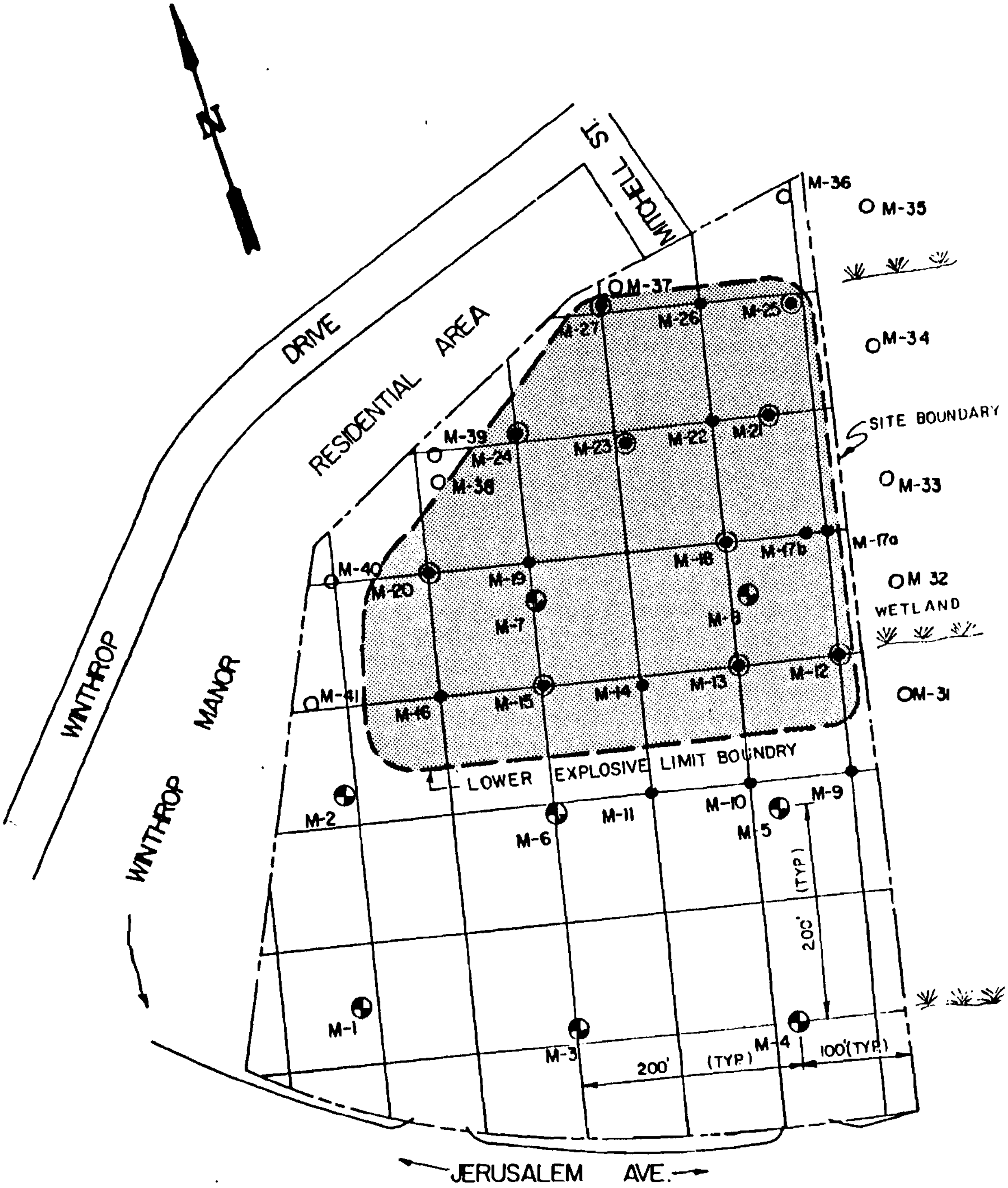
Following the Characterization Study a methane survey was executed to determine the amount of methane gas present as well as the extent of gas migration on site. Appendix 4 contains an engineering report of the existing methane gas conditions as well as its remediation alternatives. Section 2 of the engineering report is a detailed explanation of the methane sampling exercises. Figure 3.1.6 and Table 3.1.3 show sampling locations and results respectively. As can be seen from Figure 3.1.6, the methane Lower Explosive Limit encompasses the northern half of the site.

3.1.4 Topography

As mentioned in Section 3.1.1, the existing site is located in a glacial outwash area. The slope is relatively flat ranging from 0 to 10 percent and generally runs north-west to southeast.

Figure 3.1.7 shows the regional topography, while Figure 3.1.8 shows the topography of the site and adjacent areas. As shown, the site slopes uniformly towards the southeast corner of the site. The center of the site is characterized with the steepest on-site slope (approximately 10 percent). The peak elevation is situated near the property line and thereby releases very little runoff to the neighboring Winthrop Manor Residential Area.

The New York State designated Class II Wetlands, located to the east of the proposed development, are relatively flat. However, because of the site topography in the northern section,



LEGEND

PHASE I:

◐ VAPOR WELL
JULY 11, 1988

PHASE II:

● VAPOR WELL

◉ VAPOR WELL INSTALLED WITH SLOTTED PIPE
JULY 25, 1988

PHASE III:

○ VAPOR WELL
AUGUST 9, 1988

APPROX SCALE

0 100' 200'

SOURCE: METHANE ENGINEERING REPORT
APPENDIX 4

FIGURE 3.1.6-SUMMARY OF METHANE SAMPLING: PHASE I-III

TABLE 3.1.3

SUMMARY OF METHANE SAMPLING CONCENTRATIONS

Well Point	July 11, 1988	July 25, 1988	A.M. August 9, 1988	P.M. August 9, 1988
M1	0% L.E.L.			
M2	0% L.E.L.			
M3	0% L.E.L.			
M4	0% L.E.L.			
M5	0% L.E.L.			
M6	0% L.E.L.			
M7	5% Gas			
M8	25% Gas			
M9		80% L.E.L.		
M10		38% L.E.L.		
M11		80% L.E.L.		
M12*		28% Gas	27% Gas	22% Gas
M13*		25% Gas	10% Gas	22% Gas
M14*		18% Gas	13% Gas	28% Gas
M15*		26% Gas	29% Gas	28% Gas
M16		27% Gas	16% Gas	70-80% L.E.L.
M17a		30% Gas	---	---
M17b		15% Gas	---	---
M18*		25% Gas	25% Gas	22% Gas
M19		60% L.E.L.	15% L.E.L.	16% L.E.L.
M20		24% Gas	0% L.E.L.	2% L.E.L.
M21*		26% Gas	100% L.E.L.	26% Gas
M22		10% Gas	9% Gas	20-40% L.E.L.
M23*		28% Gas	25% Gas	24% Gas
M24*		20% Gas	0% L.E.L.	0% L.E.L.
M25*		15-20% Gas	0% L.E.L.	0% L.E.L.
M26		13% Gas	0% L.E.L.	0% L.E.L.
M27*		24% Gas	0% L.E.L.	0% L.E.L.
M31			0% L.E.L.	
M32			0% L.E.L.	
M33			74% L.E.L.	
M34			0% L.E.L.	
M35			0% L.E.L.	
M36			0% L.E.L.	
M37			0% L.E.L.	
M38			0% L.E.L.	
M39			0% L.E.L.	
M40			0% L.E.L.	
M41			0% L.E.L.	

* Locations where permanent vapor wells were installed.

Note: Number sequence ends at M-27 and restarts at M31; M28-M30 do not exist.

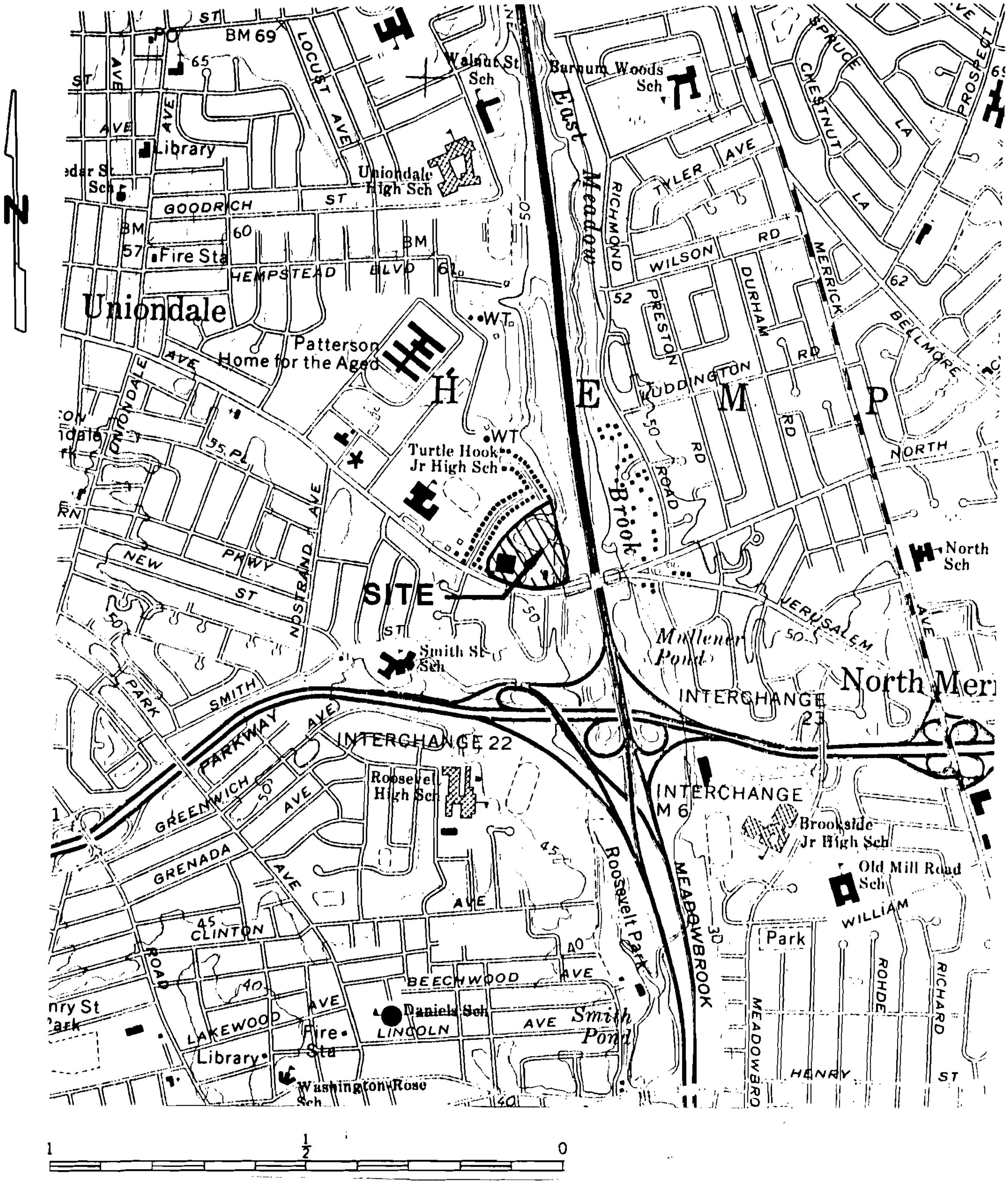


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FIGURE 3.1.7–REGIONAL TOPOGRAPHY

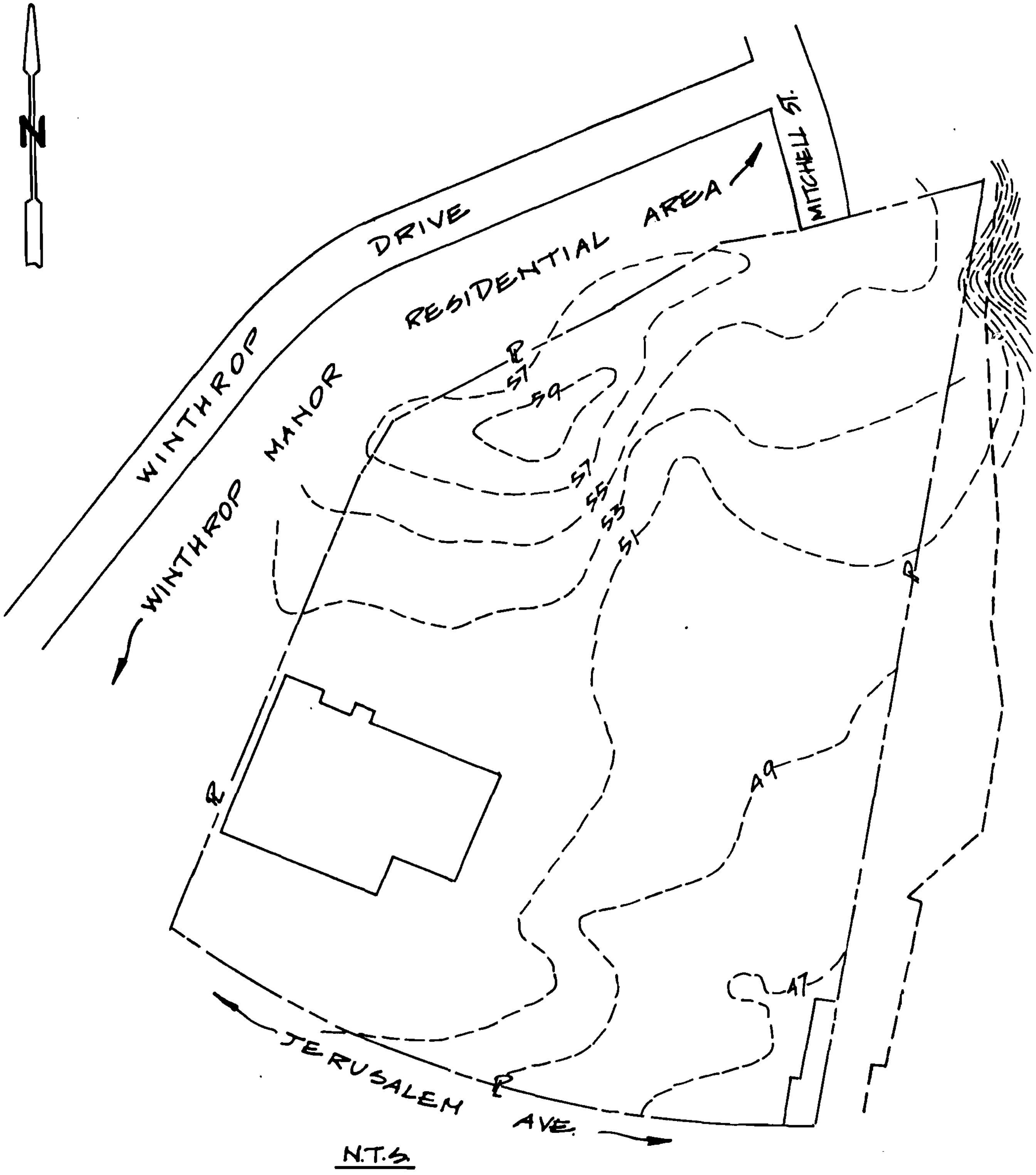

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FIGURE 3.1.8–SITE TOPOGRAPHY

the corresponding off-site slope runs east to the wetlands. The southern section of the wetland is relatively flat without unusual slopes.

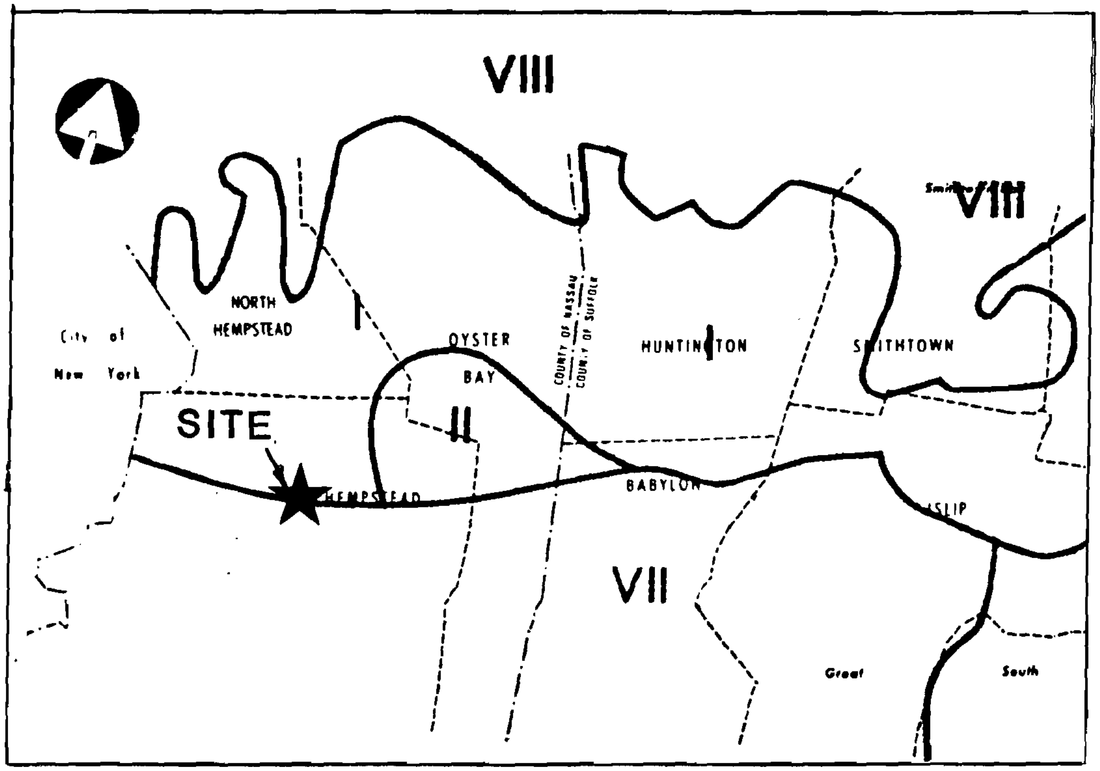
3.2 Water Resources

The important water resources in the vicinity of the site are groundwater and surface water. The site is located on the border of Hydrogeologic Zone I and Zone VII. Hydrogeologic Zone I is a deep groundwater recharge area, while Hydrogeologic zone VII is a relatively shallow discharge area, which is likely to contribute water only to the shallow groundwater flow system. This flow system discharges to streams and saltwater bays, and hence will affect the quality of the surface water. The closest surface water source is Meadow Brook, which is located to the east of the site. The existing conditions of the groundwater and surface water resources in the vicinity of the site, as well as floodplains, will be discussed in greater detail as follows.

3.2.1 Groundwater

This site is located on the border between a shallow and deep groundwater recharge area. As mentioned, the site is located on the border of Hydrologic Zone I and VII, see Figure 3.2.1. The groundwater velocity vector in the deep flow zones generally moves with a vertically downward component while the groundwater in the shallow flow zones moves essentially horizontal towards the Bays.

Hydrologic Zone I is considered a deep flow recharge zone. Zone I covers areas characterized by a deep flow system, which generally contributes water to the middle and lower portions of



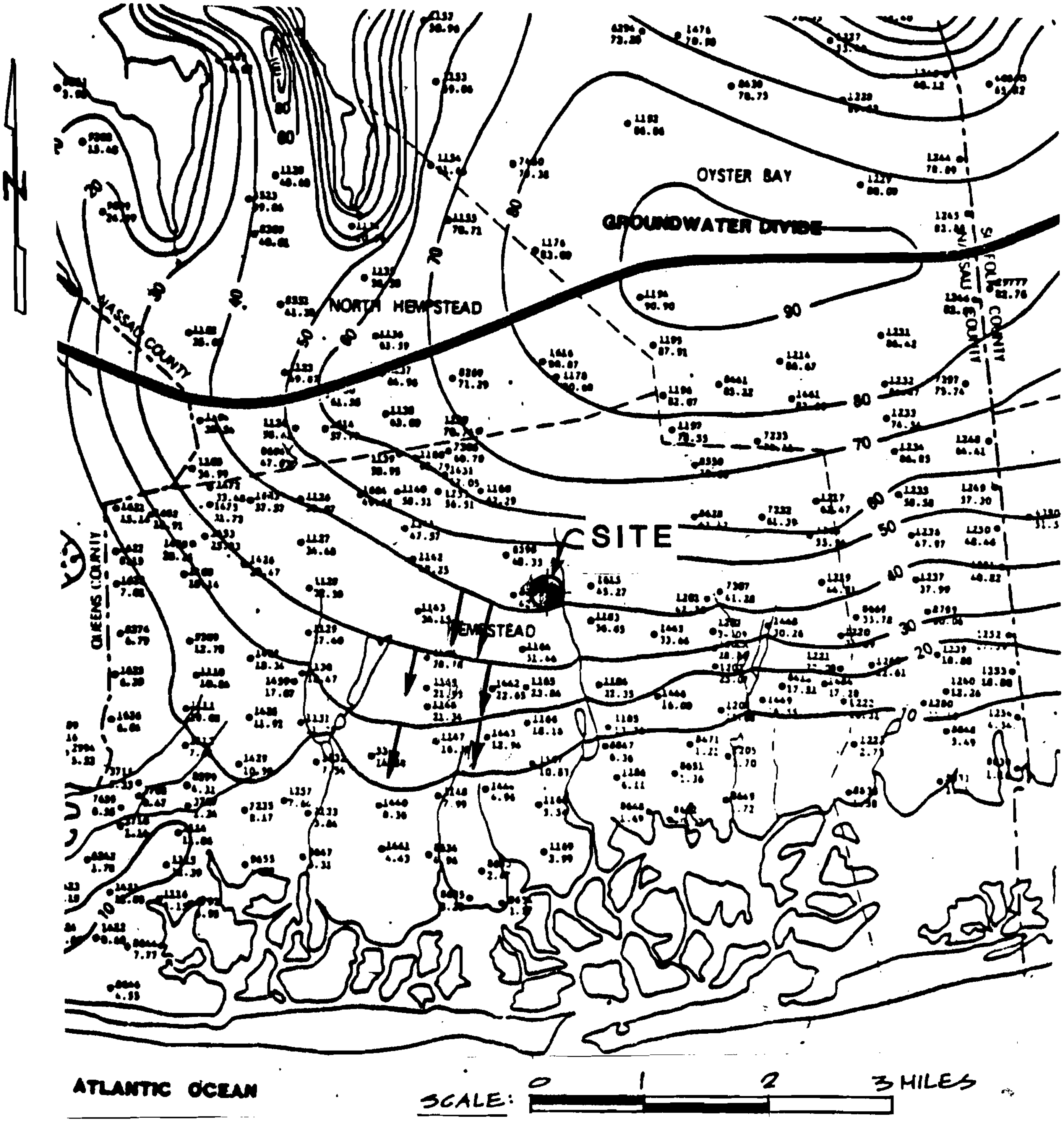
<u>SOURCE</u>: LONG ISLAND 208 STUDY,
VOL. I (JULY, 1978)

FIGURE 3.2.1 HYDROLOGIC ZONES NEAR THE SITE the Magothy. Zone VII is a shallow flow where groundwater moves in a horizontal pattern, not entering the deeper water supply area. The influence of horizontal flow will be stronger at our site due to the proximity of East Meadow Brook and will overshadow the vertical velocity vector.

Groundwater elevations below the site are estimated to be between 20 and 30 feet. Figure 3.2.2, a water table contour map of the area, depicts the regional groundwater flow pattern in the shallow water table aquifer; while Figure 3.2.2 shows the potentiometric surface of the Magothy Aquifer near the site. In both figures the water table contour lines are shown in 10 foot intervals.

The direction of horizontal groundwater flow in Figure 3.2.1 is perpendicular to the water contours in an isotropic homogeneous system. Beneath our site, the porous media cannot be considered as isotropic or homogeneous, and therefore, absolute groundwater direction cannot be established. However, groundwater below the site can be said with reasonable probability to be flowing south towards the Bays and away from supply wells at the East Meadow and Uniondale Water District. In addition, if one overlays both the Magothy Piezometirc surface (Figure 3.2.3) and the water table (Figure 3.2.2), no vertical gradient is shown for our site implying horizontal flow only.

As shown in Figure 3.2.4, the site is located in the Uniondale Water District and will be receiving water from wells owned by the District. Water supply wells owned by the Uniondale Water District are shown on Figure 3.2.5 and listed in Table 3.2.1. The project site would probably receive water from the

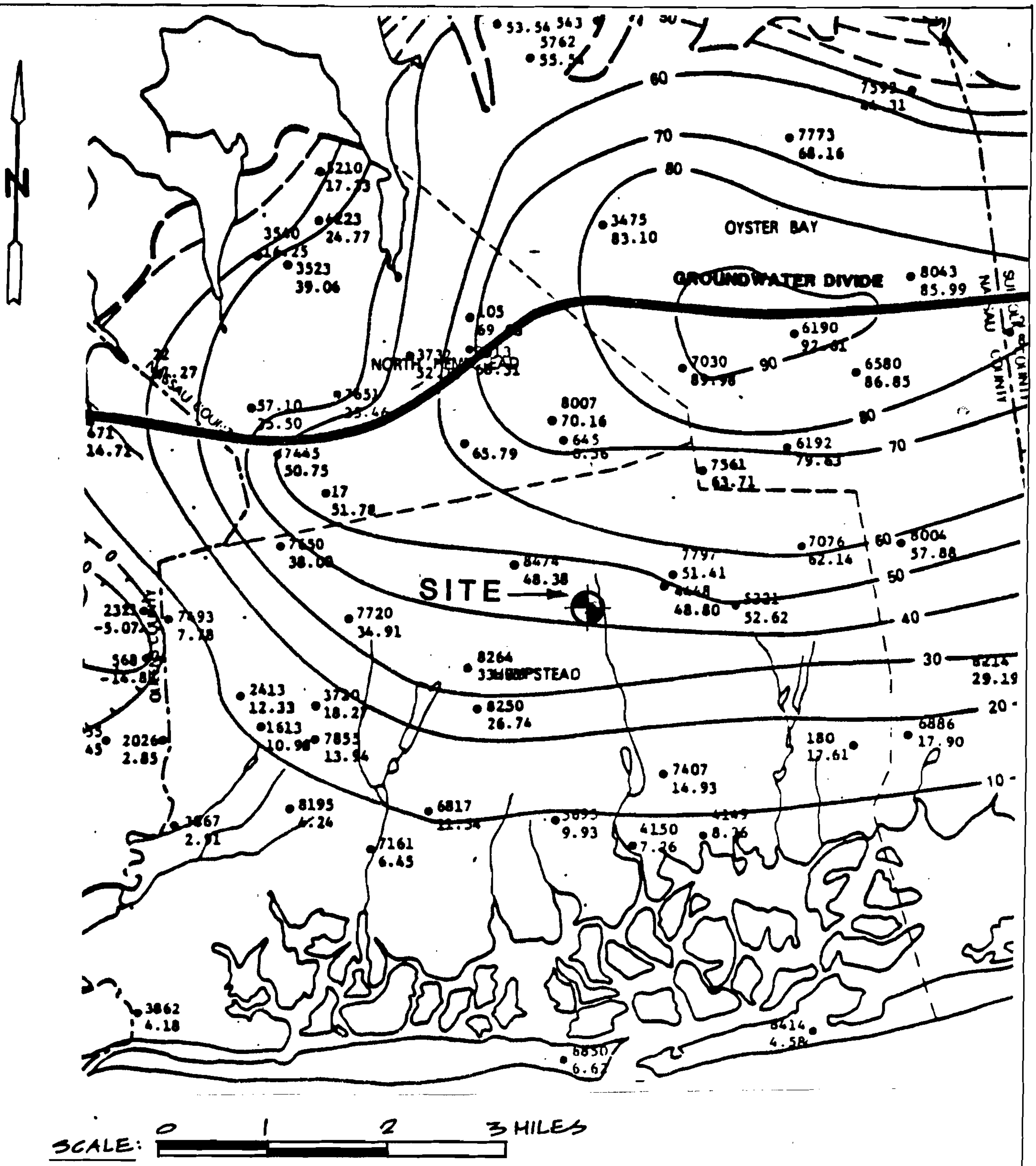


SOURCE: INVESTIGATION OF CONTAMINATED AQUIFER SEGMENTS. N.C.D.O.H. (JUNE 19, 1986)

LEGEND: ——► GROUNDWATER DIRECTION

F,P&M

FIGURE 3.2.2-WATER TABLE ELEVATIONS IN NASSAU COUNTY. MARCH 1979



SOURCE: INVESTIGATION OF CONTAMINATED AQUIFER SEGMENTS. N.C.D.O.H. (JUNE 19, 1986)

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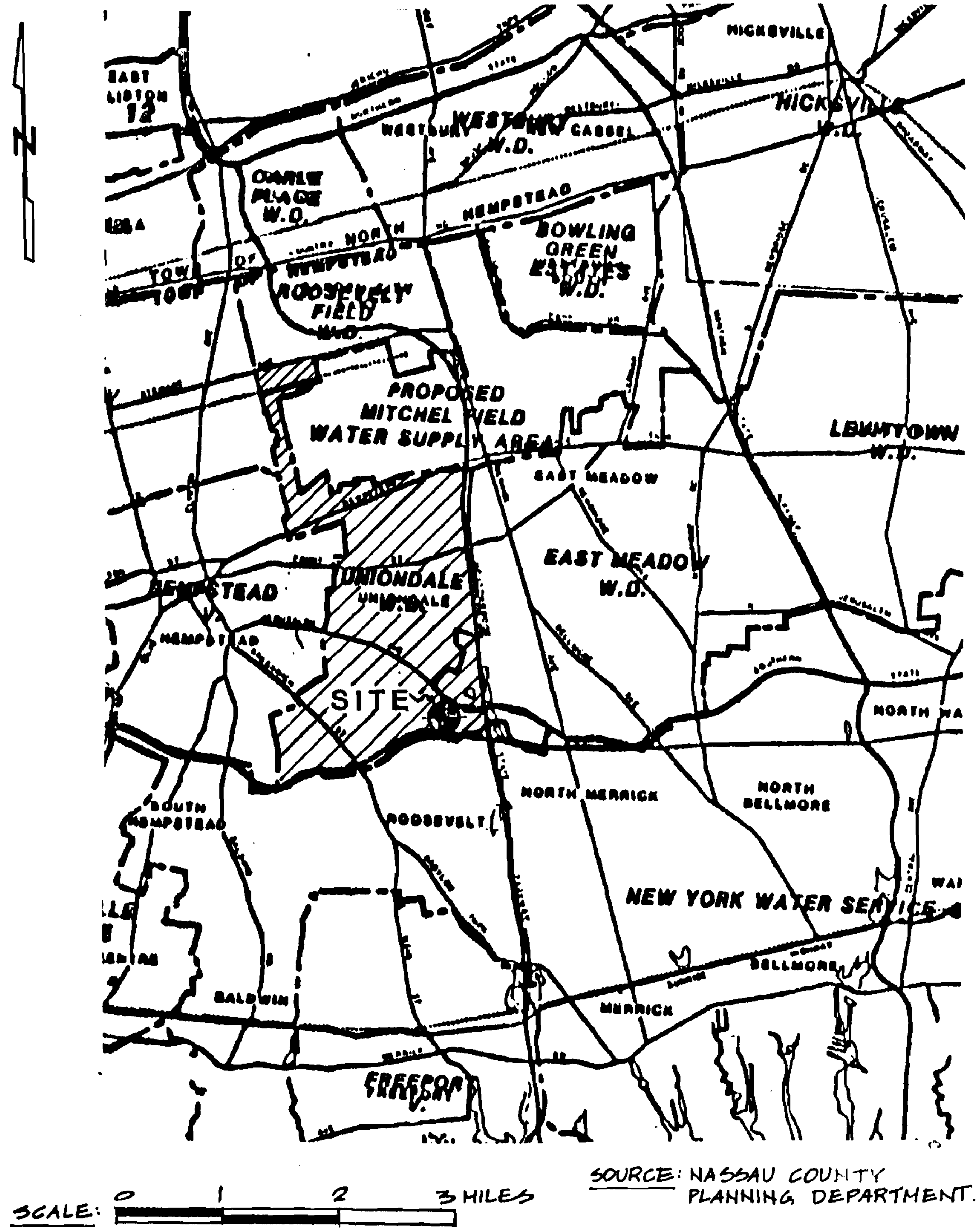
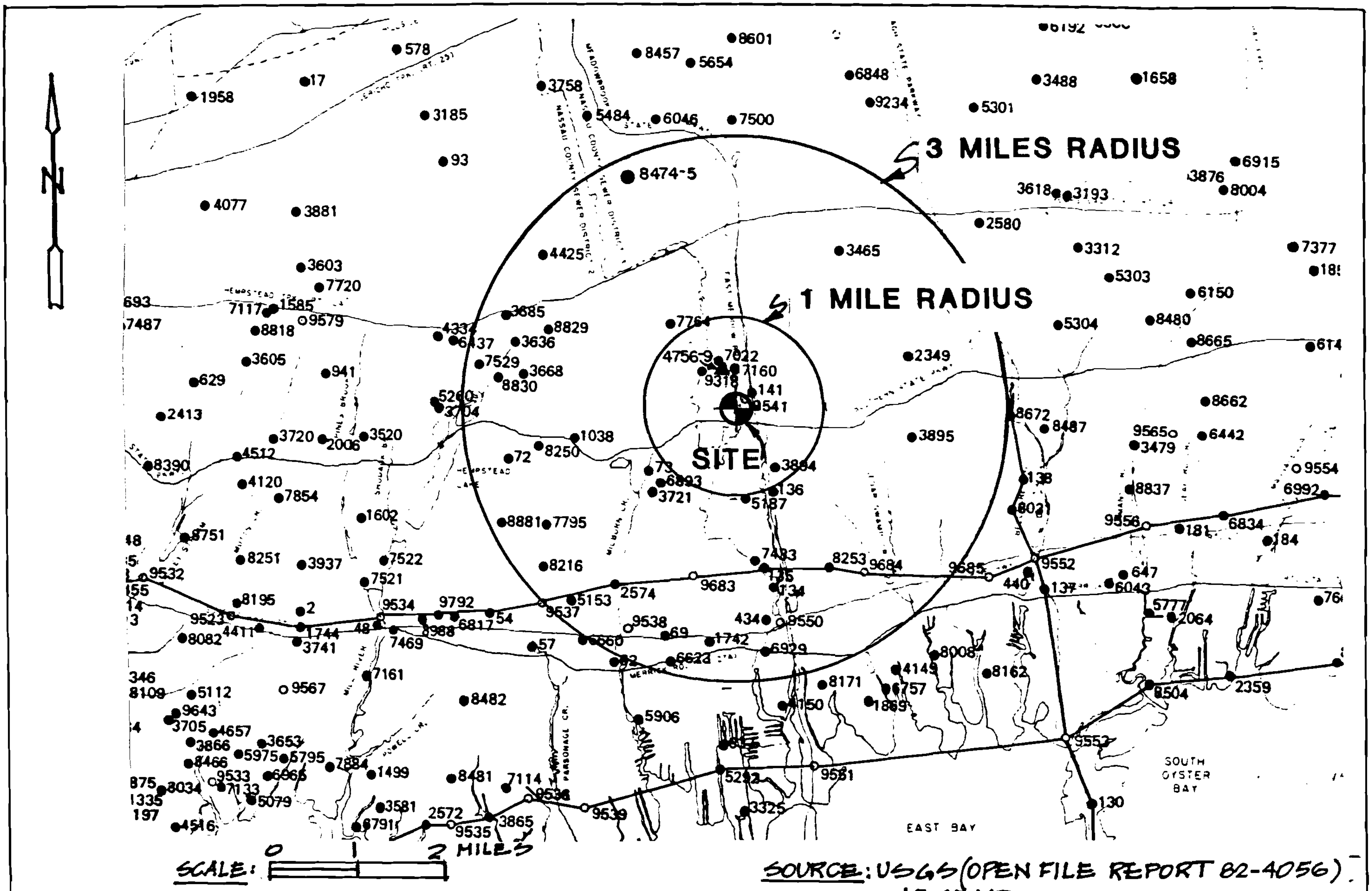
FIGURE 3.2.3-POTENTIOMETRIC SURFACE OF THE MAGOTHY AQUIFER IN NASSAU COUNTY. JAN. 1979



SOURCE: NASSAU COUNTY PLANNING DEPARTMENT.

F,P&M

FIGURE 3.2.4 - WATER SUPPLY & WATER DISTRICTS



SOURCE: USGS (OPEN FILE REPORT 82-4056).

LEGEND:

● 3894 WELL & WELL NUMBER

▲ 4756 UNIONDALE WATER DISTRICT WELL.

FIGURE 3.2.5-WELL LOCATIONS

TABLE 3.2.1

SELECTED WELLS LOCATED WITHIN 1 MILE RADIUS OF THE SITE

WELL NUMBER	DEPTH OF WELL (FEET)	WELL DIAMETER (INCHES)	AQUIFER DEVELOPED	SPECIFIC CAPACITY (gpm/ft)	OWNER OR WELL USER	USE OF WATER WELL
141[1]	109	8	-----	-----	NYCDWSGE	Test Well
73[1]	716	-----	-----	-----	LIWC	Test Well
3894[1]	415	18	Magothy	14	NYWSC	Public Water Supply
3721[1]	101	12	Magothy	4	LIWC	Public Water Supply
57	150	-----	Magothy	-----	NYCDWSGE	Abandoned Well
54	101	-----	Upper Glacial	-----	NYCDWSGE	Abandoned Well
3704	200	20	Upper Glacial	80	W. Hempstead Gardens Water Distrct	Public Water Supply
72	616	18	Magothy	51	Village of Rockville Center	Public Water Supply
2574	548	10	Magothy	-----	LIWC	Test Well
62	200	24	Magothy	-----	NYCDWSGE	Abandoned Well
1742	272	10	Upper Glacial	27	Grove Theater	Industrial Well
134	557	18	Magothy	57	Village of Freeport	Public Water Supply
135	150	8	-----	-----	NYCDWSGE	Test Well
3895	503	16	Magothy	14	NYWSC	Public Water Supply
3465	562	24	Magothy	21	East Meadow Water District	Public Water Supply
4756[1]	307	-----	Magothy	-----	Uniondale Water District	Public Water Supply
4757[1]	319	-----	Magothy	-----	Uniondale Water	Public Water Supply
4758[1]	441	-----	Magothy	-----	Uniondale Water	Public Water Supply
4759[1]	356	-----	Magothy	-----	Uniondale Water District	Public Water Supply
8474	----	-----	Magothy	-----	Uniondale Water District	Public Water Supply
8475	----	-----	Magothy	-----	Uniondale Water District	Public Water Supply

NOTE:

Source: U.S.G.S., 1963 & N.S.D.O.H. (Survey Report no. 62, 1964)

(1) Wells located within 1/2 mile radius of project site

closest well field (wells 4756-9), which are located just north of the property off Hempstead Avenue. Approval to receive additional water for the proposed project must be obtained by the owner of the site from the Uniondale Water District (part of the Town of Hempstead Department of Water).

Figure 3.2.5 also shows the locations of wells within a one and three mile radius of the site. Selected wells within the three mile radius are listed in Table 3.2.1. Of the 21 wells listed, 13 are used for the purposes of public water supply including: 6, Uniondale Water District; 2, New York Water Service Corp. (NYWSC); 1, Long Island Water Corp. (LIWC); 1, Village of Freeport; 1, Village of Rockville Center; and 1, West Hempstead, Hempstead Gardens Water District. The other 8 wells listed on Table 3.2.1 are used as test and industrial wells.

The quality of groundwater in the vicinity of the site is good. New York State Drinking Water Standards are shown on Table 3.2.2 and 3.2.3. The groundwater quality conditions in the vicinity of the site is acceptable according to drinking water standards.

Table 3.2.4 shows the past water usage for the site. As can be seen, the usage is divided into two categories; agriculture and public water supply for the golf range and bowling alley, respectively. 1986 is noted because it is the last year when both businesses were operating at full capacity.

3.2.2 Surface Waters

The only surface water existing near the site is East Meadow Brook and its tributaries. In the vicinity of the site, East

TABLE 3.2.2

NEW YORK STATE DRINKING WATER STANDARDS FOR COMMUNITY WATER SYSTEMS (FROM NYCRR, PART 5, TITLE 10)

Contaminant	Maximum Contaminant Level (mg/l, unless otherwise noted)
- Inorganics	
Arsenic (As)	0.05
Barium (Ba)	1.00
Cadmium (Cd)	0.010
Chromium (Cr)	0.05
Fluoride (Fl)	2.2
Lead (Pb)	0.05
Mercury (Hg)	0.002
Nitrate (NO_3)	10.0
Ammonia (NH_3)	2.0
Selenium (Se)	0.01
Silver(Ag)	0.05
Chloride (Cl)	250.0
Copper (Cu)	1.0
Total Solids	500.0
Iron (Fe)	0.3
Manganese (Mn)	0.3
Sodium (Na)	20.0
Sulphate (SO_4)	250.0
Zinc (Zn)	5.0
pH	6.5-8.5 units
- Organics (Pesticides and Herbicides)	
o Chlorinated Hydrocarbons	
Endrin	0.0002 (0.2 ug/l)
Lindane	0.004 (4.0 ug/l)
Methoxychlor	0.1 (100.0 ug/l)
Toxaphene	0.005 (5.0 ug/l)
o Chlorophenoxys	
2,4-D	0.1 (100 ug/l)
2,4,5 TP Silvex	0.01 (10.0 ug/l)

TABLE 3.2.3

NEW YORK STATE DRINKING WATER STANDARDS-ORGANIC COMPOUNDS

ORGANIC COMPOUNDS	INDIVIDUAL (UG/L)	TOTAL**** (UG/L)
A. STANDARDS(PART 5,TITLE 10,NYCRR)		
TRIHALOMETHANES	100	100
-CHLOROFORM (Trichloromethane)		
-BROMOFORM (Tribromomethane)		
-BROMODICHLOROMETHANE		
-DIBROMOCHLOROMETHANE		
B. GUIDELINES		
CHLOROMETHANE (Methyl Chloride)	50	
BROMOMETHANE (Methyl Bromide)	50	
METHYLENE CHLORIDE (Dichloromethane)	50**	
DICHLORODIFLUOROMETHANE (Freon 12)	50	
TRICHLOROFLUOROMETHANE (Freon 11)	50	
CARBON TETRACHLORIDE (Tetrachloromethane)	50* (EPA proposed MCL=5)	
CHLOROETHANE (Ethyl Chloride)	50	
1,1 DICHLOROETHANE	50*	
1,2 DICHLOROETHANE	5*	
1,1,1 TRICHLOROETHANE (Methylchlordform)	50* (EPA proposed MCL=200)	
1,1,2 TRICHLOROETHANE	50**	
1,1,2 TRICHLOROTRIFLUOROETHANE	50**	
1,1,2,2 TETRACHLOROETHANE	50	
VINYL CHLORIDE (Chloroethylene)	5* (EPA proposed MCL =1)	
1,1 DICHLOROETHYLENE (Vinylidene Chloride)	5* (EPA proposed MCL =7)	
TRANS-1,2 DICHLOROETHYLENE (Also Cis-)	50*	
TRICHLOROETHYLENE	50* (EPA proposed MCL =5)	
TETRACHLOROETHYLENE	50*	
1,2 DICHLOROPROPANE	50*	
1,3 DICHLOROPROPENE (Cis and/or Trans)	2**	
BENZENE	5*	
TOLUENE	50**	
XYLENES	50**	
ETHYLBENZENE	50*	
CHLOROBENZENE	50**	50**
CHLOROTOLUENE	50**	
BROMOBENZENE	50**	
DICHLOROBENZENE (o,m,p)	50** (EPA proposed MCL=750)	
1.3,5 TRICHLOROBENZENE	50**	
1,2,4 TRICHLOROBENZENE	50**	
PCB's (Total)	1*	1*
DIOCTYL PHTHALATE	50*	
ALDICARB	7**	
CARBOFURAN	15**	
CHLORDANE	1***	
DINOSEB	30**	
OXAMYL	50**	
PARAQUAT	50**	
ATREZINE	25**	

* NYSDOH REPORT,ORGANICS IN COMM. SYSTEMS,AUG 1982.

** FROM SUFFOLK COUNTY DOH.

*** FORM PUTNAM COUNTY DEHS,SEPT 1983.

**** TOTAL OF ALL COMPOUNDS 100 UG/L UNLESS NOTED.

Note: Any single organic contaminant ≈50 ug/l
Any combination of organic contaminants ≈100 ug/l

TABLE 3.2.4

WATER USAGE HISTORY

Year	Location		Usage (gallons)
1986	Golf Range		97,000
1986	Bowling Alley		639,000
		TOTAL	736,000

Source: Town of Hempstead Department of Water

Meadow Brook flows along the eastern side of the Meadowbrook Parkway and a tributary is located along the western side of the Parkway (see Figure 3.2.6). East Meadow Brook originates east of Nassau County Community College near the west side of the Parkway and flows as an intermittant stream south to Maria Regina High School. In this area the stream travels under the Parkway to the east side and continues past the project area. In the area of the site, the stream is not known to be used for public, industrial or agricultural uses and receives only urban runoff and groundwater seepage.

East Meadow Brook and its tributaries travel southward to Freeport Creek. Freeport Creek is a tributary to Long Creek, the Bay of Fundry and Jones Inlet. In this area, the waterway is used for recreation purposes.

The NYSDEC has classified East Meadow Brook as a class D fresh surface water. This classification is explained as follows.

> "The waters are suitable for fishing. The water quality shall be suitable for primary and secondary contact recreation even though other factors may limit the use for that purpose. Due to such natural conditions, such as intermittency of flow, water conditions not conductive to propagation of game fishery or stream bed conditions, the waters will not support fish propagation."
> Title 6 Environmental Conservation, Chapter X

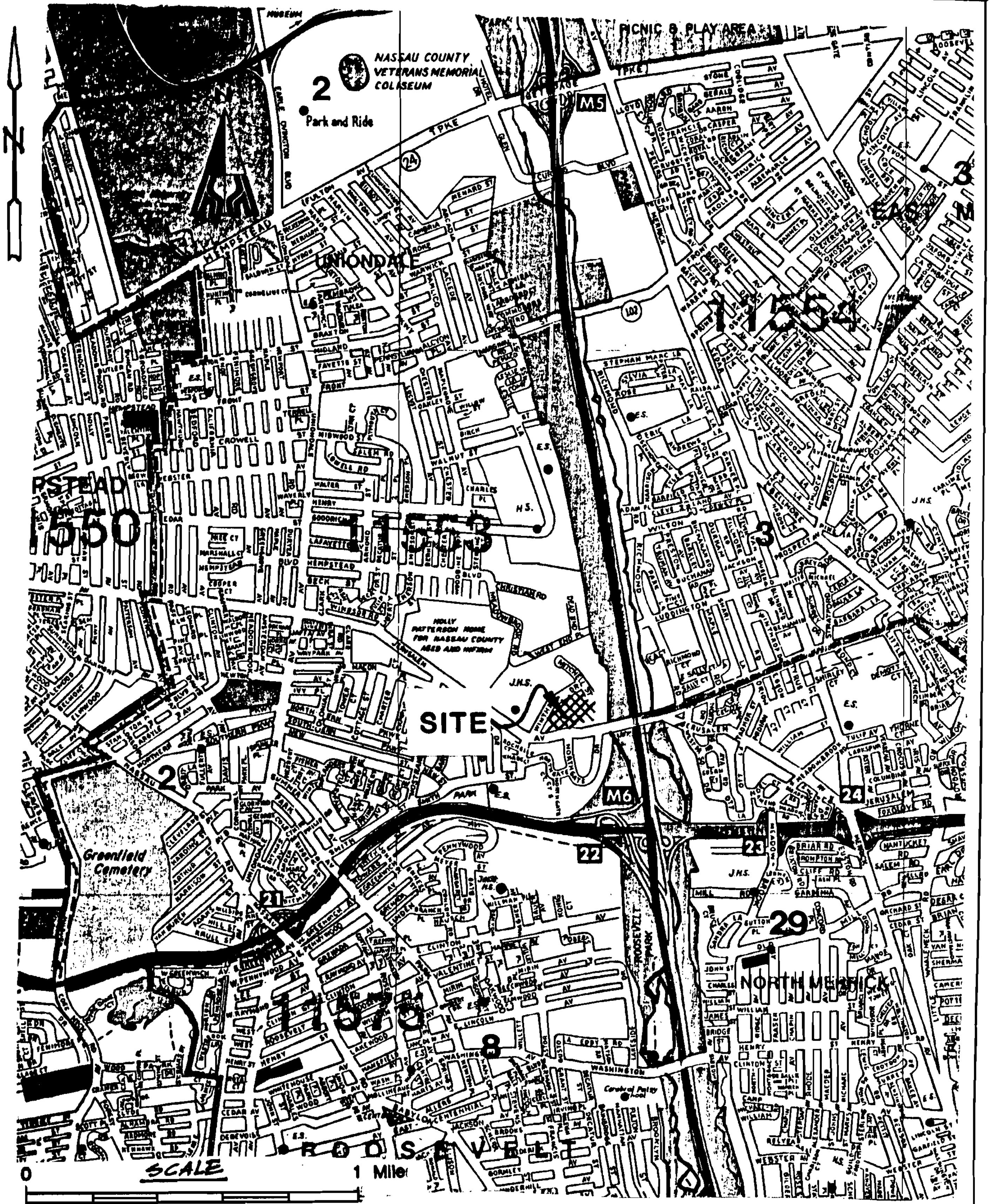


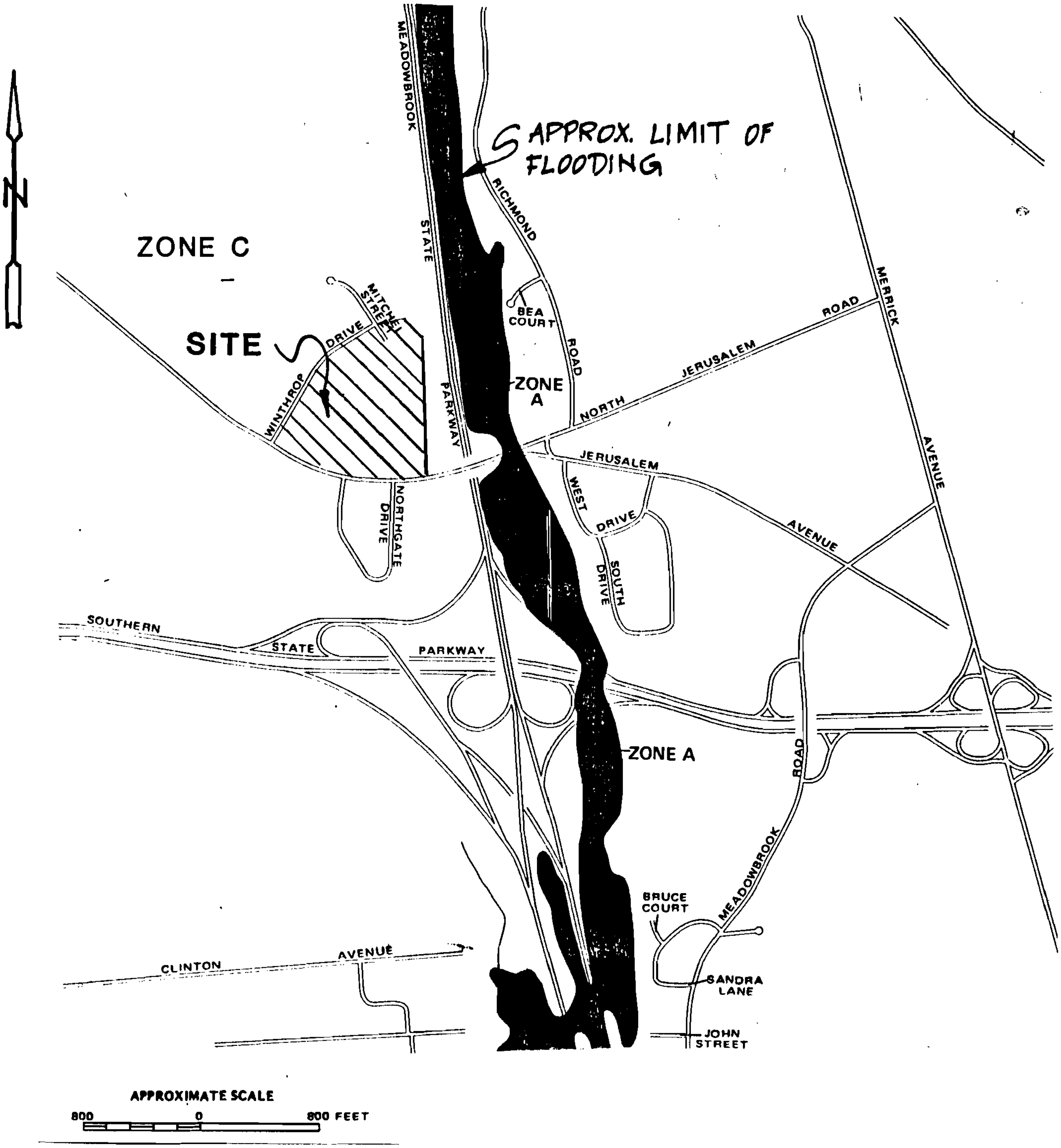
FIGURE 3.2.6–EAST MEADOW BROOK & TRIBUTARY

East Meadow Brook runs into a pond near the intersection of the Southern State and Meadowbrook Parkway. The pond is historically natural but has varied in surface level over the past years (i.e. high during wet seasons and low during dry seasons). This is primarily due to the depletion of the groundwater supplies.

Flood Insurance Rate Maps (FIRM) were obtained from the Federal Emergency Management Agency (FEMA). As can be seen in Figure 3.2.7, the site and neighboring areas are within Zone C. These areas are characterized by minimal flooding. East Meadow Brook and the immediate area are designated as Zone A; an area which lies within the 100 year flood plain. This means that this area would be underwater once in a hundred years--on average. The base flood elevations and flood hazard factors in this region are not known; however, approximate limits are shown in Figure 3.2.7. As can be seen the site is located well within the limits of Zone C; an area characterized as having minimal flooding (>100 years). As explained in Section 3.1.3, the existing drainage of the site flows in two directions. The majority of the property slopes southeast towards Jerusalem Avenue. However, in the northern section, a small amount of runoff travels easterly into the wetlands and the tributary.

3.3 Air Resources

The air resources in the vicinity of the project site can be explained in terms of local climatological conditions and the quality of air in the area.



LEGEND:

ZONE A - AREAS OF 100-YEAR FLOOD
ZONE C - AREAS OF MINIMAL FLOODING.

SOURCE: FLOOD INSURANCE RATE MAP.
TOWN OF HEMPSTEAD

FIGURE 3.2.7-100 YEAR FLOOD PLAN

3.3.1 Climate

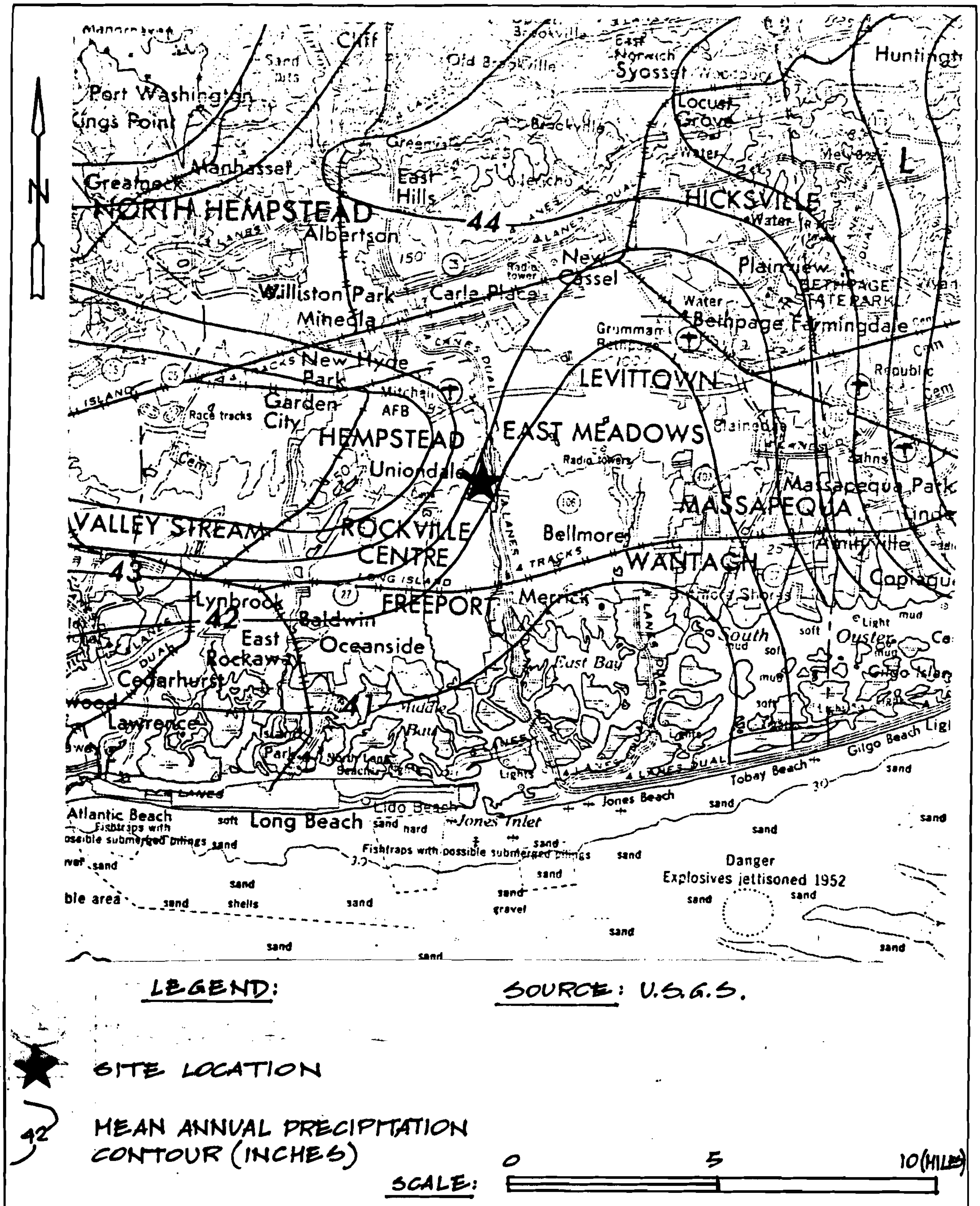
The proposed project site is located in the northern temperature climatic zone. Despite the nearness to the Long Island Sound, Atlantic Ocean, and other bodies of water (the Great South Bay), the site area more closely resembles the humid-continental type of climate than it does the maritime type. This mild and humid "modified" continental climate follows from the fact that weather conditions affecting the area usually approach from a westerly direction (weather systems originate principally over the North American land mass), not from the ocean on the east and south. Some important exceptions to this must be noted, since the influences of Long Island Sound and the ocean are by no means entirely absent. During the summer, local "seabreeze" winds blowing onshore from the cool water surface, often moderate the afternoon heat; and most often in winter, coastal storms, accompanied by easterly winds, produce considerable amounts of precipitation.

Precipitation is both moderate and distributed evenly throughout the year. Most of the rainfall from June through September comes from thunderstorms, and therefore, is usually a brief duration and sometimes intense. Heavy rains of long duration associated with tropical storms occur infrequently in late summer or fall. From October to April, however, precipitation is generally associated with widespread storm areas, so that day-long rain or snow is common. Coastal storms, occurring most often in the fall and winter months, occasionally produce considerable amounts of precipitation and have been responsible for record rain, snows, and high winds.

Figure 3.3.1 shows that the site is located in an area that averages approximately 43 inches of precipitation annually. Table 3.3.1 shows climatological data (precipitation (1938-1983) and temperature (1937-1983)) averages at the Mineola Weather Station. The Mineola Station, which no longer exists, used to be located approximately 5.5 miles northwest of the project site. Table 3.3.1 and Figure 3.3.1 depict uniformity in weather patterns over this area from Mineola to the project site in Uniondale. The climate of the proposed project area can be characterized by almost even precipitation over the year, as shown in Table 3.3.1. Temperatures are highest in July and August, and lowest in January and February. Winters in the project area are moderately severe and are usually over a three month duration. Snowfall occurs frequently in the winter months and can generally be expected to occur between October and April. The mean yearly snowfall is 26.6 inches.

The relative humidity varies between 20 and 100 percent during the year. Early morning humidity averages between 70 and 90 percent, while early afternoon humidity averages between 40 and 50 percent.

Wind direction and speed data were measured at Mitchell Field, which is located approximately 2 miles north of the project site. Seasonal wind conditions at Mitchell Field are shown in Figure 3.3.2. Prevailing winds are westerly and northwesterly in the winter, and southerly and southwesterly in the summer. Average wind speeds in the area are 10-15 miles per hour. Continental polar air masses moving from the northwest



SOURCE: U.S.G.S.

FIGURE 3.3.1-MEAN ANNUAL PRECIPITATION 1951-1965

TABLE 3.3.1

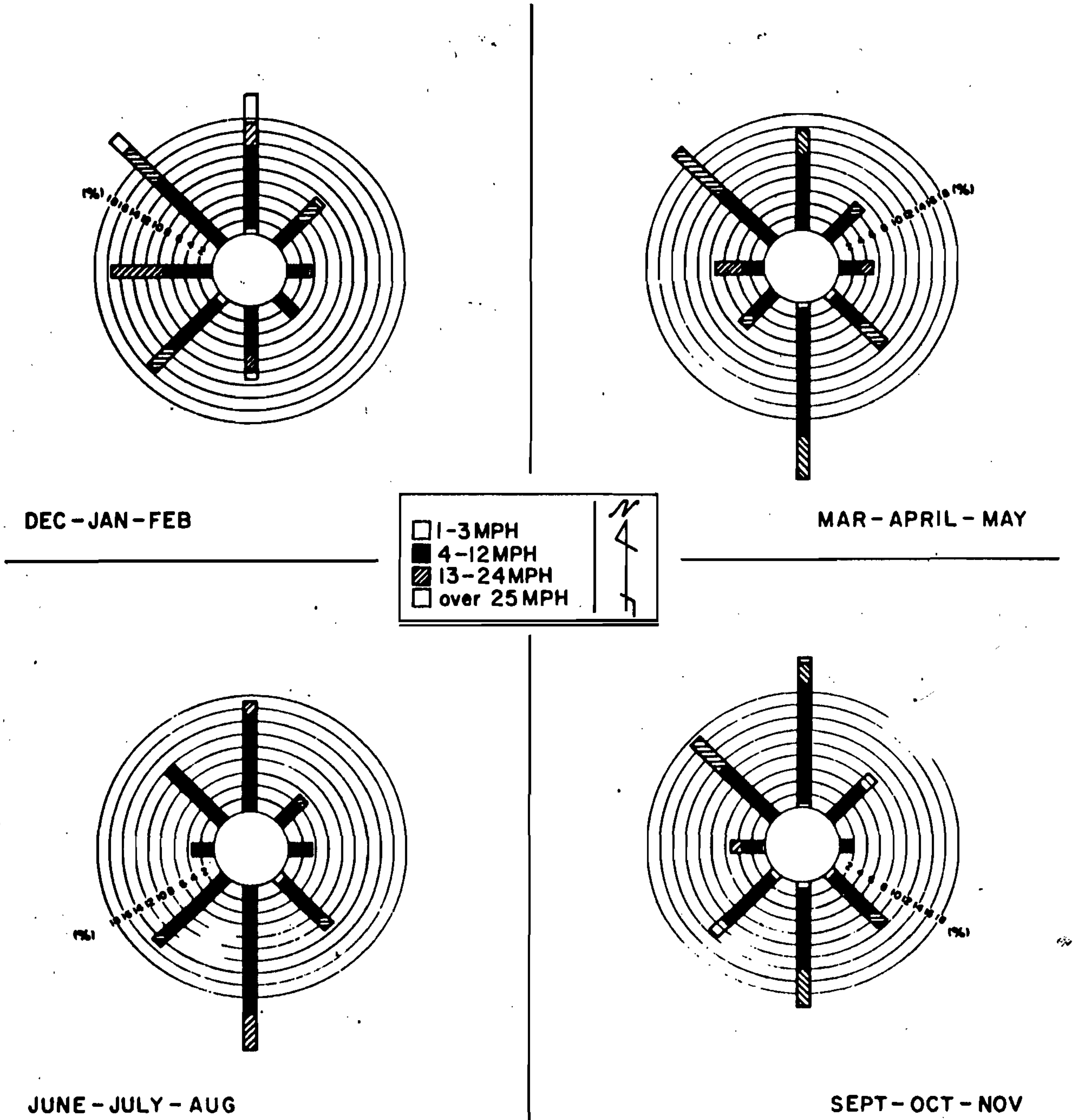
AVERAGE PRECIPITATION AND TEMPERATURES AT MINEOLA (1)

MONTHLY/ ANNUAL	PRECIPITATION(2) (INCHES	TEMPERATURE(3) (DEGREES F)
January	3.37	31.3
February	3.29	32.6
March	4.20	39.6
April	4.01	49.4
May	3.55	59.5
June	3.19	68.8
July	3.60	74.4
August	4.01	73.3
September	3.65	66.3
October	3.28	56.2
November	3.94	46.2
December	3.79	35.6
Annual	43.87	52.8

(1) Source: National Oceanic and Atmospheric Administraiton (NOAA)
(2) Average precipitation 1938-1983
(3) Average temperatures 1937-1983

SEASONAL WIND ROSES

MITCHEL FIELD



Source: Nassau County Dept. of Health
Reproduced by: Nassau County Dept. of Planning

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FIGURE 3.3.2–WIND DIRECTION ROSES

comprise the principal wind factor in winter, while maritime tropical air flows from the south predominately in the summertime. Convection currents caused by the rapid heating of the land during the day and the ensuing movement of cooler air from the ocean to replace the rising warmer air, provide refreshing "sea breezes" in late spring, summer, and early fall.

3.3.2 Air Quality

The Town of Hempstead including the project site is located in the New York City-Metropolitan Air Quality Control Region (AQCR), as designated by the U.S. Environmental Protection Agency (EPA). The AQCR program was established to assist states in attaining and maintaining acceptable ambient air quality levels. Primary national ambient air quality standards (NAAQS) are based on a margin of safety to protect the public health, and secondary NAAQS standards are based on criteria to include protection of ecosystems. These primary and secondary air quality standards have been established for six criteria pollutants to quantify acceptable ambient levels, namely, sulfur dioxide, carbon monoxide, photochemical oxidants (principally ozone), nitrogen dioxide, total suspended particulates, and lead. The federal and state ambient air quality standards for these criteria pollutants are shown in Table 3.3.2.

Air quality, as represented by Air Quality Monitoring Stations (see Figure 3.3.3) throughout the site area, are of generally good quality and meet Federal and State standards for sulfur dioxide (SO_2), nitrogen dioxide (NO_2), lead and total suspended particulates (TSP). Contraventions of standards

TABLE 3.3.2
AMBIENT AIR QUALITY STANDARDS

Contaminant ①	Averaging Period	New York State Standards				CORRESPONDING Federal Standards					
						PRIMARY			SECONDARY		
		Level	Conc.	Units	Statistic ②	Conc.	Units ⑤	Stat.	Conc.	Units	Stat.
SULFUR DIOXIDE SO_2	12 Consecutive Months	ALL	0.03	PPM	A. M. (Arith. Mean of 24 hr. avg. concen.)	80	µg/m³	A.M.			
	24 - HR.	ALL	0.14③	"	MAX.②	365	µg/m³	MAX②			
	3 - HR.	ALL	0.50④	"	MAX.				1300	µg/m³	MAX.
CARBON MONOXIDE CO	8 - HR.	ALL	9	"	MAX.	10	mg/m³	MAX.	10	mg/m³	MAX.
	1 - HR.	ALL	35	"	MAX.	40	mg/m³	MAX.	40	mg/m³	MAX.
OZONE (PHOTOCHEMICAL OXIDANTS)	1 - HR.	ALL⑧	0.12	"	MAX.	235	µg/m³	MAX.	235	µg/m³	MAX.
HYDROCARBONS (NON-METHANE)	3 - HR. (6 - 9 A. M.)	ALL	0.24	"	MAX.	160	µg/m³	MAX.	160	µg/m³	MAX.
NITROGEN DIOXIDE	12 Consecutive Months	ALL	0.05	"	A.M.	100	µg/m³	A.M.	100	µg/m³	A.M.
PARTICULATES (SUSPENDED) TSP	12 Consecutive Mos.	IV	75	µg/m³	G. M. (Geometric mean of 24hr. average concentrations)	75	µg/m³	G. M.	60⑥	µg/m³	G. M.
		III	65	"							
		II	55	"							
		I	45	"							
	24 HR	ALL	250	"	MAXIMUM	260	µg/m	MAX.	150	µg/m	MAX.
	30 DAYS⑦	IV	135	"	A. M.						
		III	115	"	"						
		II	100	"	"						
		I	80	"	"						
	60 DAYS⑦	IV	115	"	A. M.						
		III	95	"	"						
		II	85	"	"						
		I	70	"	"						
	90 DAYS⑦	IV	105	"	A. M.						
		III	90	"	"						
		II	80	"	"						
		I	65	"	"						
LEAD	3 Consecutive Mos.	⑨				1.5	µg/m³	MAX.			

(1) N.Y.S. also has standards for Beryllium, Flourides, Hydrogen Sulfide and Settleable Particulates (Dustfall).

(2) All maximum values are values not to be exceeded more than once a year (Ozone std. not to be exceeded during more than one day per year)

(3) Also during any 12 consecutive months, 99% of the values shall not exceed 0.10 ppm (not necessary to address this standard when predicting future concentrations)

(4) Also during any 12 consecutive months 99% of the values shall not exceed 0.25 ppm (see above)

(5) Gaseous concentrations are corrected to a reference temperature of 25° C and to a reference pressure of 760 millimeters of Mercury

(6) As a guide to be used in assessing implementation plans to achieve 24-hour standard

(7) For enforcement only, monitoring to be done only when required by N.Y.S., (not necessary to address this standard when predicting future concentrations

(8) Existing N.Y.S. standard for Photochemical Oxidants (Ozone) of 0.08 ppm not yet officially revised via regulatory process to coincide with new Federal standard of 0.12 ppm which is currently being applied to determine compliance status.

(9) New Federal standard for lead not yet officially adopted by N.Y.S. but is currently being applied to determine compliance status

Source: N.Y.S. D.E.C., 1981

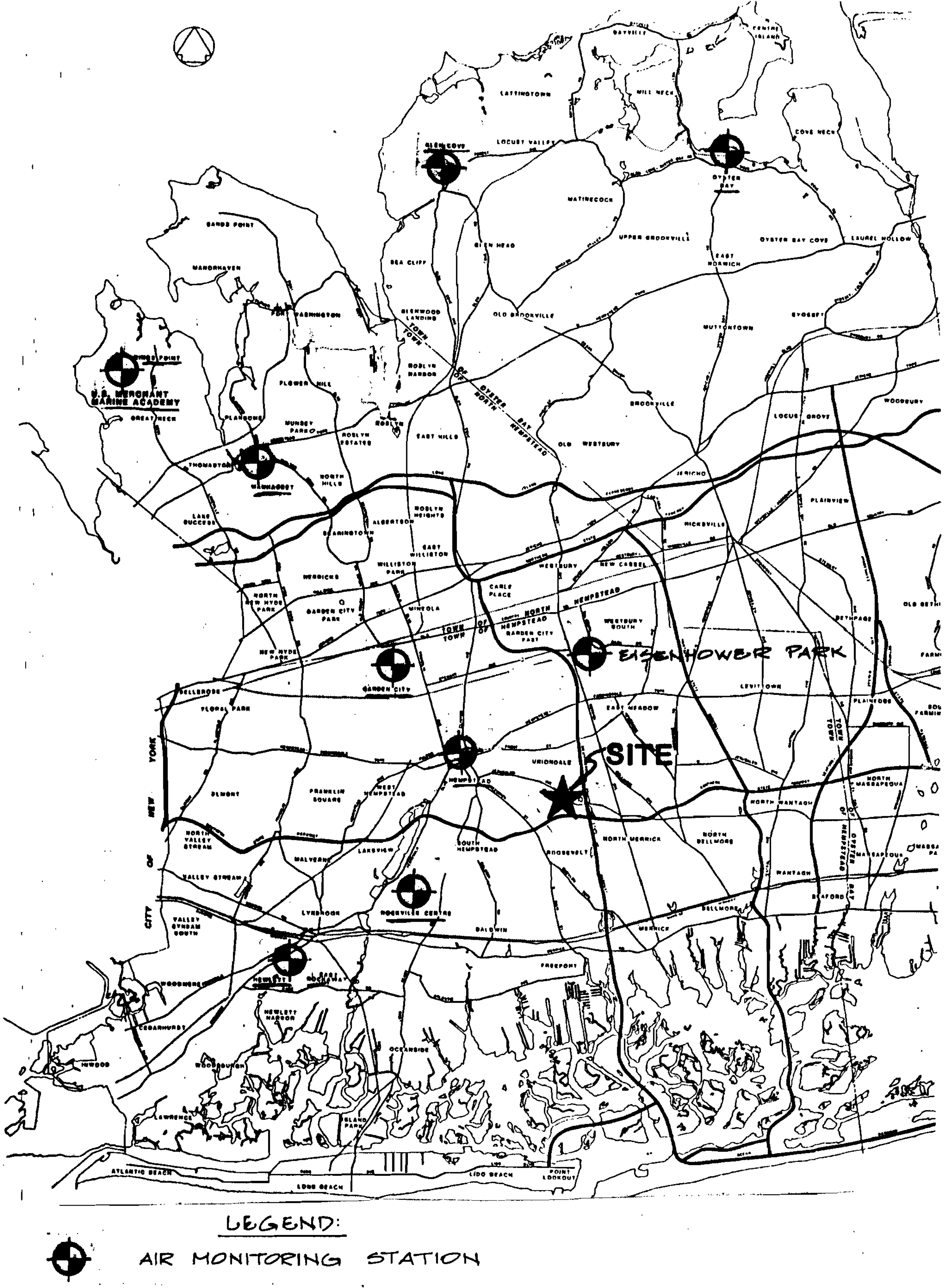

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FIGURE 3.3.3-AIR MONITORING STATIONS

occurred at Eisenhower Park for carbon monoxide (CO) (running 8 hour average) and for ozone. Eisenhower Park, which is located near an area of fairly high traffic density has always experience CO levels higher than other non-urban sites. Ozone is the most sensitive parameter in the airshed and concentrations of ozone throughout the entire Metropolitan AQCR are in violation of air quality standards.

Sensitive receptors within a half of a mile radius of the site include: Smith Street School and Roosevelt High School to the south; and Turtle Hook Junior Highschool and Patterson Home For The Aged to the west along Jerusalem Avenue.

3.4 Terrestrial and Aquatic Ecology

3.4.1 Existing Environmental Conditions

An abandoned bowling alley with meadowlands to the north and east presently exists on the proposed shopping center site. There is also a narrow bank of hardwoods containing some understory, which borders a portion of the property to the north and west of the bowling alley that has been able to progress further along in succession.

This meadowland area with its band of hardwoods comprises approximately 0.7 of an acre of a site which is approximately 10 acres in size.

There were no freshwater wetlands or other aquatic habitats located on the proposed project site. However, there is a freshwater wetlands located on the west side of the Meadowbrook Parkway running parallel with the eastern edge of the proposed project site.

The wildlife present on this site is generally limited to insects, small mammals, reptiles, amphibians and your typical birds common to this area.

3.4.2 Ecology

This section will delinate the floral and fauna of the meadowland and the wooded area as it presently exists.

This area can be classified as mainly meadowland in the state of secondary succession. Succession is a directional change that is best associated with the plant community that involves a change in the species composition with time. The fauna will follow the successional change of the plant community.

Succession may be Primary or Secondary. The difference being that primary succession occurs in areas where vegetation has never existed, such as on volcanic ash or bare rock. Whereas, secondary succession results due to a disturbance that has occurred to vegetation that was once present. Hence, an abandoned farm area would be an example of secondary succession.

A typical secondary succession pattern can be described as follows: In the first and second years annual weeds tend to dominate the newly formed community; crabgrass (Digitaria) is the principal species during the first year, with sorrel (Rumex) in the second year. During the third year such plants as goldenrod (Solidage) tend to dominate with broom sedge (Andropogon) and other grasses dominating later on (15-20 years). During this third year, pine seedlings (Pinus) become established.

The shrub stage which tends to follow this meadow stage will range from 15 to 20 years until approximately 35 years. Between

30 and 35 years the pine trees become dominant establishing the pitch pines (Pinus rigida). Following this period, the Oaks begin to move in such as white oaks (Quercus alba) and black oaks (Quercus velutina) establishing your hardwoods. In New York State, Beech-Maple seedlings begin to develop.

By 50-75 years the oaks have become the predominant hardwoods as Maple (Acer sp.) and Beeck (Fagus grandifola) have also become established.

A climax forest community of Maple-Beeck become the predominant hardwoods between 150-200 years in New York State. Therefore, what is referred as a climax community is that which is the most stable community that presently exists.

This successional pattern that has developed may not proceed as smoothly as described, because freedom from fire or other catostrophic events may set back the successional cycle, causing the forest community to return to one of the earlier stages in the successional cycle.

The project site area tends to be found predominately in a form in which goldenrods as well as other grasses tend to dominate. In addition, the stand of hardwoods tends to create what is known as the edge effect or ectone type of community, which is a meeting of the grass community with the hardwood community.

In the meadowland area there may be found, herbivore animals, (plant eating) such as small mammals, birds, some amphibians and reptiles. In addition, predator animals, which feed upon these herbivores such as birds and snakes may also be found here.

In the area where the trees are located various species of birds tend to predominate. These birds use the trees for nesting purposes as well as protection from predation.

3.4.3 Floral Inventory

A vegetation inventory was carried out on the project site. There were no federally or state listed threatened plants, but there were two protected plants listed on the site. A protected specie is one that only the owner can remove.

Protected species:

Cornus florida	Flowering dogwood
Loniceria sp.	Honey suckle

Dominant floral types observed or expected to occur on-site include but may not be limited to:

Agropyron repens	Quackgrass
Aster sp.	Aster
Solidago sp.	Goldenrod
Allium nineale	Wild onion
Rhus radicans	Poison ivy
Rannuculus sp.	Buttercup
Stellaria sp.	Chick weed
Daucus carota	Queen Anne's lace
Plantago rugelli	Broad-leafed plantain
Plantago lanceolota	Narrow-leafed plantain
Ambrosia sp.	Ragweed
Chrysanthemum leucantheumum	Field daisy
Cirsium sp.	Thistle

Taraxacum sp.	Dandelion
Oxalis sp.	Wood sorrel
Pontentilla argentea	Silvery cinquefoil
Trifolium repens	White clover
Medicago lupulina	Black medic
Senecio viscous	Common groundsel
Senecio aureaus	Golden ragwort
Verbascum thapsus	Mullen
Rosa nitida	Northern rose
Phragmites communis	Reed grass
Acer rubrum	Red Maple
Robinia pseudo-acacia	Black locust
Sassafra alibidum	Sassafras
Prunus serotina	Black cherry
Catalpa bignonioides	Common catalpa
Pyrus coronaria	American crabapple
Acer negundo	Box elder
Poa annua	Annual bluegrass
Quercus alba	White oak
Quercus velutina	Black oak
Quercus rubra	Red oak

See Figure 3.4.1 for a generalized view of the distribution of vegetative types found on the proposed project site.

3.4.4 Fish and Wildlife

The combination of wooded and meadow land areas will result in the edge effect type of habitat resulting in a diversity of wildlife animals. Due to the absence of aquatic habitats, no

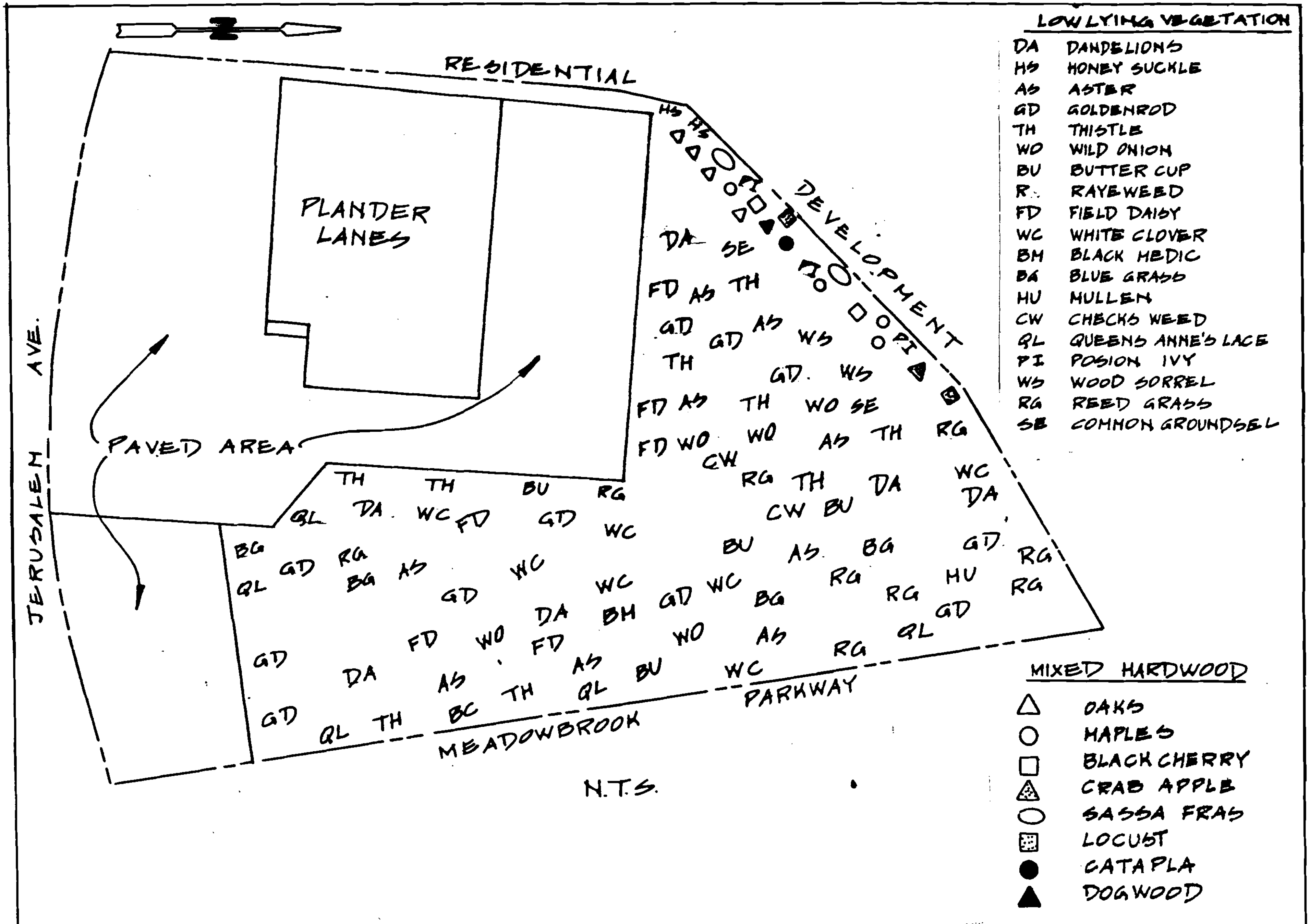


FIGURE 3.4.1-GENERALIZED VIEW OF THE DISTRIBUTION OF VEGETATEVE TYPES

fish were found on the proposed project site.

Below are listed the species observed at the project site that can be most commonly associated with these types of habitats. Population density studies were not considered on the various species of animals observed during the visitation that was made to the site.

There were no observations on the project site of endangered or threatened species as noted by the United States Fish and Wildlife Service. In addition, New York State has a listing of endangered and threatened species as well as a listing referred to as "Species of Special Concern." This category includes species native to NYS that have not yet been recognized as endangered or threatened, but they can fall into this category.

None of the species observed were on the State endangered or threatened species. In addition, certain bird species listed under special concern under the governmental Conservation Law: W-0530, were also not observed on the site either feeding and/or perching.

The following species of birds were observed as well as those that may be expected to be found on the project for roosting, nesting, and feeding:

Chardarius vociferus	Killdeer
Columba livia	Rock Dove
Zenaida macroura	Moringin Dove
Cyenocitta cristata	Blue Jay
Corvus brachyrhynchos	American Crow
Mimus polyglottos	Northern Mockingbird

Dumettella carolinensis	Gray Catbird
Sturnus vulparis	European Starling
Passer Domesticus	House Sparrow
Cardinalis cardinalis	Northern Cardinal
Carpodacus mexicanus	House Finch
Melospiza melodia	Song Sparrow

The following species of amphibian was observed that may be expected to occur at the project site includes, but is not limited to:

Bufo americanus	American Toad

The following mammalian species that may be found at the site, but are not limited to:

Sylvilagus florodanies	Eastern Cottontail
Sciurus carolinensis	Gray Squirrel
Peromyscus leucopus	Whitefooted Mouse
Microtus pennsylvanicies	Meadow Vole
Blerina brevicauda	Shottrailed Shrew
Mus musculus	House Mouse
Procyon lotor	Raccoon
Dideliphis marsupialis	Oppossum
Ratties norvepicus	Norway Rat

The reptiles species observed that may be expected to occur at the project site include, but were not limited to:

Lampropeltis triargulum	Milksnake
Thamnophis Dirtalis	Common Garter Snake

3.4.5 Wetlands

There was no freshwater wetlands located on the proposed project site. However, there is a Class II wetlands area located on the west side of the Meadowbrook Parkway and running parallel with the eastern edge of the proposed project site.

Freshwater wetlands are vital and productive areas that have many values such as:

- Acting as flood and storm control areas
- Providing wildlife habitats for the breeding, nesting and feeding grounds for many forms of wildlife.
- Acting as valuable watershed for recharging groundwater supplies and for the protection of subsurface water resources. However, the NYSDEC has stated that the Class II Freshwater Wetland near our site is primarily protected because of its vegetation content.

3.5 Human Resources

A traffic survey report was prepared for the proposed project site in June, 1988. The purpose of this report was to review and analyze the traffic impact of the proposed development. In analyzing the traffic impact of the proposed project, data on existing traffic conditions was estimated. The impact was super-imposed on existing conditions and the result analyzed. The existing traffic conditions are described in the following section.

3.5.1 Transportation

Transportation in the vicinity of the site can be divided into three categories: Transportation services, public transportation and pedestrian environment. The following sections will investigate the current setting for these three categories.

Transportation Services

The project site is located on the north side of Jerusalem Avenue, between Winthrop Drive and the Meadowbrook Parkway, and is opposite Northgate Drive (East and West), as shown on Figure 3.5.1.

In this area, Jerusalem Avenue is an east-west Nassau County arterial roadway, with two lanes of traffic in each direction and with parking on both sides. The arterial roadway services westbound commuters traveling to office buildings and the Long Island Railroad Station in Hempstead and eastbound drivers to the Southern State Parkway. The posted speed limit is 40 miles per hour. In the area of the project site, Jerusalem Avenue has a horizontal curve which presents a sight distance problem which limits the ability of vehicles attempting to leave the site from seeing westbound traffic.

To the west of the project site, Jerusalem Avenue intersects with Smith Street/Winthrop Drive at a signalized location. Winthrop Drive is a two lane roadway which provides access to a small residential area to the north of Jerusalem Avenue, while Smith Street is a two lane roadway also providing access to a primarily residential area.

To the east of the project site, N. Jerusalem Road, another east-west arterial roadway, forms a signalized Y-intersection with Jerusalem Avenue. N. Jerusalem Road also has two travel lanes with parking in each direction.

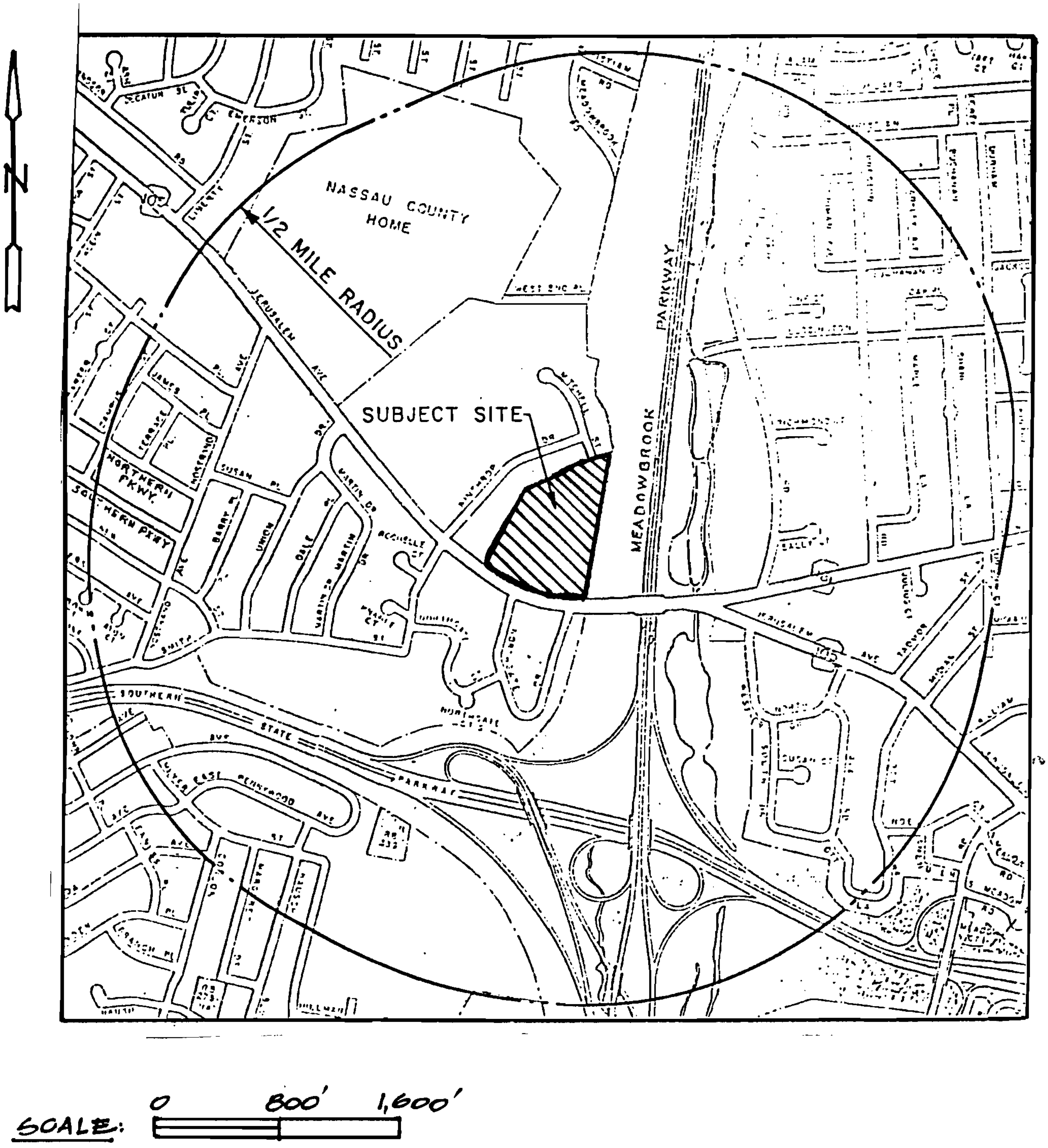


FIGURE 3.5.1–LOCATION MAP

The proposed access points to the shopping center are located opposite the two unsignalized intersections of Northgate Drive with Jerusalem Avenue. For this report, these points are designated Northgate Drive East and Northgate Drive West. Each location is proposed to remain controlled by stop signs, with a right turn lane and a left turn lane exiting the shopping center. Northgate Drive is a two lane residential roadway, with an outlet to Smith Street.

Turning movement counts were obtained for the key intersections during the morning, evening and Saturday peak hours. The summary of the traffic count on Jerusalem Avenue and Northgate Drive is on Table 3.5.1 and the summaries of all intersections are in Appendix I to this report.

Peak hours were determined to be as follows:

Morning Peak Hour	7:00 - 8:00 a.m.
Evening Peak Hour	5:00 - 6:00 p.m.
Saturday Peak Hour	12:00 - 1:00 p.m.

Public Transportation

The Metropolitan Suburban Bus Authority (MSBA) utilizes Jerusalem Avenue as means for public transportation between Massapequa and Hempstead. The MSBA N54 and N55 line has frequent stops (every other block) on Jerusalem Avenue near the site. This provides transportation for school students, shoppers and commuters. The N54 runs through the area every half hour on Mondays through Saturday and the N55 every hour on Sundays.

TABLE 3.5.1

EXISTING PEAK HOUR TRAFFIC COUNTS

JERUSALEM AVENUE AND NORTHGATE DRIVE

	8-9 AM (M - F)	5-6 PM (M - F)	12-1 (WEEKEND)
NORTHGATE DR. EAST			
EASTBOUND	343	1239	440
WESTBOUND	1114	578	355
NORTHGATE DR. WEST			
EASTBOUND	436	1237	336
WESTBOUND	1111	568	355

Pedestrian Environment

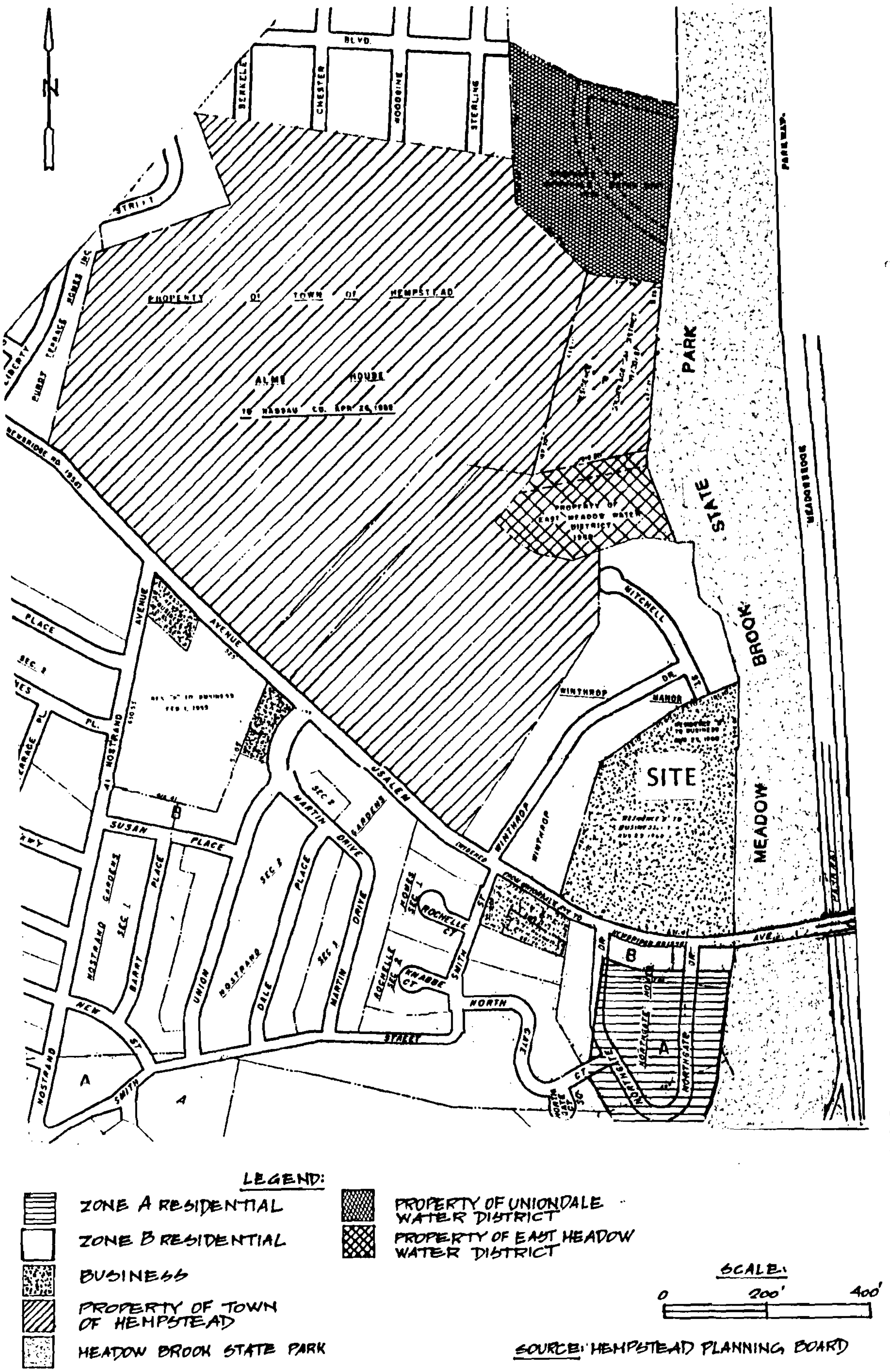
There are three major sources of pedestrian traffic within a half mile of the site; students from Smith Street Elementary School and Turtle Hook Junior Highschool, and visitors of the Patterson Home of the Aged. Currently the intersection of Jerusalem Avenue and Smith Street/Winthrop Drive is the only signalized pedestrian crossway. The combination of a large amount of pedestrian traffic and only one traffic light in the area creates a difficulty in pedestrian movement from one side of Jerusalem Avenue during peak traffic hours.

3.5.2 Land Use and Zoning

The surrounding area to the project site is designated to the following land uses: residential, business, institutional, state park and utilities. Figure 3.5.2 shows the location of these land uses in the project area.

Residential zoning is located to the immediate west and south of the site. In this area of the Town of Hempstead, the zoning is divided into two categories: "A" and "B". "A" residential zoning consists of single family dwellings which occupy 25 percent of the lot. The frontage is typically 60 feet and each lot is a minimum of 6,000 square feet. Type "B" zoning is also a single family residential district with 30 percent lot occupancy, 55 feet frontage, and a minimum of 6,000 square feet. Residential "B" is the most predominant zoning in the project area as can be seen on Figure 3.5.2. The residential density is 5 to 10 dwelling units per acre in this area.

To the west of the residential property bordering the west



SOURCE: HEMPSTEAD PLANNING BOARD

FIGURE 3.5.2-LAND USE

side of project, the land is used for institutional purposes (see Figure 3.5.2). This land became the property of the Town of Hempstead (Nassau County) on April 26, 1955. The previous owner was Alms House. The land is currently occupied by Turtle Rock Junior High School and Holly Patterson Home for Nassau County Aged and Infirm.

As can be seen on Figure 3.5.2, land north of the project site is designated for water utilities. Designated areas became the property of the East Meadow Water District and Uniondale Water District in 1958. The wells located on the Uniondale Water District property will be the source of the site's water supply.

To the east of the site, the land is used as a state park. The Meadow Brook State Park consists of wetlands and the Meadowbrook Parkway. The wetlands to the east of the site provide a natural buffer from the Parkway, which is one of Nassau County's main north-south arteries. Wetlands are also included in the park to preserve and encourage their aesthetic benefits.

The project site and a couple of areas on the south side of Jerusalem Avenue are currently zoned for business. These areas used to be zoned residential "B", but have been converted in the past as the demand for business increased. The project site was transferred to a business zone on August 23, 1960.

Due to the fact that the neighboring areas are developed and vacant land is scarce, future development in the area will be limited. The land uses of residential, institutional, and state park are effectively used and shouldn't be changed in the near future.

3.5.3 Community Services

The site is located in Uniondale School District #2. Public elementary and secondary schools within this District are Uniondale High School, Lawrence Junior High School, Turtle Hook Junior High School, Walnut St. (elementary), Grand Avenue (elementary), Smith Street (elementary), Corncl̲ia Court - California Avenue Complex (elementary) and Northern Parkway (elementary). Private schools within this district are the Hebrew Academy of Nassau County JSHS, Maria Regina High School, St. Martha and St. Pius X Prep. Seminary (boys high school). The public colleges and universities in Nassau County are the State University at Old Westbury, Empire State College, Nassau Community College, and the U.S. Merchant Marine Academy. Private colleges and universities are Adelphi University, C. W. Post, Hofstra University, Molloy College, New York Chiropractic College, New York Institute of Technology and Webb Institute of Naval Architecture.

Public libraries in the area include the Uniondale Public Library and Nassau Library System.

The police department that services the site area is the Nassau County Police Department First Precinct, located in Baldwin. The fire departments that service Uniondale are part of the Seventy Battalion with locations at: 501 Uniondale Avenue (Headquarters); Hawthorne Avenue and Webster Street; Park Avenue and Davis Avenue; and Uniondale Avenue N/O Front Street.

The hospitals located in the Town of Hempstead are Lydia E. Hall Hospital (Proprietary), Franklin General (Proprietary), Freeport (Proprietary), Hempstead General (Proprietary), Long

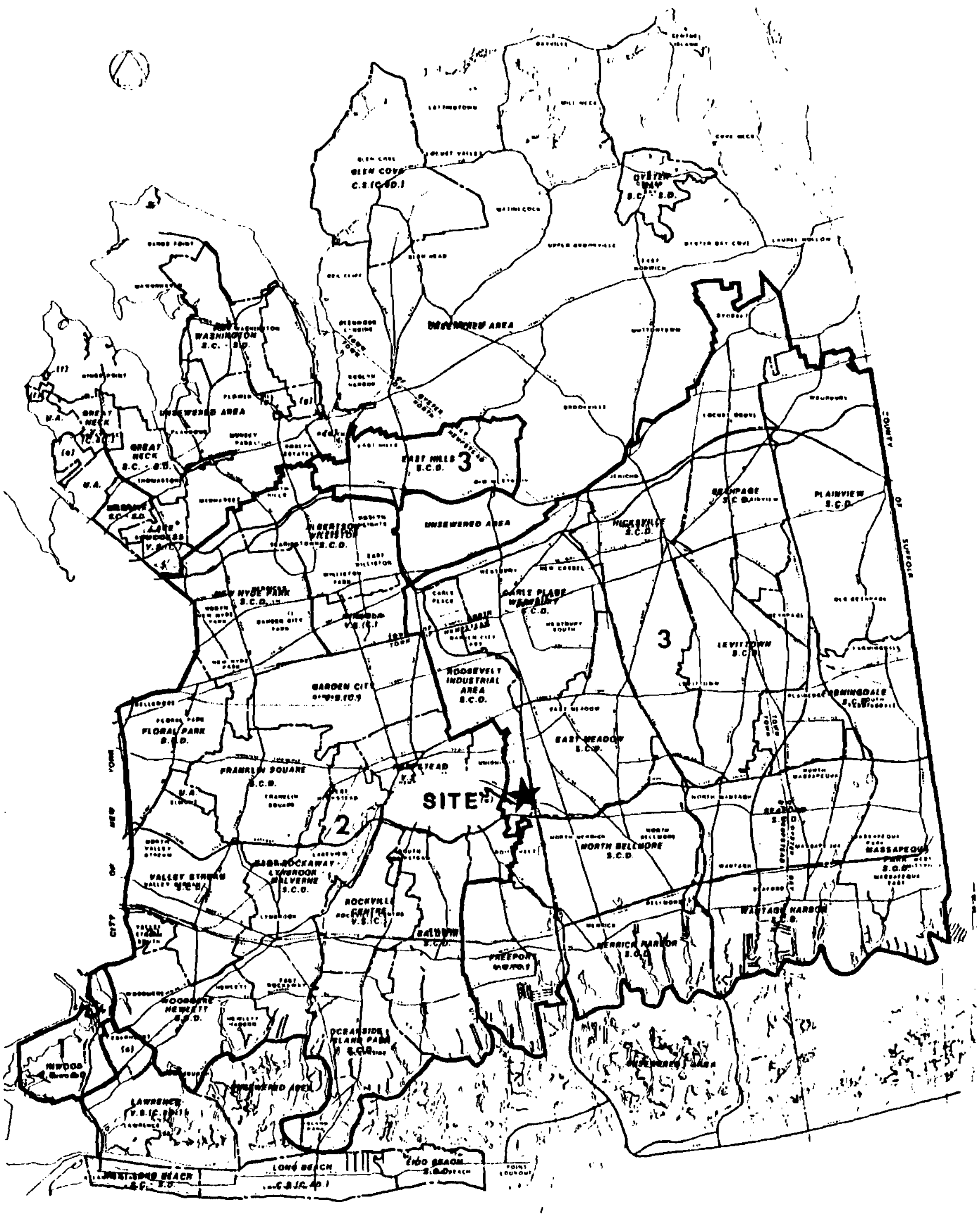
Beach Memorial (Voluntary), Massapequa General (Proprietary), Mercy (Voluntary), Nassau County Medical Center East Meadow Division (Local Government), Oceanside Gardens Sanitarium (Proprietary), and Nassau Communities Hospital (Voluntary). The closest hospital to the site is Hempstead General in Hempstead. Holly Patterson Home for Nassau County Aged and Infirm is another health care facility near the site.

The major utilities and services of the area are electricity, gas, water, telephone, sewers/wastewater disposal and solid waste disposal.

Electricity and natural gas are mainly supplied by the Long Island Lighting Company (LILCO). The LILCO Far Rockaway Power Plant is the closest source from LILCO, located approximately six miles southwest of the site. Other fuels such as oil, coal and LP gas are distributed by private suppliers.

The source of water supply on Long Island is groundwater. As discussed in Section 3.2.1 (Groundwater), the project site is located in the Uniondale Water district and would receive its water supply from wells owned by the District. The site will connect into the water main located on Jerusalem Avenue and would probably receive its water from the well field located just north of the site at the end of Hempstead Boulevard. The source of water from these wells would be the Magothy Aquifer. Uniondale, which is an unincorporated community in the Town of Hempstead, will receive its water from the Uniondale Water District, which is governed by the Town of Hempstead Department of Water.

As shown in Figure 3.5.5, the site is located in Nassau



LEGEND

2 - SEWAGE DISPOSAL DISTRICT
S.C.D. - SEWAGE COLLECTION DISTRICT
S.C. - S.D. - SEWAGE COLLECTION DISTRICT AND SEWAGE DISPOSAL DISTRICT
V.S.(C) - VILLAGE SEWER (COLLECTION ONLY)
V.S.(C.&D.) - VILLAGE SEWER (COLLECTION & DISPOSAL)
C.S.(C.&D.) - CITY SEWER (COLLECTION & DISPOSAL)
U.A. - UNSEWERED AREA

AREA IDENTIFICATION

(a) - CEDARHURST V.S.(C.&D.)
(b) - GREEN ACRES S.C.D.
(c) - ROOSEVELT - UNIONDALE S.C.D.
(d) - ROSLYN V.S.(C.&D.) (ALSO INCLUDES FALL CORP.)
(e) - GREAT NECK S.C. - S.D.
(f) - KINGS POINT (PART) V.S.(C.)
(g) - PORT WASHINGTON S.C. - S.D.

*REMAINDER OF VILLAGE OF LAKE SUCCESS IS IN NEW HYDE PARK S.C.D.

SOURCE: N.C.P.C.

SCALE:

0 6,400'

FIGURE 3.5.5-SANITARY SEWER DISTRICTS

County Disposal District Three. This Disposal District covers an area in the Town of Hempstead, North Hempstead and Oyster Bay. The site is located within the Roosevelt Industrial Area Sewage Collection District within the Nassau County Disposal District Three.

The major communications service is the New York Telephone Company, as well as other new telephone services. Other forms of communications are numerous newspapers, radio stations, major network television stations, cable television, telegraph service and post offices.

The site area in the Town of Hempstead is accessible by major highways of Long Island, such as the Meadowbrook Parkway and Southern Parkway. Hempstead Turnpike is a major local roadway located just north of the site. In addition, mass transit opportunities are abundant. Extensive bus routes have been established and the Long Island Railroad provides another transportation alternative.

Recreational sites and facilities are located throughout the project area. County, village and town parks, special historical districts, beaches, tennis courts, and golf and country clubs represent a sampling of the opportunities available. Parks offer a wide range of activities including swimming pools, beaches, ponds, lakes, ball courts, ball fields and picnicking. Major beaches in the Town of Hempstead, Jones Beach State Park, Lido Beach and Point Lookout Town Park. Wetlands offer natural recreational and educational sites. These areas possess aesthetic values and promote the study of natural history and ecology. Portions of wetlands areas are included in parks to preserve and encourage their aesthetic benefits.

3.5.4 Cultural Resources

Cultural resources include districts, sites, buildings, structures or objects which are significant in American History, architecture, archaeology or culture. The Town of Hempstead has several historic and archaeological districts, sites, buildings and structures scattered throughout its villages. Selected historic places, local landmarks and points of interest are listed in Table 3.5.2.

There are many scenic resources in the vicinity of the site. In general, the major scenic resources in the area include Hempstead Lake State Park, Baldwin Harbor Park and such features as beaches, wetlands, streams, ponds, recreational areas and woodlands.

3.5.5 Demography

The project site is located in the Uniondale Census Community. According to the latest census (1980 U.S. Census), Uniondale has a population of 20,016, distributed over a total acreage of 1,654, or approximately 12 people per gross acre. Table 3.5.3 compares census as well as projected populations through 1985. Examining the table shows a decrease in population of 9 percent from 1970 to 1980 for the Census Community of Uniondale while the Town decreased by 7.4 percent. Since 1981, LILCO estimates that the population in Uniondale is decreasing at a slow rate.

In Nassau county, the average household size at

TABLE 3.5.2

SELECTED HISTORICAL PLACES, LOCAL LANDMARKS AND POINTS OF INTEREST

TOWN OF HEMPSTEAD

Museum in the Park	East Meadow
Grist Mill Museum	East Rockaway
Belmont Park Race Track	Elmont
Woodcleft Canal	Freeport
Christ First Presbyterian Church	Hempstead
St. George Episcopal Church	Hempstead
Black History Museum	Hempstead
Rock Hall	Lawrence
Tackapausha Perserve	Seaford
Nassau County Natural History Museum	Seaford

TABLE 3.5.3

POPULATION

	1960[1]	1970[1]	1980[1]	1981[2]	1982[2]	1983[2]	1984[2]	1985[2]
TOWN OF HEMPSTEAD	767,211	834,719	772,590	768,608	762,824	760,764	760,816	760,260
UNIONDALE	20,041	22,077	20,016	20,035	19,578	19,512	19,442	19,421

(1) Figures takem from U.S. Census @ April 1, of the year shown

(2) Figures estimated by LILCO @ January 1, of the year shown

Sources: LIRPB & LILCO

January 1, 1985 was estimated to be 2.94 persons per household down from the April 1, 1980 (U.S. Census) of 8.08 persons per household. Within Nassau County, the Town of Hempstead was estimated, slightly higher than the county, to be 2.97 persons per household in 1985 (LILCO, 1985).

Although the populations given in Table 3.5.3 have declined since the 1980 Census, the total number of households has continued to rise in the Town of Hempstead (Table 3.5.4).

As the aging of America continues, the process is reflected in the Nassau County data. The median age for Nassau County rose 10.4 percent from the 1970 to 1980 Census while the nation increased 7.1 percent. Table 3.5.5 shows the age distribution breakdown in Nassau County for the 1980 Census (LILCO, 1982).

TABLE 3.5.4

YEAR ROUND HOUSEHOLDS

TOWN OF HEMPSTEAD

1980 Census	1982[1]	1983[1]	1984[1]	1984[1]
235,501	237,194	238,611	240,421	241,645

[1] Estimated by LILCO, January 1 of the year shown.
Source: LILCO, 1982, 1984, 1985

TABLE 3.5.5

1980 POPULATION BY AGE COHORT

PERCENT DISTRIBUTION

AGE	NASSAU COUNTY	NEW YORK STATE	UNITED STATES
0-4 yrs.	5.2%	6.5%	7.2%
5-9	6.1	6.7	7.4
10-14	8.2	8.0	8.0
15-19	9.7	9.1	9.3
20-24	8.2	8.7	9.4
25-29	6.9	8.1	8.6
30-34	6.9	7.7	7.8
35-44	11.7	11.6	11.3
45-54	13.6	10.9	10.1
55-64	12.9	10.4	9.6
65+	10.6	12.3	11.3

Source: 1980 U.S. Census

SECTION 4

SIGNIFICANT ENVIRONMENTAL IMPACTS

4.1 Geology Impacts

4.1.1 Subsurface Geology

The soils in the northern portion of the site were previously decribed as a nominally unsatisfactory bearing material. The project will require mitigating measures to support the foundations of the proposed structures.

4.1.2 Soil Quality and Soil Gas

Items of environmental concern from the Characterization Study were presented in Section 3. These items include: high TPHC in the top 1 foot of the existing drainage pools, the 14 existing sanitary drainpools, 3 Underground Storage Tanks (UST) and leaky lines to one UST. All of these items will require mitigating measures prior to construction.

As discussed in Section 3.1.3, the existing methane gas levels are greater than the Lower Explosive Limit for methane. Therefore, an adequate engineering design of a venting system must be employed to eliminate the risk of this impact.

4.1.3 Topography/Drainage

The majority of the 10-acre site will be re-graded. Hence, the topography and drainage characteristics will be changed. Site drainage will no longer feed the Wetlands and Jerusalem Avenue. All rainfall will be captured and recharged on site. Site drainage will be discussed further in the Water Resources Impacts.

4.2 Water Resources

4.2.1 Groundwater

The amount of water to be used at the site will be increased from past usage. In Section 3, it was stated that the bowling alley and golf range used 736,000 gallons of water in their last full year of operation (1986). The proposed project will require an estimated 6,300,000 gallons annually for domestic use. This is a substantial increase. However, it should be emphasized that the past water usage was low for a site of this size and operation; primarily because no irrigation was utilized for the golf range (this is seen by the low annual usage for the golf range, Table 3.2.4).

The expected water usage was compared to the total water pumpage of the Uniondale Water district for the past five years, to determine any significant impacts. As can be seen on Table 4.2.1, the project's expected use would have had only a .005 - .0063 increase of the Water District's annual pumpage from 1983-1987. In addition, the NYSDEC maximum one year cap and consecutive five year running average cap are both above the projected usage. Although the project's development alone doesn't appear to approach any of the NYSDEC water caps, a combination with other future projects would increase the water usage. Therefore, mitigating measures should be considered to conserve the proposed project's water use.

Long Island water table fluctuations are a growing concern (this in part is the reason why the NYSDEC has set the maximum one year and accumulated five year caps). Any fluctuations in

TABLE 4.2.1

IMPACT OF ESTIMATED WATER USE
(All Values in Million Gallons Except Where Noted)

Year	Uniondale WD Pumpage	Uniondale WD Pumpage Plus Project's Estimated Use	Percent Increase	Amount Below Maximum 1 yr. Cap[1]	Amount Below Consecutive 5 Year Avg. Cap[2]
1987[3]	1,259.91	1,266.21	0.50	72.79	
1986	1,059.39	1,065.69	0.59	273.31	
1985	1,144.47	1,150.77	0.55	188.23	55.06
1984	1,117.23	1,123.53	0.56	215.47	
1983	1,007.22	1,013.52	0.63	325.48	

---

[1] NYSDEC Maximum One Year Cap = 1,339 Million Gallons for Uniondale WD

[1] The values listed represent:
Maximum One Year Cap - (Uniondale WD + Project's Estimated Annual Use)

[2] NYSDEC Consecutive 5 Year Running Average Cap = 1,179 Million Gallons for Uniondale WD

[2] The values listed represent:
Consecutive 5 Year Running Average Cap - (Uniondale WD (1987 through 1983) + Project's Annual Estimated Use x 5)

[3] 1987 has been marked as an unusually high water usage year. Through June 30, 1988 the pumpage was 420.5 million gallons compared 588.9 million gallons on June 30, 1987.

SOURCE: Town of Hempstead Department of Water the water tables are a direct function of precipitation and recharge. Naturally, this project will have no effect on annual precipitation, but the development will affect the amount of water being recharged to the aquifer. In order to measure the benefit or impact of the development, a water balance was performed.

Table 4.2.2 is a water balance of the pre and post construction conditions at the site. As can be seen, 652,000 additional cubic feet (4,877,000 gallons) will be recharged in the ground to help resupply the aquifers in the post condition than is currently being recharged in the pre construction condition. This dramatically helps offset the difference in water usage from pre to post development--as previously discussed.

The quality of the water recharged from the post development condition will not be as clean as the predevelopment condition. This can be explained by realizing that the rainfall is landing and traveling on a parking lot before entering a drywell. The oils and greases collected become deposited in the drywell and typically get caught in the soil at the bottom of the drywell (this is because hydrocarbons are not very soluble with water). Although this is a common, often unnoticed problem, mitigation is necessary to insure that the water being recharged is as clean as possible.

4.2.2 Surface Water

The only impact to the neighboring East Meadow Brook would be in a beneficial way. The additional recharge to the immediate

TABLE 4.2.2

WATER BUDGET OF THE SITE
PRE AND POST CONSTRUCTION CONDITIONS
(ft^3/yr)

Parameter	I		P		ET		R		E		R
Pre	98,000	+	1.7×10^6	-	550,000	-	274,600	-	0	=	974,000
Post	842,000	+	1.7×10^6	-	114,000	-	170,000	-	631,700	=	1,626,000
							Net Positive Recharge from Development			=	652,000

I: Importation, Precondition based on water usage in 1986, Town of Hempstead Department of Water Post conditions estimated by Clive Samuel Associates.

P: Precipitation = 43.87 inches/yr (Section 3.3)

ET: Evapotranspiration loss due to vegetation (50%) and paving (5%). 4.2 Acres are currently paved and 10.7 are proposed.

RUN: Amount of water due to runoff off-site and puddling.

E: Exportation pre conditions are 0 because current system discharges to the ground. Post conditions are assumed to discharge 75% of imported water through Nassau County Sanitary Sewers.

R: Amount of water recharged into the ground.

area created by the proposed project will increase groundwater supplies and thereby increase the supply in the Tributary on the west side of the Meadowbrook Parkway. However, this is not expected to be a significant impact to the tributary's flow.

4.3 Air Resources Impacts

4.3.1 Climate

It is anticipated that this project is not of a size that would affect existing climatological factors such as wind and temperature.

4.3.2 Air Quality

As required by the NYSDEC, a "Carbon Monoxide Hot Spot Screening Analysis" was run to determine if the increased traffic due to the proposed project will have a significant impact on the air quality of the area. The two most critical intersections are Jerusalem Avenue and Northgate Drive West, and Jerusalem Avenue and Winthrop Drive. The computed values from the worksheets proved to be significantly below the criteria that would suggest the developer to complete a more refined process (worksheets are shown in Appendix 3). Therefore, the projected increase in traffic for the proposed project will not make a significant impact on the area's air quality.

A project of this size will typically generate dust during various phases of the construction process; creating a short-term air quality problem for workers and possibly the neighboring residences to the west. Therefore, it is advisable that mitigating measures discussed in Section 5 be executed when necessary during the construction process.

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4.3.2 Air Quality

As required by the NYSDEC, a "Carbon Monoxide Hot Spot Screening Analysis" was run to determine if the increased traffic due to the proposed project will have a significant impact on the air quality of the area. The two most critical intersections are Jerusalem Avenue and Northgate Drive West, and Jerusalem Avenue and Winthrop Drive. The computed values from the worksheets proved to be significantly below the criteria that would suggest the developer to complete a more refined process (worksheets are shown in Appendix 3). Therefore, the projected increase in traffic for the proposed project will not make a significant impact on the area's air quality.

A project of this size will typically generate dust during various phases of the construction process; creating a short-term air quality problem for workers and possibly the neighboring residences to the west. Therefore, it is advisable that mitigating measures discussed in Section 5 be executed when necessary during the construction process.

4.4 Terrestrial and Aquatic Ecological Impacts

4.4.1 Vegetation

All of the vegetation on the site will be removed. Although this is an undesired impact for many, it is necessary in order to provide the required amount of parking for the available gross leasable area (GLA). This impact will be discussed later in Section VI - Adverse Environmental Impacts that Cannot Be Avoided If The Project Is Implemented.

4.4.2 Fish and Wildlife

There are no fish that inhabit the site. In addition, there are no fresh-water streams or ponds present on the site. Wildlife was noticeably absent in the several site visits that we made. However, there is wildlife on the site as discussed in Section 3.4.2, that uses the site for migratory purposes or for habitats. This wildlife will more than likely be moved to additional adjacent areas (such as the neighboring wetland) or lost to the area permanently.

4.4.3 Wetlands

As established in Section 3.4.4, a New York State Class II Wetland exists adjacent to the eastern portion of the site. Normally Class II wetland can be protected by the State from any development within 100 feet from the wetlands. The proposed development ranges from 40 feet in the south, 100 feet in the center and 10 feet in the north off the wetlands. However, examining the site's boring data, methane readings, and past dumping into the wetland, one can argueably say that the wetlands adjacent area have experienced a considerable amount of disturbance. In addition to the obvious aforementioned disturbance of past land uses to the west, directly to the east is the Meadowbrook Parkway with its noise and air pollution. Sandwiched in between is a New York State Class II Wetland.

Reviewing this project with regulatory agencies indicates that both the NYSDEC and Town of Hempstead agree that the northern portion of the site is an area where mitigation may be necessary (where the proposed project extends 10 feet off the wetlands).

In order to mitigate the impacts they must be delineated. The most significant impacts can be described as aesthetic, noise, runoff and erosion impacts. Aesthetic impact has been determined as significant because of the potential for dumping into the wetland buffer zone from the proposed parking lot.

Noise generated from daily activities on site could cause ecological disturbance, especially during breeding.

Runoff and erosion are considered significant due to their potential adverse affect on the wetlands. Silt from erosion and oil and grease from the proposed parking area may enter the neighboring wetlands and potentially damage the wetland.

In order to develop the project as proposed, mitigating measures will have to be developed, protecting the integrity of the wetlands as they exist or as they would be protected with a 100 foot buffer.

4.5 Human Resources

4.5.1 Transportation Services

Naturally, it is anticipated that a new shopping center will increase traffic in a given area. In order to determine the significance of the impact, a traffic survey was performed. Table 4.5.1 lists the site generated traffic due to the proposed development. All of the values in the table represents the straight, right and left hand turning traffic at an intersection (see Appendix 2 - Traffic Study for the breakdown of the given numbers).

In order to fully understand the impact of the increased volumes, the level of service at each intersection is given. Levels of service range from A to F, which correspond to low delay (short if any delay) to long delay (greater than 60 seconds), respectively. Generally Level A and B are favorable, while D and F are unfavorable (complete definitions of the various levels are given on page 9 and 10 in Appendix A of the Traffic Study). Table 4.5.2 and 4.5.3 examine the levels of service at signalized intesections and unsignalized intersections, respectively.

Table 4.5.2, which lists the level of service for signalized intersections, shows that the existing condition will be unaffected by the development. This holds true for all turning conditions at these intersections.

Conversely, Table 4.5.3 shows that there will be undesired turning situations at a few locations following development; specifically turning left across traffic. As can be seen, southbound left turns are consistently at a lower level of

TABLE 4.5.1

SITE GENERATED TRAFFIC
DUE TO THE PROPOSED DEVELOPMENT

	Peak Hours		
	8-9 a.m. (M-F)	5-6 p.m. (M-F)	12-1 p.m. (Weekend)
Jerusalem Ave./Winthrop Dr.			
Eastbound	45	176	259
Westbound	41	196	287
Northbound	5	20	29
Southbound [1]	0	0	0
Jerusalem Ave./Northgate Dr. West			
Eastbound	50	196	288
Westbound	18	78	115
Northbound[1]	0	0	0
Southbound	58	275	401
Jerusalem Ave./Northgate Dr. East			
Eastbound	35	157	230
Westbound	50	196	288
Northbound[1]	0	0	0
Southbound	35	118	172
No. Jerusalem Ave./Jerusalem Ave.			
Eastbound	42	196	287
Southwestbound	25	98	144
Northwestbound	25	98	144

---

[1] Source area is so small that site generated traffic is negligable in terms of the analysis

TABLE 4.5.2

LEVEL OF SERVICE
AT SIGNALIZED INTERSECTIONS

	Peak Hour	Level of Service Existing Condition	Proposed Condition
Jerusalem Ave.- Smith/Winthrop	A.M.	A	A
	P.M.	A	A
	Sat.	A	A
Jerusalem Ave.- N. Jerusalem Rd.	A.M.	B	B
	P.M.	B	B
	Sat.	B	B

TABLE 4.5.3

LEVEL OF SERVICE
AT UNSIGNALIZED INTERSECTIONS

			Level of Service	
	Turning Movement	Peak Hour	Existing Condition	Proposed Condition
Jerusalem Ave.-Northgate (west)	SB left	A.M.	N/A	E
	" "	P.M.	N/A	F
	" "	Sat.	N/A	F
	SB right	A.M.	N/A	A
	" "	P.M.	N/A	A
	" "	Sat.	N/A	A
	NB left/right	A.M.	D	E
	" "	P.M.	D	E
	" "	Sat.	A	D
	EB left	A.M.	N/A	C
	" "	P.M.	N/A	B
	" "	Sat.	N/A	B
	WB left	A.M.	A	A
	" "	P.M.	C	C
	" "	Sat.	A	A
Jerusalem Ave.-Northgate (east)	SB left	A.M.	N/A	E
	" "	P.M.	N/A	F
	" "	Sat.	N/A	E
	SB right	A.M.	N/A	A
	" "	P.M.	N/A	A
	" "	Sat.	N/A	A
	NB left/right	A.M.	D	D
	" "	P.M.	D	E
	" "	Sat.	A	D
	EB left	A.M.	N/A	C
	" "	P.M.	N/A	B
	" "	Sat.	N/A	A
	WB left	A.M.	A	A
	" "	P.M.	C	D
	" "	Sat.	A	A

service than northbound left turns; this is explained by the poor sighting westbound when attempting a southbound turn.

It should be pointed out that poor levels of service aren't restricted to the post development conditions. Currently there are undesirable levels of service when attempting to turn left heading north out of Northgate Drive East and West. However, the expected increase in traffic due to the development only magnifies the poor level of service at these intersections. As a result, mitigating measures should be developed.

Public Transportation Impact

As mentioned in Section 3, the Metropolitan Suburban Bus Authority system runs on Jerusalem Avenue between Massapequa and Hempstead. The proposed development will undoubtedly have a beneficial impact on the project area due to the residents' need for shopping. This will aid those who are unable to travel by a more convenient means.

Pedestrian Impact

Section 3 discussed the present pedestrian environment as difficult to cross from one side of Jerusalem Avenue to the other during peak hours of traffic. This is primarily due to the fact that there is only one crossing area (Jerusalem Avenue and Winthrop) as well as two neighboring schools and Holy Patterson Home for the Aged.

The addition of the proposed shopping center will not have a significant impact on the pedestrian environment, but will increase pedestrian traffic to a degree. In light of this fact, mitigating measures should be considered.

4.5.2 Land Use and Zoning

This project will not violate any existing land use and zoning regulations. As mentioned in Section 3, the proposed project is converting from one commercial business land use to another and therefore, maintains the local ordainances.

4.5.3 Community Services

Due to the small size of the project, the impact on the community services is minimal. Such items as police, fire protection, and utilities will increase slightly, however the overall impact is very small. The impact on items such as educational facilities, health care services and social services can all be considered de minimus.

Recreational facilities will suffer a minor impact due to the loss of land, which occupied previous facilities. However, the bowling alley and golf range have been closed to the public for over a year.

4.5.4 Cultural Resources Impacts

Due to the small size of the project, it is anticipated that no impacts will be felt on the Cultural Resources within the Town of Hempstead as well as Uniondale.

However, the proposed development will have a small impact on the local noise levels in the project's area. This will primarily be due to the delivering of supplies to the food market and retail stores. This may require mitigating measures.

4.5.5 Demography Impacts

It is anticipated that a project of this size and type will not affect demography characteristics such as: population density, distribution or composition. However, the project will have a beneficial affect on the community's job market by employing 200 people during construction and 188 following the project's completion.

SECTION 5

MITIGATING MEASURES TO MINIMIZE ENVIRONMENTAL IMPACT

The following mitigating measures will be included in this development in order to reduce or avoid the potential impacts that have been identified in Section 4.

5.1 Geology

- Support the building foundations on piles.
- Removal of the top two feet in all existing drain pools on site.
- Destroy and/or remove the sanitary drainpools.
- Removal of the buried tanks by a licensed hauler.
- Methane venting system will be designed and implemented, as shown in Appendix 4.
- The proposed site elevation should be lower and adequately sloped away from the neighboring residential area. This will to provide a safe-guard from flooding the residents' area during storms greater than 2 inches per hour.
- Design an implementation of a soil erosion control program.
- Use of energy dissipation techniques prior to discharge of runoff into the wetlands during construction.
- Use of on site dry wells to collect roof runoff and discharge into the ground rather than increase surface water runoff.
- Special attention to the off site planting in the northeast corner. Implementation of a retaining wall in this area to avoid erosion.

5.2 Water Resources

- Connect to the Nassau County sanitary system.
- As mentioned previously, use of energy dissipation techniques prior to discharge of runoff into wetlands during construction.
- Use of soil erosion control techniques during construction and operation to avoid filtration of wetlands. These include hay bales, temporary restoration of vegitation to disturbed areas, clearing and grading of only one section at a time.
- Incorporate water saving fixtures into the facility design, decreasing water need above and beyond the New York State Code.
- Use of special catch basin design to capture petroleum hydrocarbons prior to recharge (see Figure 5.1).

5.3 Air Resources

- During construction, the use of proper construction techniques such as wet down to control fugitive dust emission.

5.4 Terrestrial and Aquatic Ecology

- Implementation of eight foot high stockade fence along eastern boundary to stop dumping into wetlands and to aid in noise reduction (see Figure 5.2).
- Use of one row of hemlock trees to act as a visual and noise barrier for the wetlands (see Figure 5.2).
- Two foot high curb along eastern border to stop any runoff into adjacent wetlands.
- As mentioned previously, implement an adequately designed

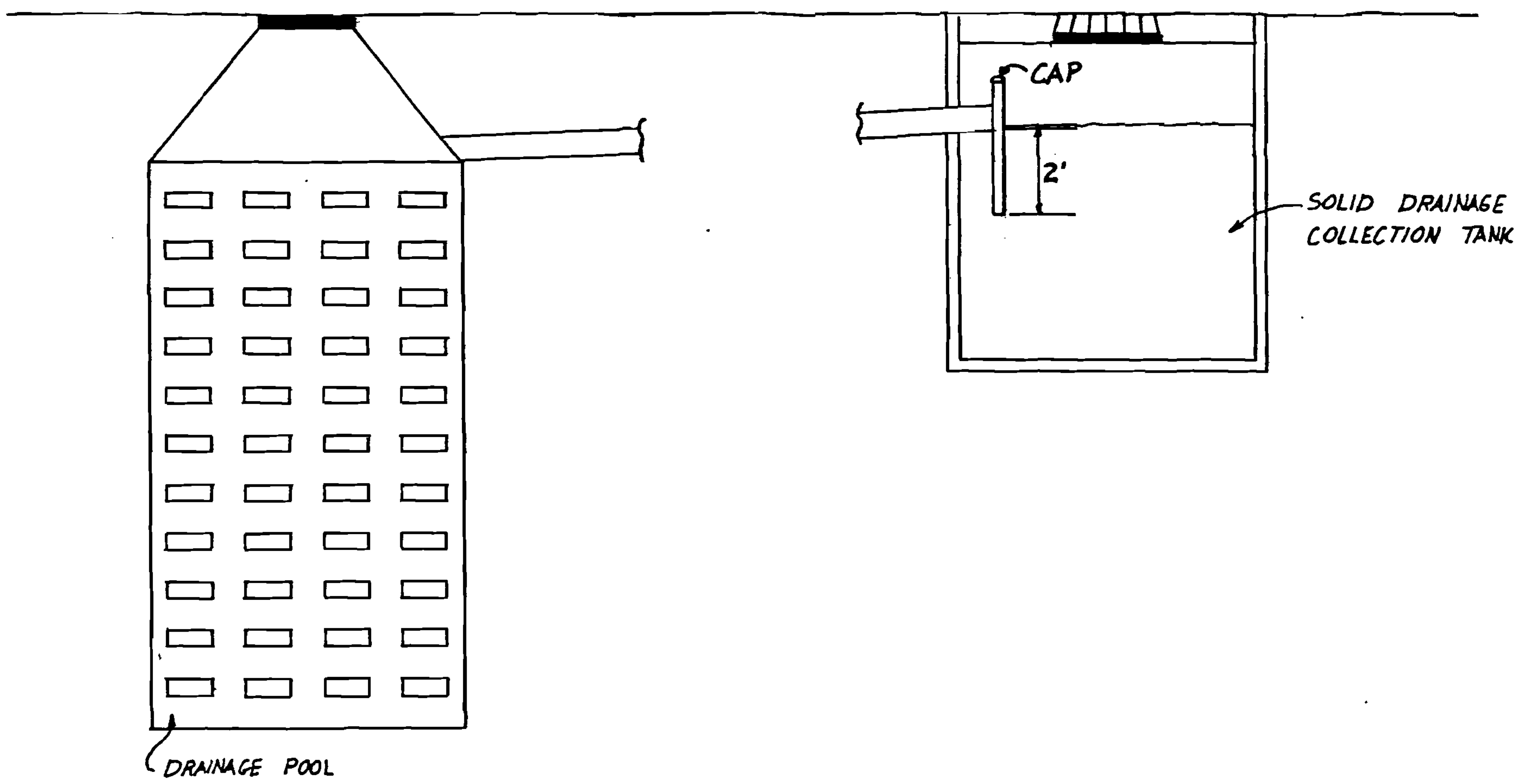
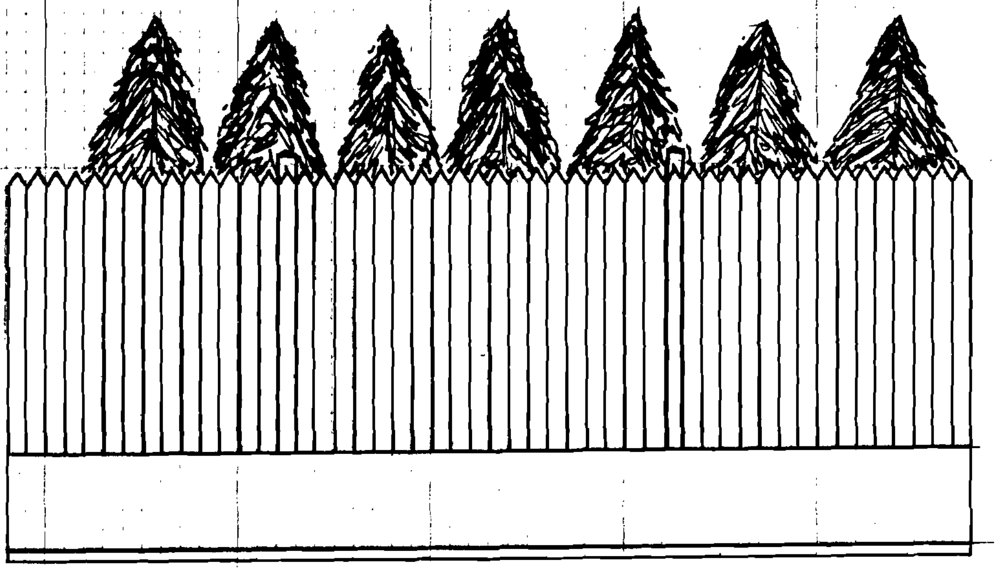
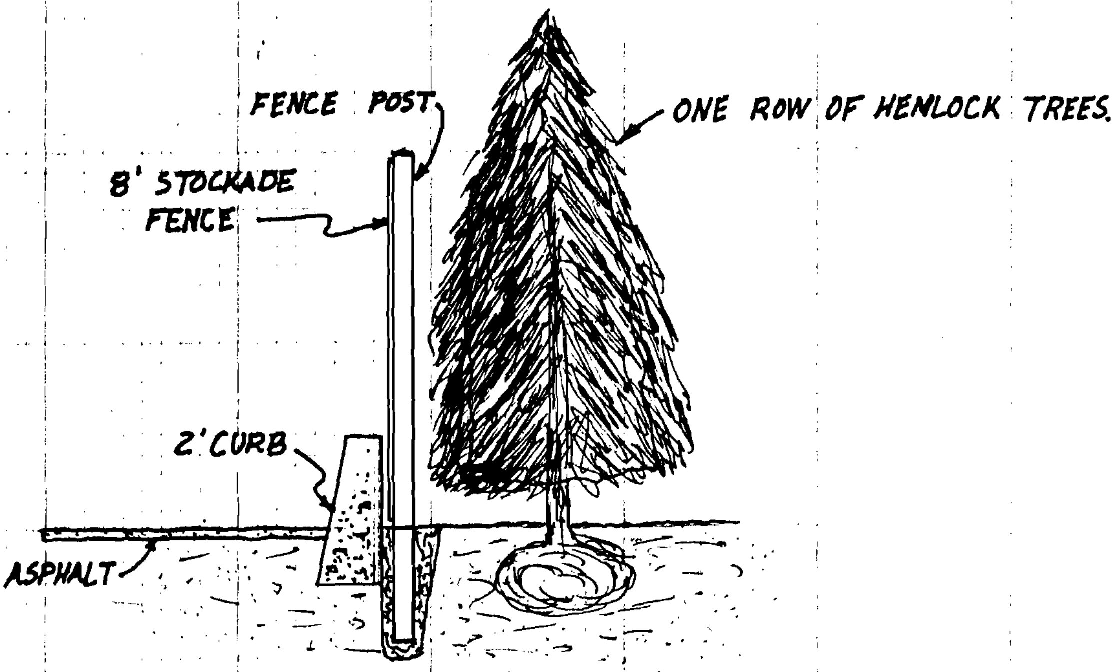


FIGURE 5.1 OIL & GREASE COLLECTION SYSTEM



PLAN



SECTION

FIGURE 5.2 VISUAL AND NOISE BUFFER FOR WETLANDS retaining wall to prevent soil erosion and siltation in the northern portion of the site. This will safely protect the wetlands near the northern border.

5.5 Human Resources

- Design adequate and safe access to project site to handle projected traffic flow.
- Installation of adequate traffic control devices; such as traffic light at east entrance of the proposed development. In addition, proper pedestrian crossing devices and walkways should be included at this intersection.
- Use of construction materials that minimize fire hazard.
- Incorporate energy saving measures into the facility design.
- Exterior lights must be directed downward toward the parking area without illuminating the adjacent residential area.
- Design buffers to be visually pleasing and to protect the surrounding land uses from the proposed project, such as: (1) plantings and (2) 8′ stockade fence along the west, north and east border of the site.
- Schedule construction operation during normal business hours to minimize noise impact and abide by Town of Hempstead Code (Chapter 144, Articles I and II).

SECTION 6

ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED IF THE PROJECT IS IMPLEMENTED

In almost every development, there are adverse environmental effects. The objective is to try and supplement the adverse effects with mitigating measures in a way to reduce their severity. The following are the adverse impacts associated with this project and their respective mitigating measures:

1. Some additional disturbance to the Class II wetlands is inevitable, however, this wetland is currently bordered by a much more adverse disturbance (the Meadowbrook Parkway) than the proposed development. In addition, the impact to the wetland has been significantly reduced by the proposed mitigating measures: implementing a retaining wall in the northern portion will eliminate erosion and siltation; a two foot high curb bordering the eastern side of the site will eliminate oils and greases from contaminating the wetlands; and the eight foot stockade fence combined with one row of hemlock trees will provide an adequate noise and visual buffer.
2. An increase in traffic in the area is inevitable. However, by implementing a traffic light, overall traffic flow will have less delays. In addition, traffic and pedestrian safety will be increased.
3. Water use at this site also has an adverse impact which is part of the proposed development. However, as shown in Section 4, the water recharged by the proposed development will almost make up for the increased use. To remove the

oil and grease from the runoff prior to being recharged, a special catch basin design was given in the mitigating section.

4. An unavoidable noise and visual impact will be felt by the neighboring residential community since all vegetation will be removed from the site. Although this is an undesirable impact, several mitigation measures are employed to reduce the impact.
   - o A concrete retaining wall will be constructed along the entire northern boundary as well as half of the western property line. This is required so that the site elevation (parking lot) is up to six feet below the resident's backyard elevation.
   - o A eight foot stockade fence will be placed on top of the retaining wall.
   - o Two rows of native shrubbery including: Hybread blueberries, Caoneaster, Ilexglabere in the first row and Junipers alternating with Viburnum in the second row. These rows will be placed behind the retaining wall for an additional buffer.

Alternative building layouts were also considered as a mitigation measure; these alternatives will be discussed in Section 7, ALTERNATIVES.

SECTION 7

ALTERNATIVES

Due to the fact that the land is privately owned, alternatives for this project are limited in scope. The alternatives investigated for the purposes of the Environmental Impact were a no action alternative, different layout alternatives and different use.

Alternative 1 - No Action

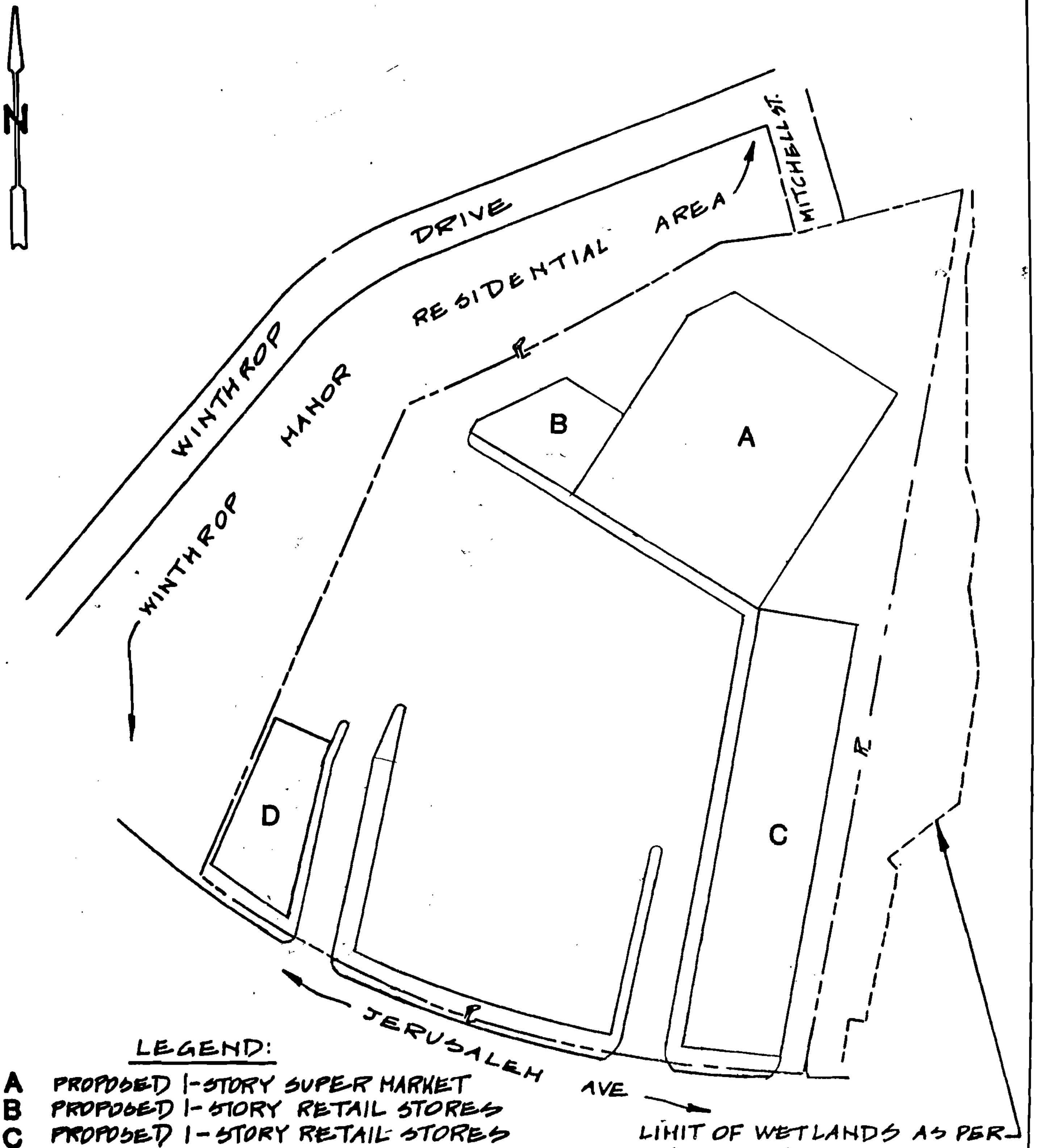
The no action alternative would keep the site in its present state. As described in the environmental study, the site has already seen the influence of man. Part of the site is being used as a local dumping area. Under the alternative, the wildlife that presently inhabits the area would benefit. However, this wildlife does not appear to be abundant or of high quality. No wild or endangered species were identified during several site visits. In addition, the property is largely undeveloped land, hence the school district is not receiving the tax benefits of the taxes for this property.

Alternative 2 - Rotation of Building

Under Alternative 3, the buildings bordering the western side of the site will be moved to the eastern side of the site as seen in Figure 7.1. This will affect the impacts in the following way.

Aesthetic Impact

- The tree buffer to the west will be removed due to the fact that there will be no truck deliveries in this area. This will cause the neighborhood on the western boundary to overlook the parking lot which has its own noise impact even at odd hours; such as young adult misuse (i.e. screaching of tires and drinking at late hours). The proposed design has building C serving as an



LEGEND:

A PROPOSED 1-STORY SUPER MARKET
B PROPOSED 1-STORY RETAIL STORES
C PROPOSED 1-STORY RETAIL STORES
D PROPOSED 1 STORY RETAIL STORES

APPROX. SCALE: 1" = 145'

LIMIT OF WETLANDS AS PER N.Y.S.D.E.C. & TOWN OF HEMPSTEAD DEPARTMENT OF CONSERVATION & WATERWAYS

F,P&M FIGURE 7.1 -ATERNATIVE 2 SITE PLAN additional buffer to any off hours disturbance in the parking area. By moving building C under this alternative to the eastern side of the site, this noise buffer will be eliminated.

- The residents along the western portion of the site will benefit from the fact that no delivery trucks will be loading and unloading between building C and the property line.

Methane Impact

- Under this rotation, buildings A and B will still be present over the high methane concentrated area as in the proposed design. Therefore, the remediation steps for the proposed design will be required for this alternative. In essence, this alternative does not benefit the methane impact.

Drainage Impact

- Under this alternative, the drainage of the site will not be significantly changed from the proposed layout.

Wetlands Impact

- Alternative 2 has the greatest impact on the wetlands. The southern portion of the site will suffer because of the rotation of building C along the eastern border of the site. The noise from the truck delivery will increase and the light shining on the delivery areas will also increase the impact in this area. However, in the southern area, the distance to the wetlands boundary is greater than in the northern portion of the site.
- The northern portion of the site will have the same impact as discussed in the prior sections of the report because building A and B will remain as in the proposed design.

Traffic Impact

- Under this alternative, the traffic levels will not be adversely changed from the proposed development. However, the positions of the entrance/exit locations are relocated, posing a particular problem with the alignment for the recommended traffic signal at the east entrance.

  This will be an undesirable situation for traffic flows and may be an increased hazard for pedestrian traffic. Governing Agencies may object to these conditions.

Alternative 3 - Different Use

The final alternative is changing the use of the land. During the Environmental Impact Statement Scoping Meeting, held on June 23, 1988, Uniondale neighborhood support groups expressed concern of losing the previous recreational facilities. The alternative of a fitness center was introduced by the support groups.

In today's era, a recreational facility such as a tennis/racketball fitness center would not eliminate or benefit the impacts on the proposed site location. For instance, the water usage for a recreational facility would be astronomical when compared to the proposed project. This is largely due to the locker rooms and their showers. Without question, this would have a large impact on the already sensitive NYSDEC water cap issue.

Other impacts developed and discussed in this report would still exist; wetlands, methane, visual and noise on the residential community, and traffic impacts would all still be present in a similar form.

These facts, combined with the developer's propensity to provide the community with a shopping center complex, make this alternative undesireable.

Conclusions

Each alternative showed some advantages and disadvantages in comparison to the proposed design. However, the proposed project with its mitigating measures, is a plan with clear overall advantages as follows:

1) Traffic

- With the addition of a traffic light at the eastern entrance of the proposed development, both the automobile and pedestrian traffic will benefit. This light will allow traffic to flow at a uniform rate without long delays for the customers leaving the development. In addition, the traffic light will increase the safety conditions for the pedestrians trying to cross Jerusalem Avenue.

2) Methane

- The design alternative presented in Appendix 4 safely vents all of the methane gas generated under the buildings and parking lots. Without this venting procedure, any development may be more dangerous than the present condition of the site; by paving the site without venting the methane gas, the gas may build up and migrate to the path of least resistance. In other words, the gas will migrate laterally to the residential community--to the north and west of the site.

3) Wetlands

- The runoff will be controlled as explained in the mitigating measures. This will prohibit oil and grease runoff from flowing into the wetlands.

- The visual and noise impacts will be remediated by an eight foot high stockade fence and one row of hemlock trees.

4) Aesthetic

- The proposed project has buildings near the adjacent residential community to the west and north of the site. These buildings provide a buffer to the parking lot area. Shopping centers are often characterized by noise disturbances such as young adult misuse.
- Noise and visual impacts will also be reduced by implementing the 8′ stockade fence and one row of hemlocks.

SECTION 8

IRREVERSIBLE AND IRRETRIEVABLE COMMITTMENT OF RESOURCES

A project of this size is so small that only the following natural and human resources will be consumed, converted, or made unavailable for future use. These include resources such as: the fuel necessary to construct the center, the wood and other raw materials that would be used in the construction of the center, any labor that is utilized for construction, and the groundwater supply (from the Uniondale Water District) that will be consumed by this development on a daily and annual basis.

SECTION 9

GROWTH INDUCING ASPECTS

Since the size of the project is so small and in an area that is already almost completely growth saturated, the growth inducing aspects of the project are minute. All of the school districts, fire districts, and police districts are well established and can handle the new development without expansion.

SECTION 10

EFFECTS ON THE USE AND CONSERVATION OF ENERGY RESOURCES

This project will be built in accordance with the New York State Energy Code and, as such, will be the most advanced construction for the use of saving energy throughout the life of the project. Energy sources for this development will undoubtedly be LILCO for electricity and oil for heating. The effects of this shopping center project on the overall oil and electric budget for Uniondale, the Town of Hempstead and the County are minuscule.

SECTION 11

REFERENCES

REFERENCES

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SECTION 12

APPENDICES

APPENDIX 1

- SITE CONTAMINATION STUDY
- SUPPLEMENT - SAMPLING PROGRAM
- AMENDMENT #1
- AMENDMENT #2

SITE CONTAMINATION STUDY

UNIONDALE

PREPARED FOR

REALCO

OCTOBER 14,1986

fanning, phillips & molnar
ENGINEERS
PLAINVIEW NEW YORK

TABLE OF CONTENTS

SECTION 1

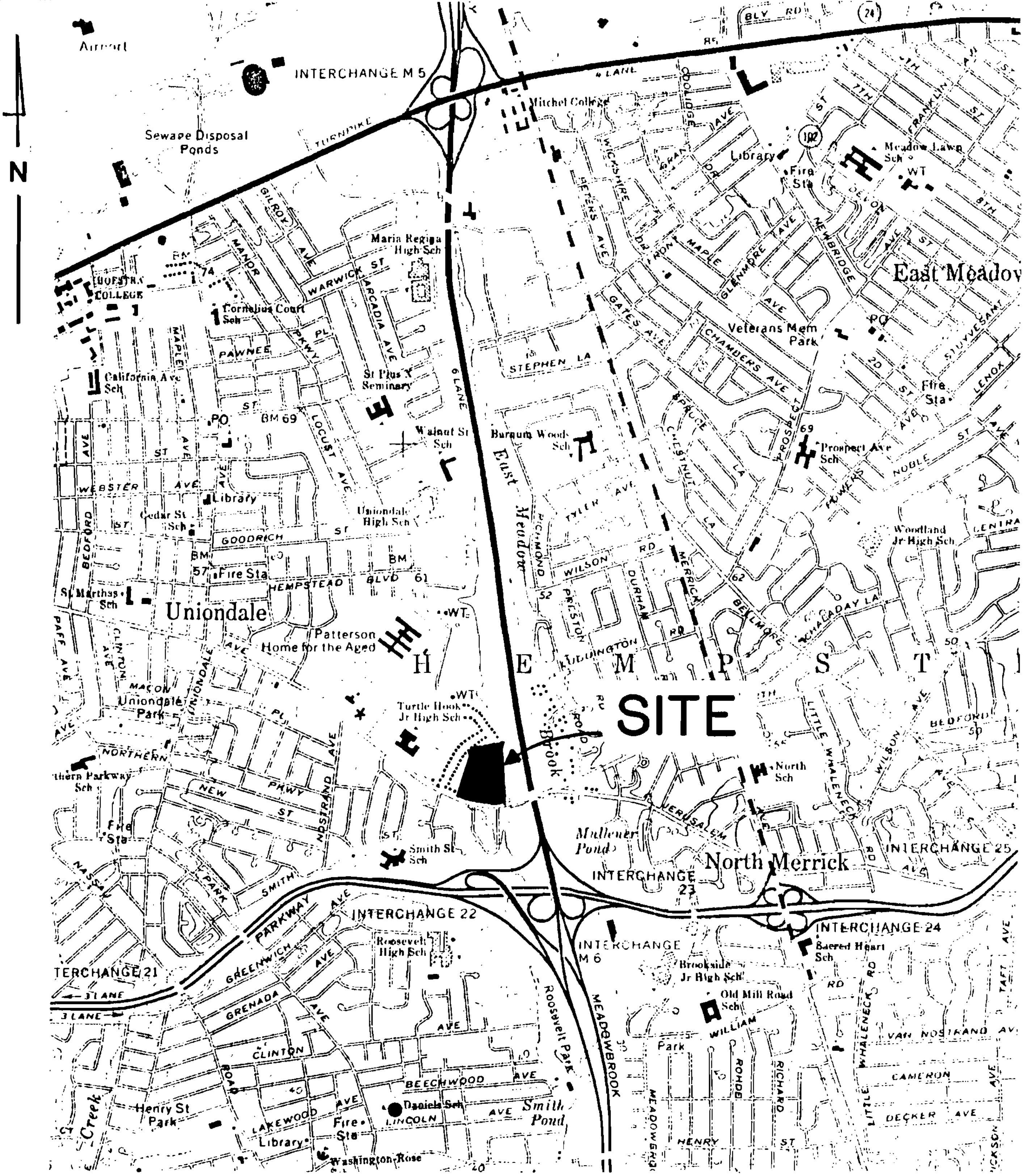
Site Visit

An initial site visit took place on September 29, 1986. It was a sunny day with temperatures in the 70's. The site area is located at 1121 Jerusalem Avenue, Uniondale within the County of Nassau (see Figure 1.1). A bowling alley and golf driving range are the present land uses at the site.

A base map was prepared and functioning businesses were located. Refer to Figure 1.1 for Site Plan.

Location and Identification of Potential or Past Storage or Spillage of Toxic Materials

- Figure 1.2 shows locations of potential sources of toxic material.
  - o Fourteen subsurface sanitary pools were located. The bowling alley and golf range evidently never connected to the sewer main located along the sidewalk, south of the site. If true, it represents a violation of the Nassau County Health Code. These pools are potential receptors of toxic material and other wastes disgarded in sinks and toilets within the building.
  - o A buried 3,000 gallon functioning oil tank was identified in the southeast corner of the bowling alley. This tank has the potential to leak its product into the ground and groundwater. By State law, it must be tested, and eventually it must be removed and replaced by a corrosion-resistant tank with secondary containment.



Scale

1" = 2000'

SOURCE:USGS

FIGURE 1.1 - SITE LOCATION

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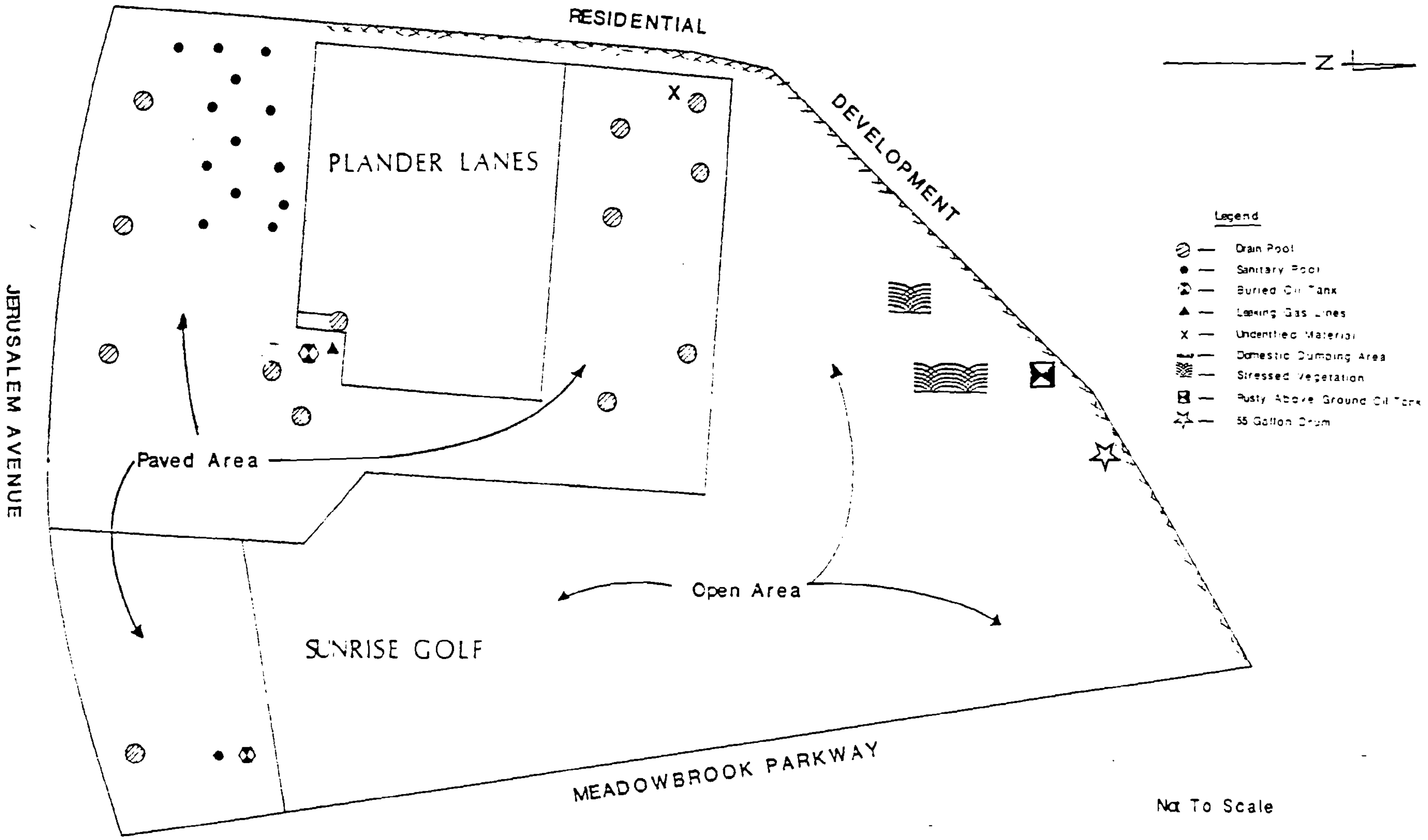


F,P&M

FIGURE 1.2 - SITE PLAN AND LOCATIONS OF POTENTIAL CONTAMINATION

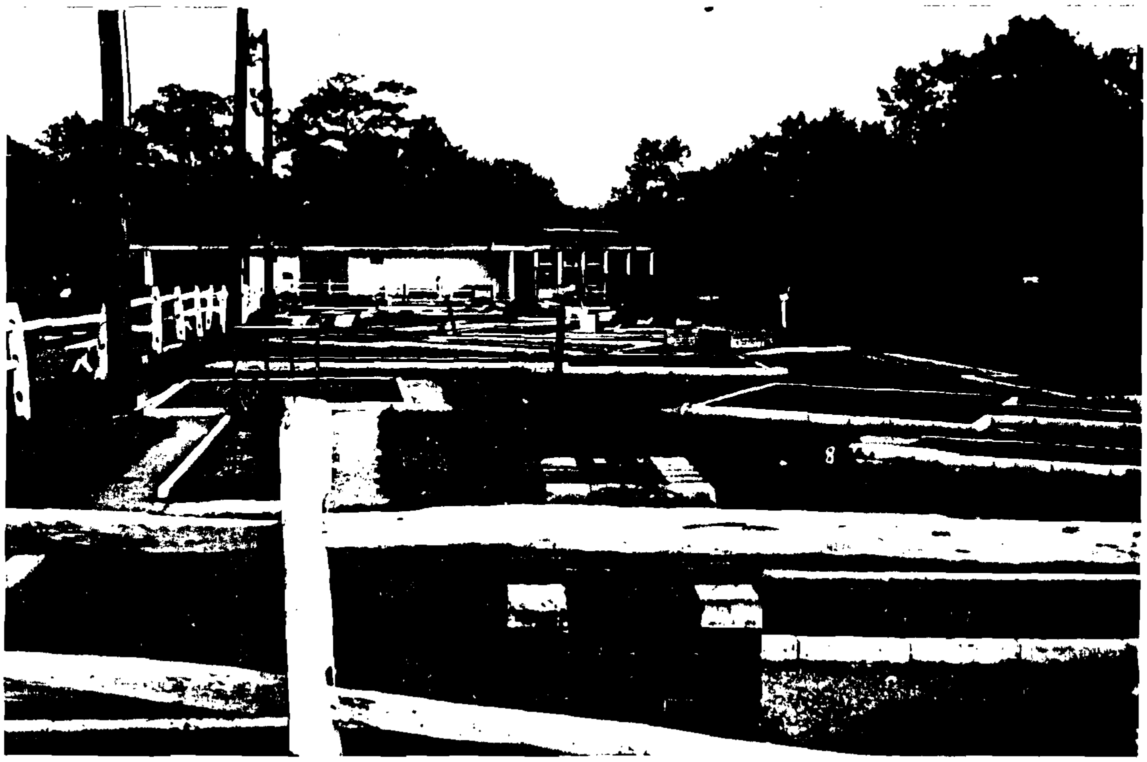
- A buried tank exists next to the septic pool near the pro shop of the golf driving range.
- Leaky gas lines are located near the buried oil tank. Explosive potential due to characteristics of gas.
- All drain pools are pooled with water indicating clogging, poorly drained soils or high water table.
- In the rear of the parking lot of the bowling alley an abandoned car and a heavily oil stained pavement area at the least indicate chronic oil dumping. This area drains directly into drain pools that have a direct connection to the aquifer.
- Unidentified brownish soft solid located in rear parking lot of bowling alley. Stain on pavement indicates leaching of material into drain pool nearby.
- Along the west border of the site, excessive amounts of domestic dumping from residence to the west of the fence. Gas tanks, paint cans, etc. were found.
- Throughout the middle and northern boundary of the site (behind the bowling alley), evidence of recent and past dumping was observed. Irregular land elevations of site indicates past landfill practices.
- Stressed vegetation in northern sections of the site area suggests limitations to root penetration and/or differing chemical properties of underlying soils.
- Large abandoned rusty tank located in the middle of the north boundary of the site.
- 55 gallon drum located to the east of the rusty tank.

SECTION 2

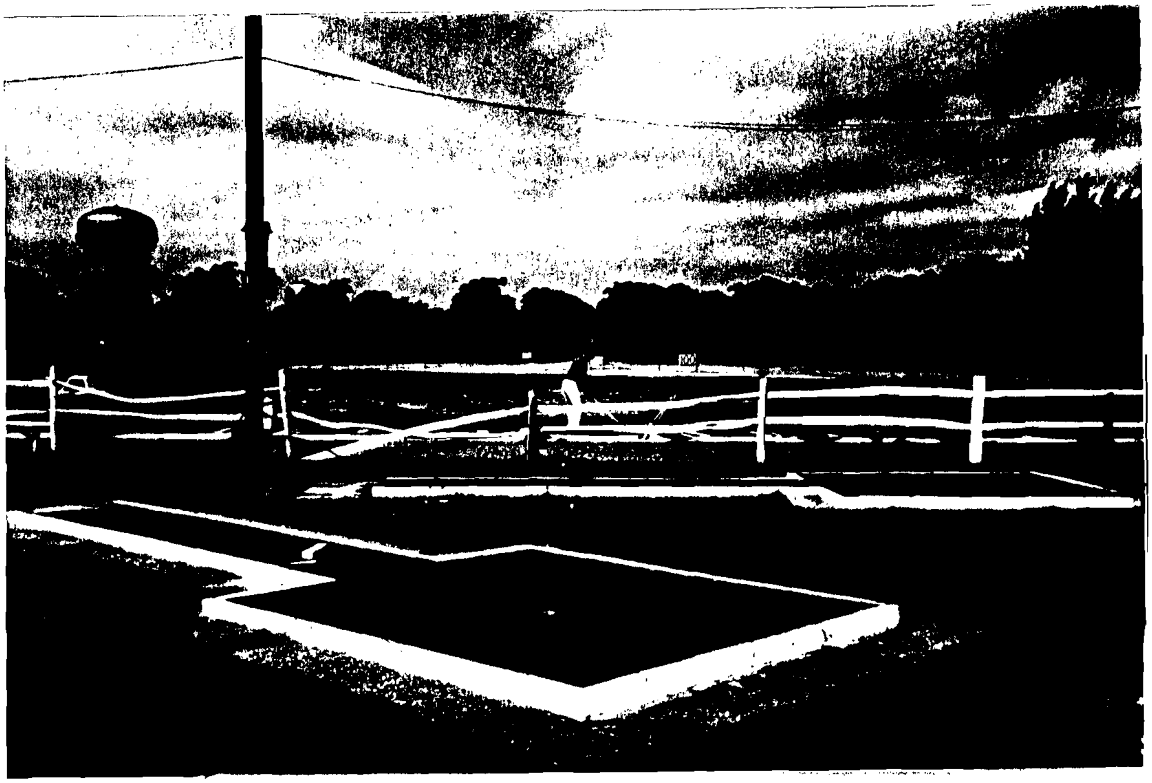
Photo Log

A photo log was taken of the site to characterize the present status of the land. Each picture was taken for a specific reason. That reason is explained below the picture.

#1- View of site area from the southeast corner showing present land use. (Plander Lanes bowling alley on left and miniature golf/driving range in center and right).



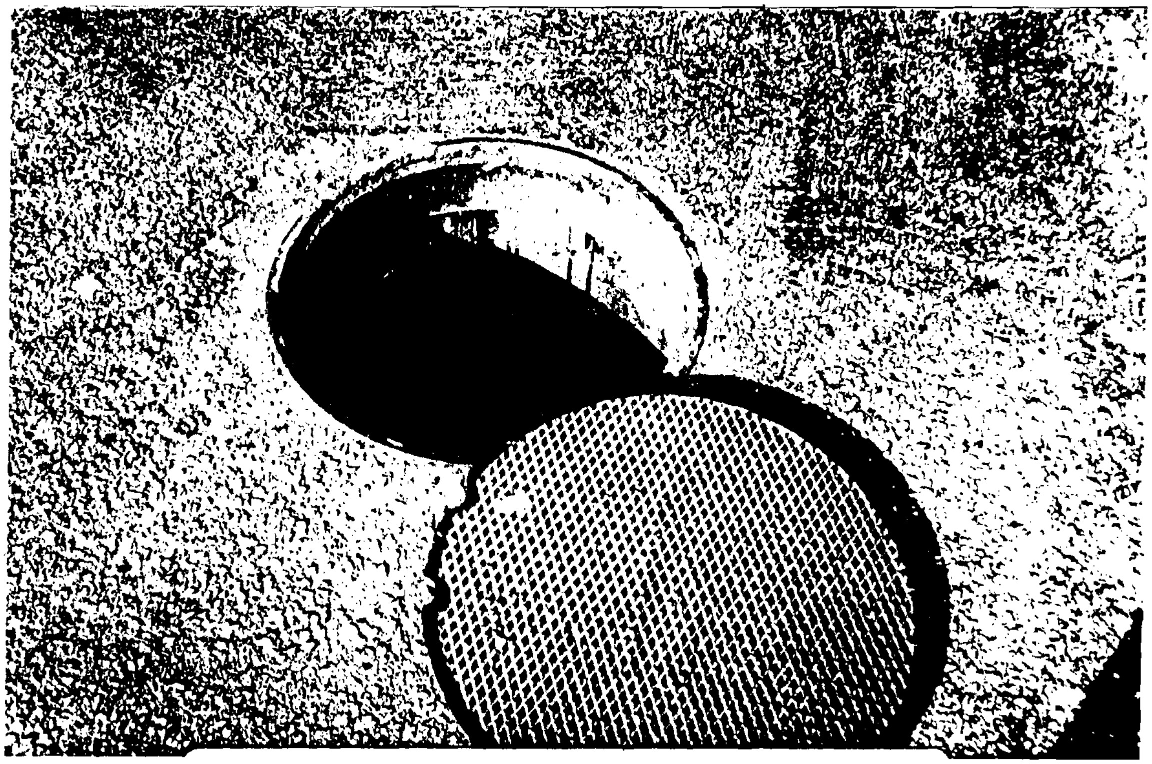
#2- Picture showing southeast corner of site (miniature golf/driving range).



#3- Golf driving range in use. No environmental hazards observed here.

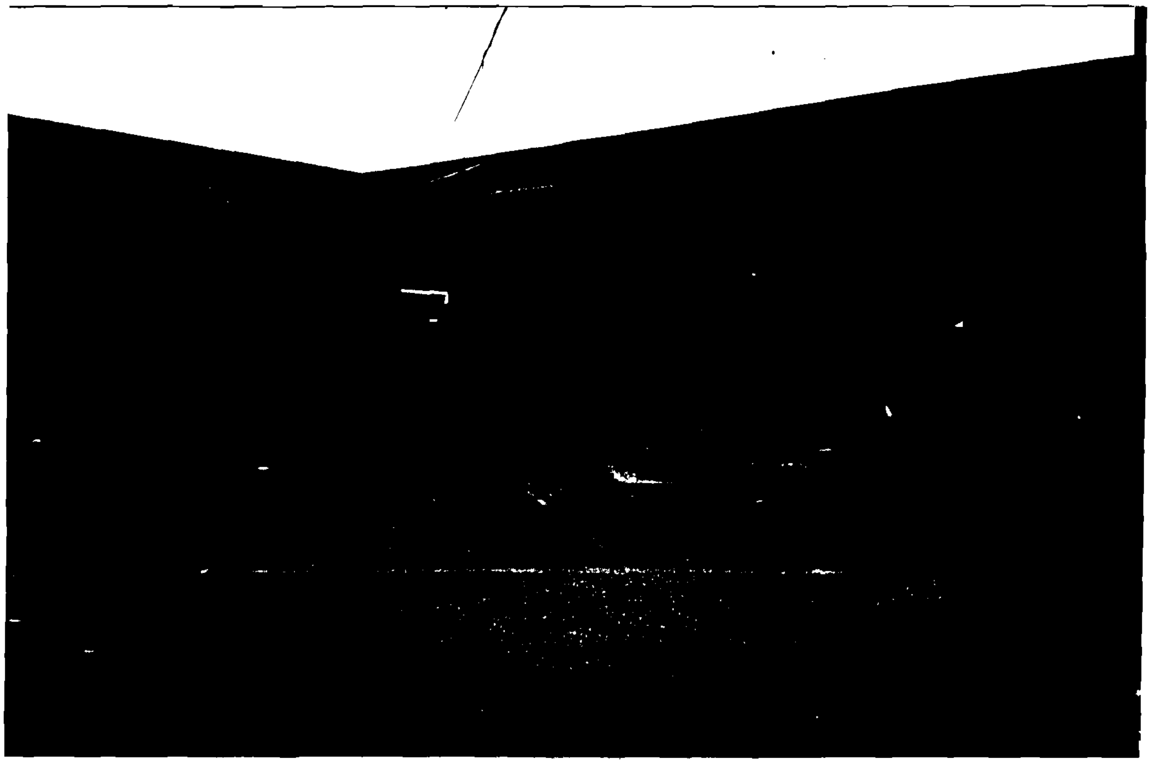
#4- Front parking lot of Plander Lanes bowling alley. Note the sample pool #1 in center of photo. High OVA/GC peaks were recorded here.

#5 - Front parking lot of Plander Lanes bowling alley. Note the sample drain pool #2 in center of photo. High OVA/GC peaks were recorded here.



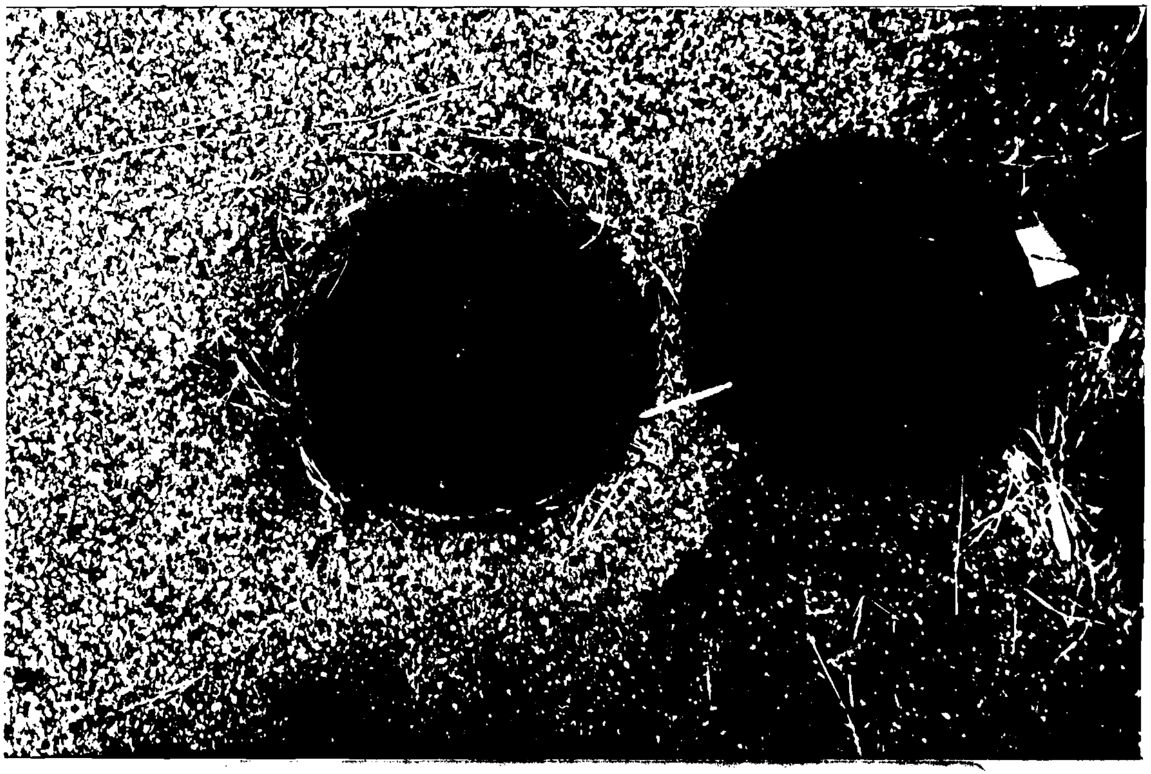
#6- Sanitary pool located in front parking lot of bowling alley. No connection to Nassau sewer.

#7- The west side of the bowling alley. Photo shows thick vegetation and domestic dumping from residential land to the left of the fence.



#8- Southeast corner of Plander Lanes bowling alley. Photo shows air conditioner, garbage dumpster, and newly tarred asphalt where 3,000 gallon oil tank is buried (center).

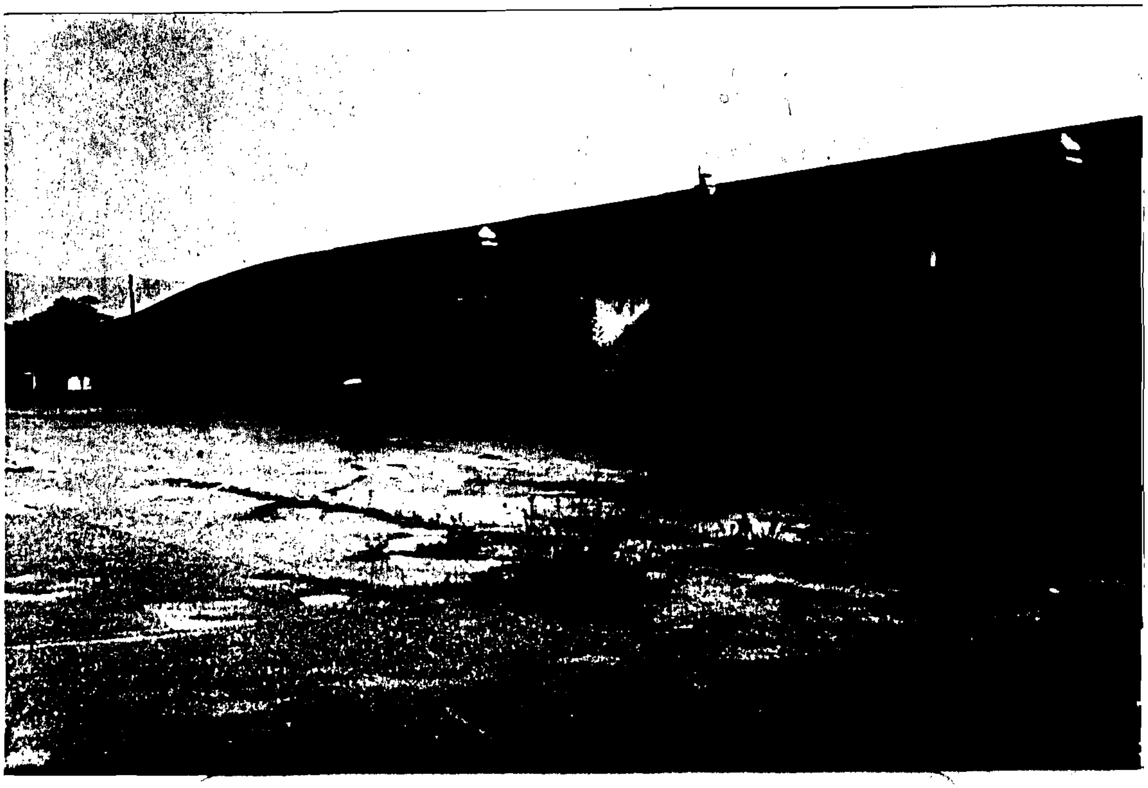
#9- Closer view of southeast corner of bowling alley. Picture shows cap to buried oil tank in center of photo and newly tarred asphalt. Also in mid-right of photo, cover to leaky gas lines.



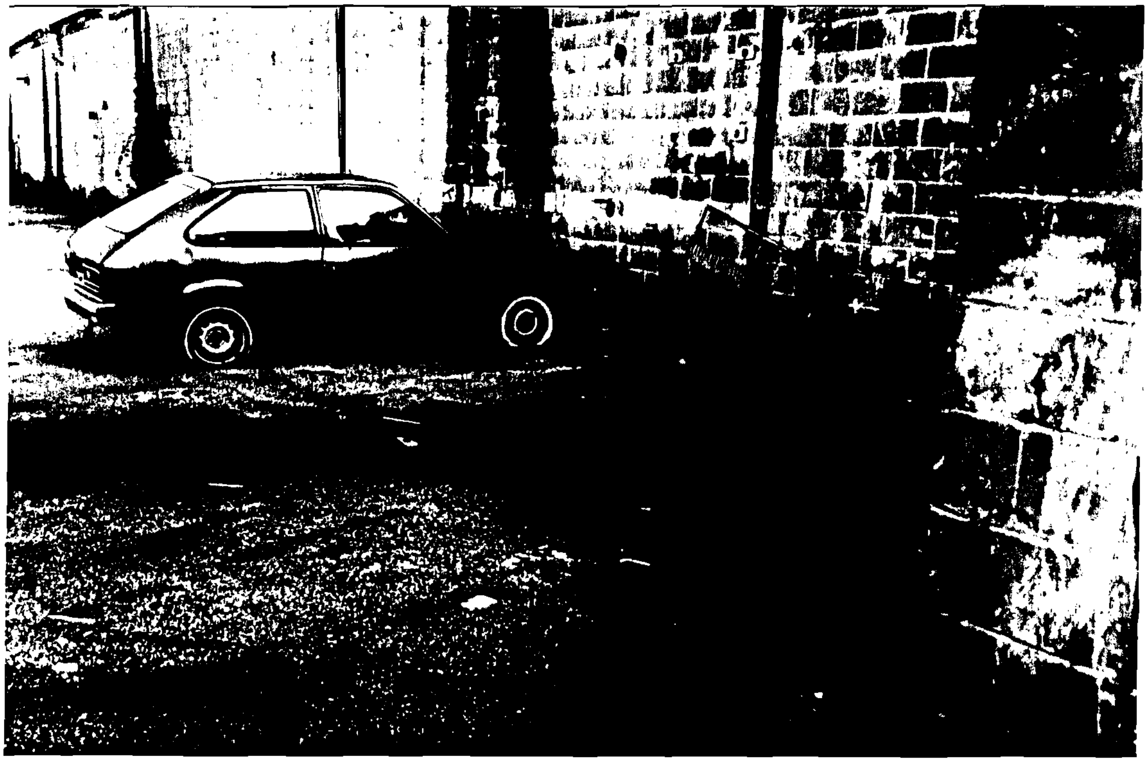
#10- Leaky gas line on southeast corner of bowling alley.

#12- East border of bowling alley-parking lot and west border of golf driving range. Area appears to be clean.

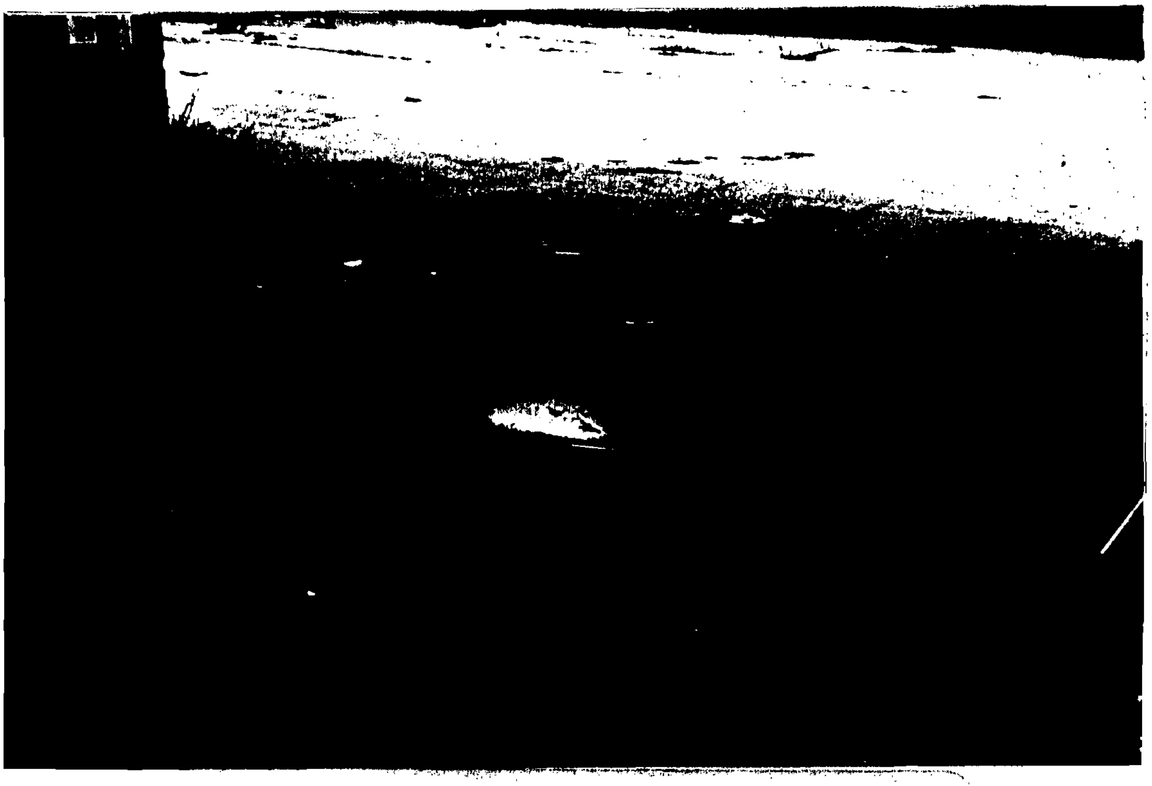
#11- Clogged drain pool at bottom of stairs, on southeast corner of bowling alley.



#13- Rear of Plander Lanes bowling alley. Note the abandoned car in center.

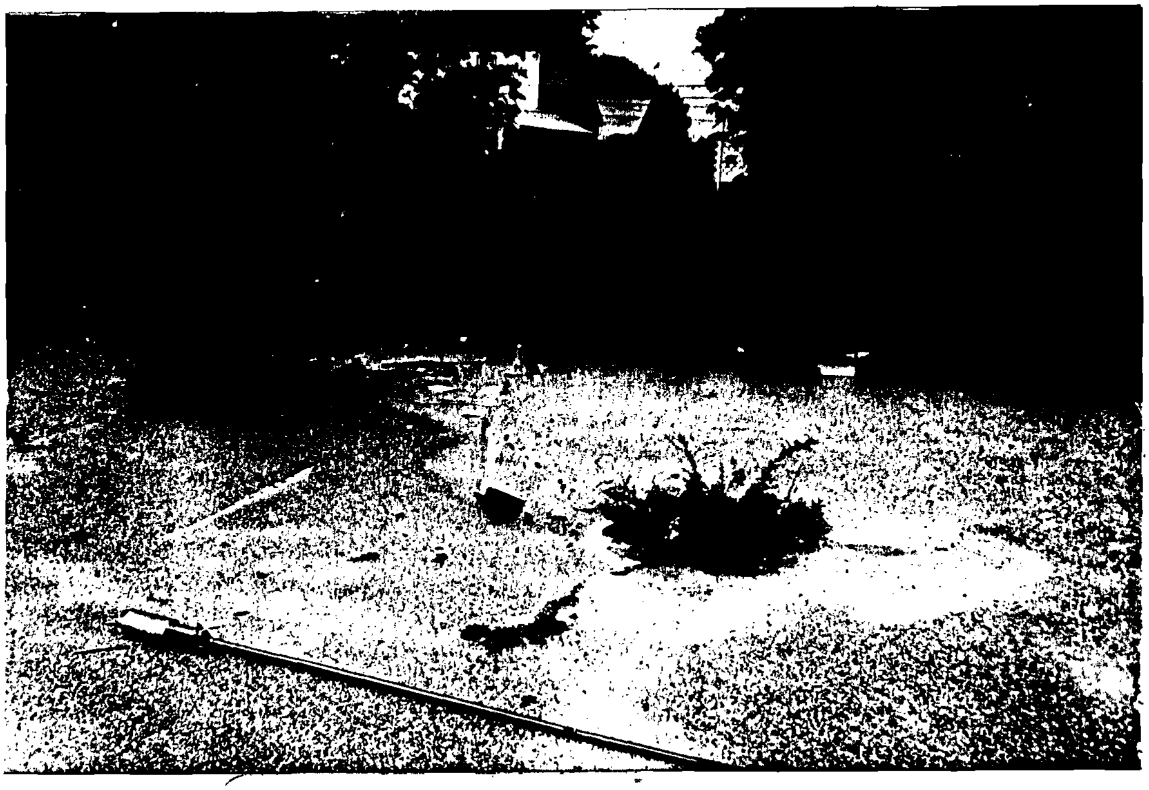


#14- Closer view of car and oil stained asphalt. Evidence of dumping on right of photo.

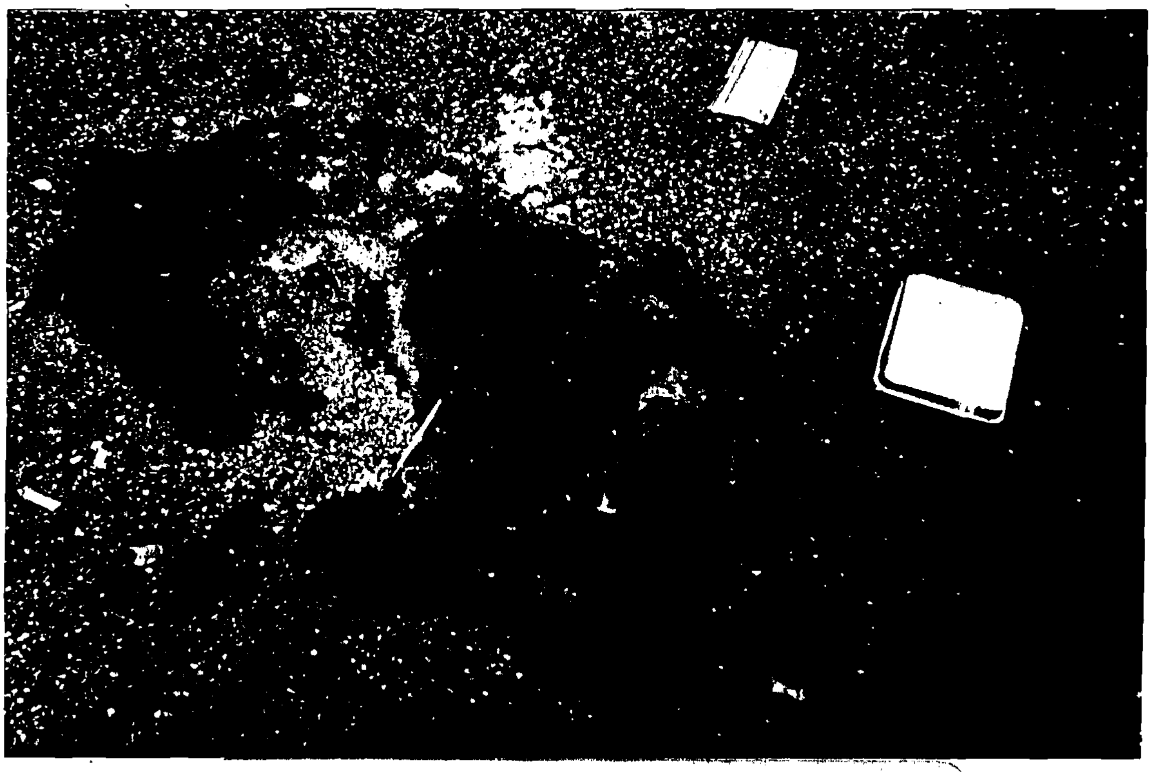


#15- Closer view of oil stained pavement in rear of bowling alley.

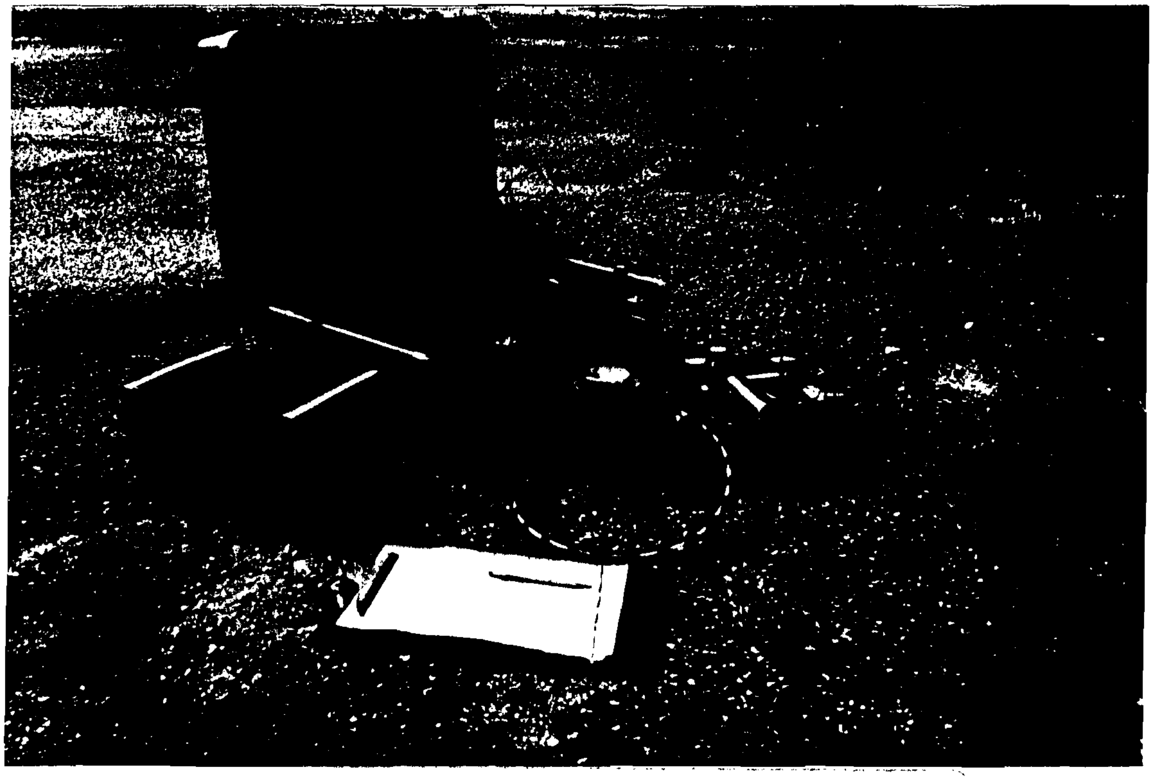
#16- Evidence of dumping in rear of bowling alley.



#17- Drain pool sampling location #6. Note the staining of the asphalt leading to the pool. This staining appears to be originating from an unidentified substance in mid-left of photo.



#18- Closer view of unidentified substance on asphalt. A sample of this was taken to the laboratory to be analyzed for EP Toxicity.



#19- Photo shows OVA/GC operation on sediment sample.

#20- Site area behind bowling alley and to the east. Note the differing elevation of the landscape in the center of the photo.

#21- Puddles of water located in rear parking lot of bowling alley indicating improper drainage of drain pools.

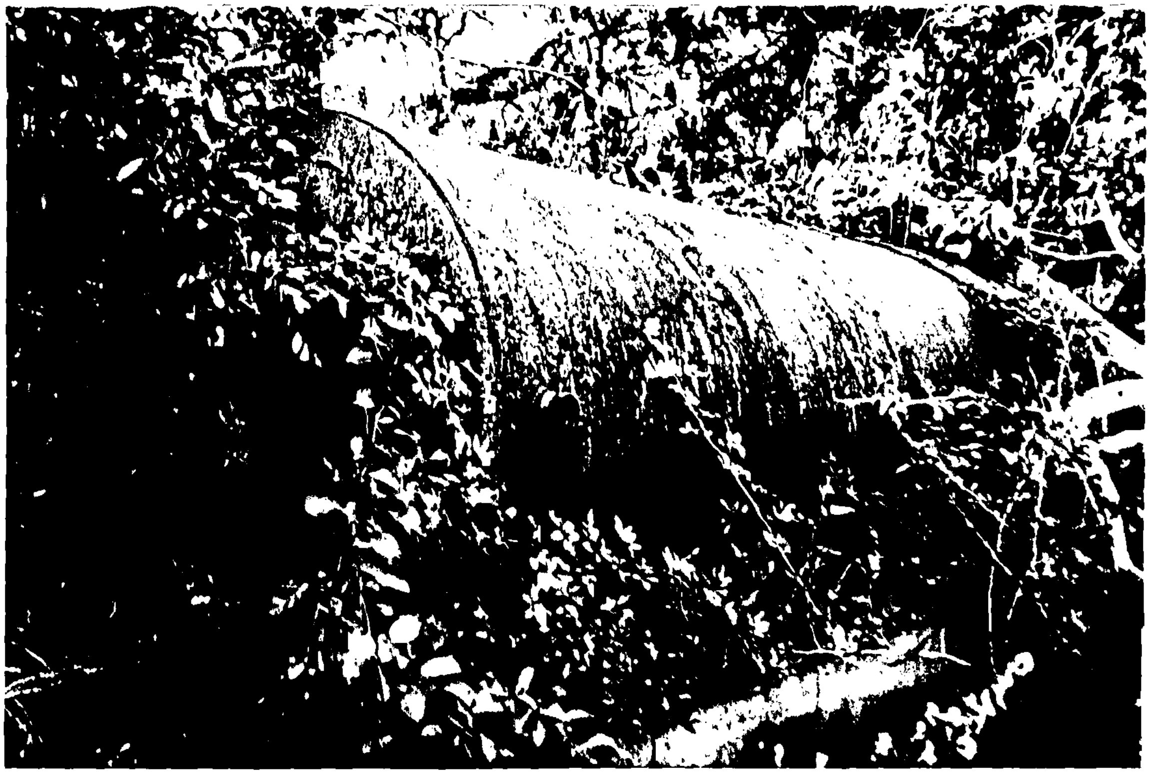
#22- Drain pool #4 sample location. Note the flooding of this pool. High OVA/GC peaks recorded here.

#23- Drain pool #5 sample location (north of drain pool #4). Note the flooding of this pool. High OVA/GC peaks recorded here.

#24- Soil boring #2 located in center of site area. High OVA/GC readings were recorded here.

#25- Photo shows domestic dumping of gas tank and paint can along northwest border of the site area.

#26- Middle of northern border of site area. Note the rusted tank in center of photo.



#27- Closer view of rusted tank.

#28- Evidence of recent dumping in northern portion of site area.

#29- Photo clearly points out evidence of stressed vegetation along northern portion of site area.

#30- More evidence of stressed vegetation on site.

#31- Boring location B-3 in center of photo. Slight OVA peak was recorded here. Note the 55 gallon drum in mid-right of photo.

#32- Closer view of 55 gallon drum on north boundary of site. Ambient air readings in this area were recorded having 30 ppm organic compounds with the OVA unit

#33- East border of site area. Note the difference in elevation indicating landfill.

#34- Boring B-5 along east border of site. OVA/GC recorded no peaks here. Note the clean soils.

#35- Dry drainage ditch running north-south along east border of site area. Note the thick vegetation here.

SECTION 3

Past Spill Activity and History of Land Use

- Contacted Steve Silvers, P.E. (in Sanitation Department of the Nassau County Department of Health) to gain access to files of recorded oil and gasoline spills in close proximity to the site.
    - o Met with Lawrence Hoffman, Public Health Sanitarian for the Bureau of Water Pollution Control (N.C.D.H.).
    - o Reviewed files for Uniondale and no oil or gasoline spills were recorded for this area.
- Met with Lawrence Sama, Public Health Engineer, (N.C.D.H.) of the Industrial and Hazardous Waste Management Division.
    - o Filled out request form for access to chemical spill files.
    - o Reviewed Uniondale file and found the following:

Date of Incident	Location	Details
8/83	A. Holly Patersen Nursing Home (Jerusalem Ave., Uniondale)	-Chemical dumping on site. Chemical identified as kerosene used to clean brushes. Dumped along the fence line on the eastern boundary of the property. Discoloration of soil marked dumping location. Soil was excavated to be removed and disposed of but it was stolen.
8/85	A. Holly Patersen Nursing Home (Jerusalem Ave., Uniondale)	-A 55 gallon drum was emitting toxic vapors. The 55 gallon drum was removed from the laundry room and set out in an open field northeast of the main building. -Several employees were sent to the hospital from inhalation of gases emitted from the drum. -Drum was removed and disposed of.

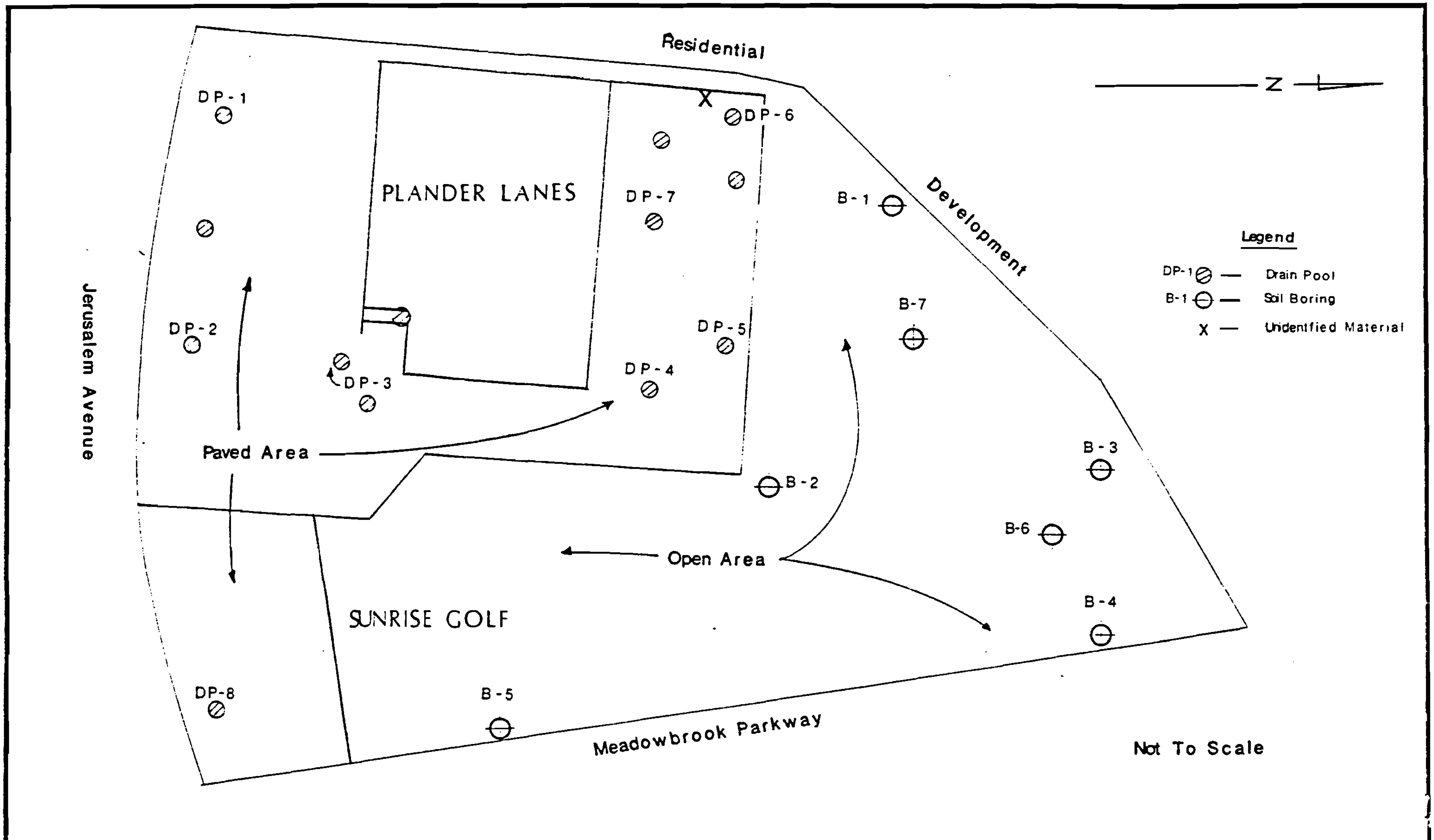
- The location of this activity is within a one mile radius, however, it is distant enough to pose no major threat to the site area.
- Met with Philip Spalleta, Chief Planning Drafter, of the Nassau County Planning Commission and reviewed aerial photographs of site area dating from 1950 to 1984.
  - o Reproduction of these photos was not possible due to positive photos.
  - o In 1950, aerial photo shows the entire site used as a cement manufacturing plant. The north portion was a large pit filled with water. Surrounding land to the west was used for farming. Undeveloped land was observed to the east.
  - o In 1962, aerial photo shows the site to be used as a cement manufacturng plant on the southeast portion and the entire north was occupied by a large pit filled with water. The southwest portion of the site was occupied by a bowling alley.
  - o In 1966, aerial photo shows the same site development as 1962 photo.
  - o In 1976 and 1984, aerial photographs show site area to be developed the same as present. Plander Lanes Bowling Alley and Sunrise Golf Driving Range presently occupies the site.
- Contacted Nassau County Tax Assessors Office and met with Gene Finelli in tax map locations department for the Town of Hempstead.
  - o Reviewed file of site (Section 50/Block G) occupancy.

- Cement manufacturing plant began in 1930.
- Bowling alley put in in 1962.
- Addition to east side of bowling alley in 1970.
- Landfill of pit in north portion of property in 1973.
- Golf driving range began in 1975.
- Presently occupied by Plander Lanes and Sunrise Golf.

SECTION 4

Organic Vapor and Petroleum Hydrocarbon Analysis of Drainage pools and Soils On Site

- Located drain pool in southwest corner of the site area (DP#1 on Figure 4.1).
  - o Removed grate to pool and observed seven feet of pooled water with small amount of floating product. Pooled water is indicative of poorly drained, clogged soils or high water table.
  - o Total depth of pool was twelve feet.
  - o Hand augered one foot into bottom sediment and observed a black organic, fine grained, sediment with a sheen and a petroleum hydrocarbon sheen and decaying organic odor was also recognized.
  - o Captured sediment sample in a jar and sealed with a membrane.
  - o Ran OVA/GC analysis after 30 minutes and recorded several peaks occurring with concentrations ranging from 15 to 60 parts per million. This may indicate the presence of several organic compounds at this location. Refer to Table 4.1 for OVA/GC peaks of sampling locations.
  - o A sediment sample was retained at this location and sent to the laboratory for analysis of petroleum hydrocarbons.
- Located drain pool approximately 130' east of Drain Pool #1 (DP #2 on Figure 4.1).
  - o Removed grate to pool and observed 2 1/2' of pooled water with a gasoline sheen.



F,P&M

FIGURE 4.1 - DRAINAGE POOL AND BORING LOCATIONS OF OVA/GC ANALYSIS

TABLE 4.1

OVA/GC PEAKS RECORDED FROM SAMPLING OF POOLS AND SOIL BORINGS (SECONDS/PARTS PER MILLION) *

		GAS CHROMATOGRAPHY PEAKS			
Sample Location	Total OVA	1st Peak(2)	2nd Peak	3rd Peak	4th Peak
*DP #1	>100	6/20	9/60	15/25	34/15
DP #2	>100	6/10	9/20	15/15	X
DP #3	>100	3-15/>100	24/60	X	X
DP #4	>100	3-15/>100	24/90	X	X
DP #5	>100	3-15/>100	24/90	X	X
DP #6	>100	3-25/>100	2 min. 48 sec./20	X	X
DP#7	15	6/10	12/8	X	X
DP#8	X (1)	X	X	X	X
B-1	X	X	X	X	X
B-2	>100	3-24/>100	48/90	1 min. 12 sec/20	X
B-3	20	3/10	X	X	X
B-4	X	X	X	X	X
B-5	X	X	X	X	X
B-6	>100	10/>100	20/90	1 min./20	
B-7	X	X	X	X	X

* The sensitivity of this Century model 128-GC/OVA: 0.1 ppm calibrated to methane.

(1) "X" indicates no peak recorded.

(2) 1st peak, coming off quickly, is probably methane; of concern here is the second and third pea

  - Total depth of pool was 8'.
  - Hand augered one foot into bottom sediment and observed a black, medium to coarse grained sediment with a gasoline sheen. A strong petroleum hydrocarbon and decaying organic odor was also recognized.
  - Captured sample in a jar and sealed with a membrane.
  - Ran OVA/GC analysis after 30 minutes and recorded several peaks occurring with concentrations ranging from 10 to 20 ppm. This may indicate the presence of several organic compounds here. Refer to Table 4.1 for OVA/GC peaks.
  - The time of these peaks were similar to the OVA/GC peaks for DP #1, therefore, DP #1 was chosen to be lab tested.
- Located Drain Pool #3 on Figure 4.1. Removed grate to pool and observed approximately 3' of pooled water.
  - Important to note was the grease/oil build up on the top of the grate. Site activity and conversation with Mr. Planner suggests that the bowling alley restaurant dumps cooking oils into the drain. This may explain the pooled water and poor drainage within this drain pool.
  - Ran OVA/GC and recorded several peaks occurring, with concentrations ranging from 60 to >100 ppm. Refer to Table 4.1 for OVA/GC peaks.
- Located Drain Pool #4 on Figure 4.1.
  - Area surrounding this pool was flooded, indicating poor or non-existent drainage.
  - Removed grate to pool and observed total depth of pool was 11'.
  - Hand augered 1' into bottom sediment and observed a fine

    grained black and brown sediment with some decaying organic matter.
    - o Sediment emitted a strong petroleum hydrocarbon and decaying organic odor.
    - o Ran an OVA/GC analysis after 30 minutes and recorded several peaks occurring, with concentrations ranging from 90 to >100 ppm. Refer to Table 4.1 for OVA/GC peaks. This may indicate the presence of several organic compounds occurring here.
    - o A sediment sample was retained and sent to the laboratory to be analyzed for petroleum hydrocarbons.
- Located Drain Pool #5 on Figure 4.1.
    - o Area surrounding this pool was flooded, indicating poor or non-existent drainage.
    - o Removed grate to pool and observed pool to be 10' deep.
    - o Hand augered 1' into bottom sediment and observed black clay and silt sediment with rocks. Slight petroleum hydrocarbon odor was recognized.
    - o Ran OVA/GC analysis after 30 minutes and recorded several peaks occurring, with concentrations ranging from 90 to >100 ppm. Refer to Table 4.1 for OVA/GC peaks. This may indicate the presence of several organic compounds occurring here.
    - o A sediment sample was retained at this location and sent to the laboratory for analysis of petroleum hydrocarbons.
- Located Drain Pool #6 on Figure 4.1.
    - o Removed grate on pool and observed 4' of pooled water. Total depth of pool was 10'.

        - Hand augered 1' into bottom sediment of pool and observed a black and brown sediment with organic matter. A strong petroleum hydrocarbon odor was emitted from the sample.
        - Contained a sample in a jar and sealed it with a membrane.
        - Ran OVA/GC analysis after 30 minutes and recorded several peaks occurring with concentrations ranging from 20 to >100 ppm. Refer to Table 4.1 for OVA/GC peaks. This may indicate the presence of several organic compounds occurring here.
        - A sediment sample from Drain Pool #6 was retained and sent to the laboratory to be analyzed for petroleum hydrocarbons.
        - Important to note was an unknown substance in close proximity to this pool. Staining of the asphalt shows leaching of this material into the pool. (Refer to Figure 1.2 for location of material).
        - Ran an OVA/GC on material and no peaks were recorded. A sample of this material was retained and sent to the laboratory to be tested for E.P. Toxicity (metals only).

- Located Drain Pool #7 on Figure 4.1.
    - Removed grate on pool and observed 1' of pooled water. Total depth of pool 14'.
    - Hand augered 1' into bottom sediment of the pool and observed a brown, medium-coarse grained sand with no odor.
    - Contained a sediment sample in a jar and sealed with a

membrane.

- o Ran OVA/GC analysis after 30 minutes and recorded a few minor peaks. Refer to Table 4.1 for OVA/GC peaks.

- Located Drain Pool #8 on Figure 4.1.
  - o Pool was dry with a depth of 9 1/2'.
  - o Hand augered 1' into bottom sediment of pool and ran an OVA/GC analysis. No peak was recorded here.
- In addition to these sampled drain pools, 7 soil borings were done on the site area.
- The location of Boring #1 on Figure 4.1 was selected along the northwest sector the site.
  - o Boring Log:

    0' - 2 1/2' - brownish-orange, medium to coarse sand.
    2 1/2'-3' - gravel and tan sand.
    3'-4 1/2' - orange-brown, medium to coarse sand with gravel.
  - o No odor in soil.
  - o Ran OVA/GC on sample obtained at 4 1/2' and recorded no peaks.
- The location of Boring #2 on Figure 4.1 was selected near the northeast corner of the rear parking lot of the Plander Bowling Alley.
  - o Boring Log:

    0'-2' - brown and black medium sand with strong methane odor. Unable to penetrate any deeper due to obstruction.
  - o Ran OVA/GC and soil sample from 2' and recorded several peaks occurring with concentrations ranging from 20 to >100 ppm. This may indicate the presence of several organic

compounds occurring here.

- o A sediment sample at this depth was retained and sent to the laboratory for analysis of petroleum hydrocarbons.

- The location of Boring #3 in Figure 4.1 was selected in the middle of the northern boundary of the site area.
  - o Boring Log:

    0'-1 1/2' - medium coarse brown sand with rocks. Unable to penetrate further due to obstruction.
  - o Ran OVA/GC on sample and recorded peak of 20 ppm, possibly indicating the presence of methane gas here.
- Located 55 gallon drum in the area (Refer to Figure 1.2) and recorded a total OVA of 10 ppm in air surrounding it.
- The location of Boring #4 on Figure 4.1 was selected on the northeast corner of the site.
  - o Boring Log:

    0'-2' medium orange-brown sand. Unable to penetrate further with hand auger.
  - o Ran OVA/GC on sample and recorded no peak here.
- The location of Boring #5 on Figure 4.1 was selected in the southeastern border of the site area.
  - o Boring Log:

    0'-4 1/2'- orange-tannish well sorted, medium grained sand.
  - o Ran OVA/GC on sample at 4' and recorded no peak.
- The location of Boring #6 on Figure 4.1 was selected directly behind the 200 yard mark in the middle of the golf driving range.
  - o Boring Log:

    0'-1'-black colored fill with strong petroleum hydrocarbon odor. Unable to penetrate any deeper.

- o Ran OVA/GC sample and recorded several peaks occurring, with concentrations ranging from 20 to >100 ppm. The time of these peaks were similar to the peaks recorded for Boring #2, therefore, no sample was retained at this location.

- The location of Boring #7 on Figure 4.1 was selected in the middle of the rear of the bowling alley property.

- o Boring Log:

  0'-1'-brown and medium grained sand, with no odor. Unable to penetrate further than 1'.

- o Ran OVA/GC on sample and no peak was observed.

SECTION 5

Results, Conclusions and Recommendations

Results-

The results of the petroleum hydrocarbon analysis showed unusually high concentrations of petroleum hydrocarbon in the soil samples from Drainage Pools #1, #4, #5 and #6. Additionally, Boring #2 was found to contain high concentrations as well (see Appendix A).

The results of the organic vapor survey showed elevated vapors at these sample locations and DP #2, DP#3 and B-6 as well.

The presence of high organic vapors and petroleum hydrocarbons may indicate something other than normal runoff taking place here. (See Figure 5.1 for locations of high OVA and petroleum hydrocarbon results).

The unknown substance analyzed for "Extraction Procedure Toxicity" was not available at the time of writing: The laboratory estimates results will be completed by Friday, October 17, 1986.

Conclusions and Recommendations-

There are several locations that could warrant further investigation.

1. Buried oil tanks at Plander Lanes and Sunrise Golf.
   a. Have they been tested as per Nassau County Health Code Article 11 and New York State Bulk Petroleum Storage Law?
   b. Have they filed for the necessary New York State and County permits for underground and above ground tanks?
2. Leaky gas lines at Plander Lanes may have explosive

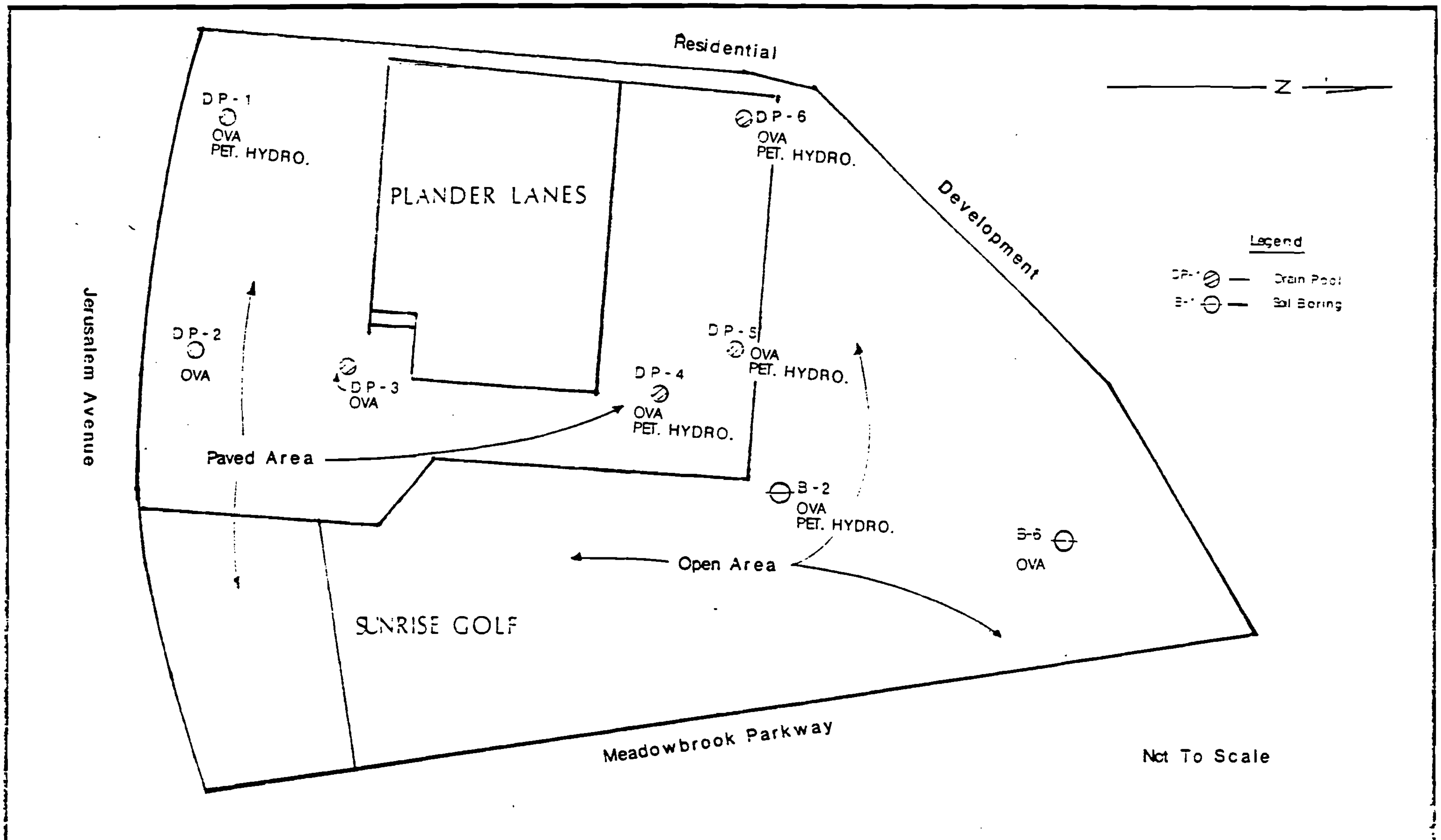


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FIGURE 5.1 - SAMPLE LOCATIONS WITH HIGH O.V.A. AND PETROLEUM HYDROCARBON RESULTS

potential and should be remedied immediately.

3. The unidentified substance in rear parking lot of Plander Lanes may be hazardous. Laboratory results will determine this.

4. Thirteen sanitary pools in front of Plander Lanes and one in front of golf pro shop.
   a. Have they been receptors of toxic chemical dumping?

5. High OVA/GC readings other than methane and past land use of site points to the possibility of hazardous waste dumping when land was filled in.

6. Domestic dumping on site area suggests the possibility of minor chemical problems.

7. All drainage pools and soil borings recorded with elevated OVA/GC peaks (DP #1, DP#2, DP#3, DP#4, DP#5, DP#6, B-2 and B-6) may be contaminating groundwater resources with toxic organics.

<u>Recommendations</u>

Phase II - Identify contamination in soil areas that show high OVA/GC readings.

Phase III - For positive results in Phase II, test groundwater in pools.

- Place downgradient wells and sample shallow groundwater

APPENDIX A

LAB RESULTS

ECOTEST LABORATORIES, INC. *ENVIRONMENTAL TESTING*

377 SHEFFIELD AVE. • N. BABYLON, N.Y. 11703 • (516) 422-5777

LAB NO.C862077/1 10/07/86

Fanning, Phillips & Molnar
80 Skyline Dr.
Plainview, NY 11803
ATTN:

SOURCE OF SAMPLE: Realco/Uniondale
COLLECTED BY: Client DATE COL'D: RECEIVED:10/03/86

SAMPLE: Water-DP#1, pool sample

ANALYTICAL PARAMETERS		ANALYTICAL PARAMETERS	
Petrol. Hydrocarbons ppm	5900		

cc:

REMARKS:

DIRECTOR Thomas R

rn= 6253

ECOTEST LABORATORIES, INC. *ENVIRONMENTAL TESTING*

377 SHEFFIELD AVE. • N. BABYLON, N.Y. 11703 • (516) 422-5777

LAB NO.C862077/4 10/07/86

Fanning, Phillips & Molnar
80 Skyline Dr.
Plainview, NY 11803
ATTN:

SOURCE OF SAMPLE: Realco/Uniondale
COLLECTED BY: Client DATE COL'D: RECEIVED:10/03/86

SAMPLE: water-DP#4 pool in rear

ANALYTICAL PARAMETERS		ANALYTICAL PARAMETERS	
Petrol. Hydrocarbons ppm	2300		

cc:

REMARKS:

DIRECTOR Thomas R

rn= 6256

ECOTEST LABORATORIES, INC. *ENVIRONMENTAL TESTING*

377 SHEFFIELD AVE. • N. BABYLON, N.Y. 11703 • (516) 422-5777

LAB NO.C862077/5 10/07/86

Fanning, Phillips & Molnar
80 Skyline Dr.
Plainview, NY 11803

ATTN:

SOURCE OF SAMPLE: Realco/Uniondale
COLLECTED BY: Client DATE COL'D: RECEIVED:10/03/86

SAMPLE: water-DP#5, pool in rear

ANALYTICAL PARAMETERS		ANALYTICAL PARAMETERS	
Petrol. Hydrocarbons ppm	2200		

cc:

REMARKS:

DIRECTOR

rn= 6257

ECOTEST LABORATORIES, INC. *ENVIRONMENTAL TESTING*

377 SHEFFIELD AVE. • N. BABYLON, N.Y. 11703 • (516) 422-5777

LAB NO.C862077/3 10/07/86

Fanning, Phillips & Molnar
80 Skyline Dr.
Plainview, NY 11803

ATTN:

SOURCE OF SAMPLE: Realco/Uniondale
COLLECTED BY: Client DATE COL'D: RECEIVED:10/03/86

SAMPLE: water-DP#6, in rear

ANALYTICAL PARAMETERS ANALYTICAL PARAMETERS

Petrol. Hydrocarbons ppm 7200

cc:

REMARKS:

DIRECTOR

rn= 6255

ECOTEST LABORATORIES, INC. *ENVIRONMENTAL TESTING*

377 SHEFFIELD AVE. ● N. BABYLON, N.Y. 11703 ● (516) 422-5777

LAB NO.C862077/2 10/07/86

Fanning, Phillips & Molnar
80 Skyline Dr.
Plainview, NY 11803

ATTN:

SOURCE OF SAMPLE: Realco/Uniondale
COLLECTED BY: Client DATE COL'D: RECEIVED:10/03/86

SAMPLE: water-B-2, boring 2'

ANALYTICAL PARAMETERS		ANALYTICAL PARAMETERS
Petrol. Hydrocarbons ppm	350	

cc:

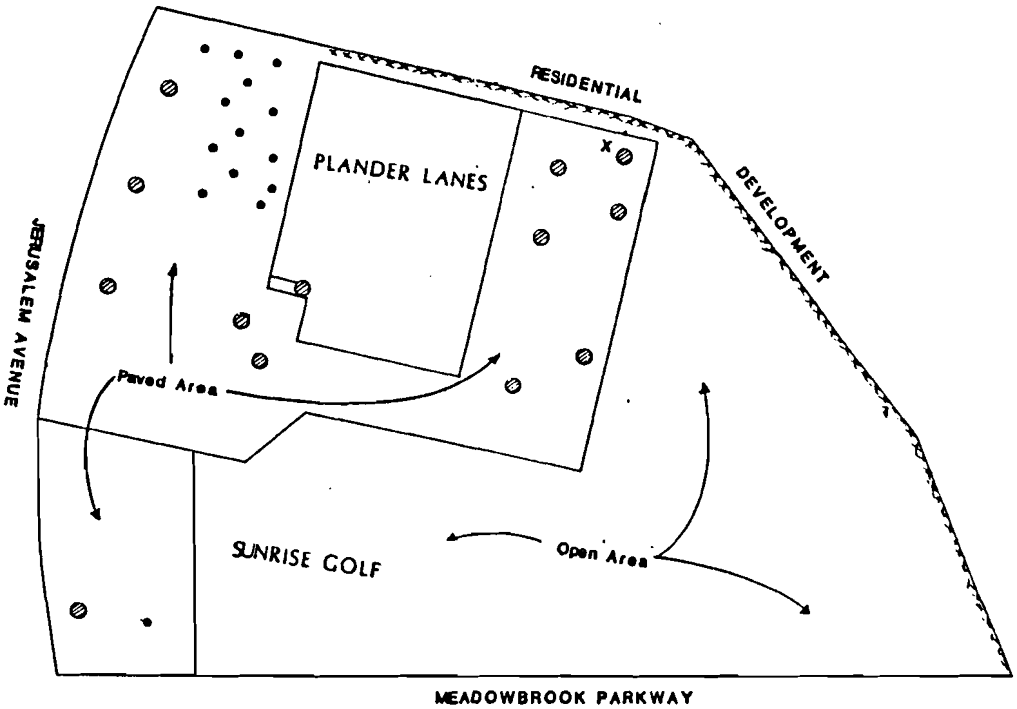
REMARKS:

DIRECTOR

rn= 6254

SUPPLEMENT

SAMPLING PROGRAM
UNIONDALE, NEW YORK



NOVEMBER 1986

fanning, phillips & molnar
ENGINEERS
PLAINVIEW NEW YORK

DISCLAIMER

These findings are based upon a detailed sampling procedure that has been formulated in accordance with U.S. E.P.A. Procedures both for sampling and for laboratory analysis. Conclusions from this data represent our best judgment using analytical techniques and our past experience. Due to the complexity of this project, the site and past discharge practices, it is likely that there are some aspects which are as yet unidentified and may warrant further study.

FIELD REPORT FOR REALCO/UNIONDALE PHASE II SAMPLING

Objective: Sample sediment and soils from locations that were recorded having elevated concentrations of petroleum hydrocarbons and multiple OVA/GC peaks. Have samples analyzed by laboratory for volatile organics listed under EPA's "129 Priority Pollutants."

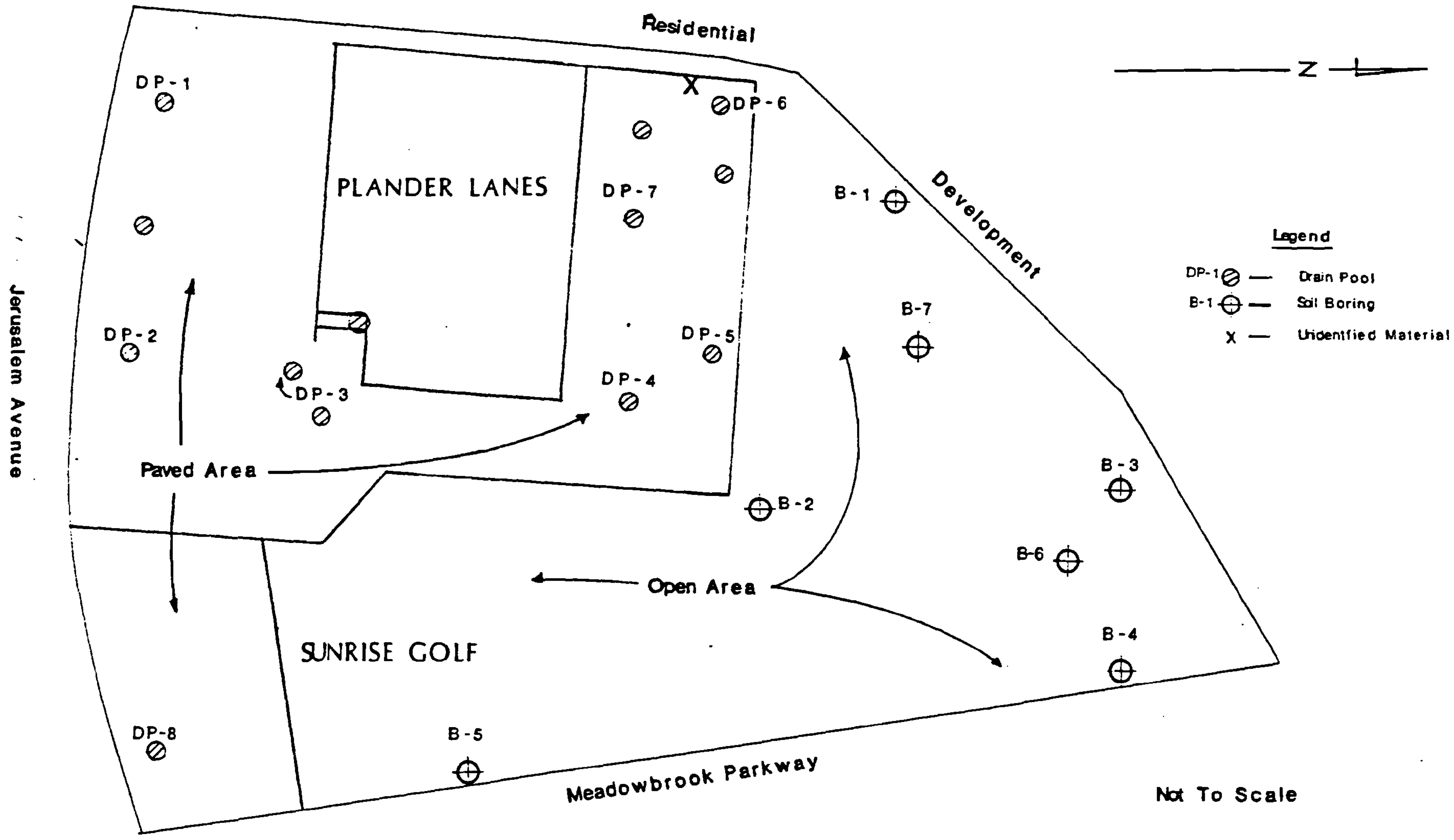
Dates: 10/9 and 10/10/86

Present: Fanning, Phillips and Molnar - Errol Kitt
Fanning, Phillips and Molnar - Martin Klein

Weather: Conditions
10/9 - Sunny, 80°F
10/10- Sunny, 65-70°F

Summary:

- Preparation:
  - Located sampling locations DP#1, DP#3, DP#4, DP#5, DP#6, B-2 and B-6 on base map (Figure 1).
  - Rinsed all sampling equipment with distilled water and torched all metal parts with propane burner to assure quality of samples.
- Sampling of Drain Pools:
  - Identified all drain pools to be sampled (#1, #3, #4, #5 and #6) in field.
  - Hand augered a surface sediment sample from each pool.
  - Each sediment sample was contained in a 40 ml. vial and packed in ice.
  - Drove a 1" O pipe, 3' into the bottom sediment of the pool in order to obtain a 3' soil sample.
  - Each sample was contained in a 40 ml vial and packed in ice.



F,P&M

FIGURE 1 - DRAINAGE POOL AND BORING LOCATIONS ANALYZED

- Sampling of soil borings:
  - o Identified soil boring locations to be sampled (#2 and #6) in field.
  - o Hand augered 2' into soil at boring location #2. Deeper penetration was not possible with the equipment used. Obtained a soil sample at 2' depth.
  - o Hand augered 1' into soil at boring location #6. Deeper penetration was not possible with the equipment used. Obtained a soil sample at 1' depth.
  - o Each soil sample was contained in a 40 ml vial and packed in ice.
- All sampling areas were cleaned after sampling.
- All 12 sediment samples were immediately delivered to the laboratory to be analyzed for the volatile organics portion of EPA's "129 Priority Pollutants."

Results of Sampling, Conclusions and Recommendations

Sampling Results-

Initial sampling and OVA/GC analysis determined high levels of organic vapors emanating from soils collected at several locations on site. Laboratory analysis identified extremely high concentrations of petroleum hydrocarbons within these samples as well (see Table 1).

Phase II sampling and laboratory results (see Appendix A) confirm undetectable concentrations of the EPA list of volatile organics (1) in all samples obtained on the Uniondale site. Figure 1 shows each sampling location on site.

Interpretation of these results suggests that:

1) It is probable the multiple peaks recorded from the OVA/GC represent several different volatile compounds occurring within each sample.

2) These peaks do not correspond to E.P.A. volatile organic compounds listed in the "129 Priority Pollutants".

3) The high petroleum hydrocarbon results are an indication of potential contamination problems and should be removed from the leaching pools to:
   - Improve drainage.
   - Avoid leaking any pollutants into the groundwater.

(1) Part of the "129 Priority Pollutants"

TABLE 1

SUMMARY OF OVA/GC AND LABORATORY ANALYSIS OF SAMPLES ON SITE

(1) Sample Location	OVA/GC	Laboratory Analysis for Petroleum Hydrocarbon (Parts Per Million)	(2) Laboratory Analysis of Volatile Organic Compounds Listed Under EPA's "129 Priority Pollutants" Exceeding Maximum Levels (Parts Per Billion)	
			Surface	3' Depth
DP-1	High	5,900	X (3)	X
DP-2	High	Not Analyzed	Not Analyzed	Not Analyzed
DP-3	High	Not Analyzed	X	X
DP-4	High	2,300	X	X
DP-5	High	2,200	X	X
DP-6	High	7,200	X	X
DP-7	Low	Not Analyzed	Not Analyzed	Not Analyzed
DP-8	No Peak	Not Analyzed	Not Analyzed	Not Analyzed
B-1	No Peak	Not Analyzed	Not Analyzed	Not Analyzed
B-2	High	350	X	Not Analyzed
B-3	Low	Not Analyzed	Not Analyzed	Not Analyzed
B-4	No Peak	Not Analyzed	Not Analyzed	Not Analyzed
B-5	No Peak	Not Analyzed	Not Analyzed	Not Analyzed
B-6	High	Not Analyzed	X	Not Analyzed
B-7	No Peak	Not Analyzed	Not Analyzed	Not Analyzed

(1) See Figure 1 for sampling locations
(2) Laboratory analysis performed on 5 samples according to proposal and highest recorded OVA/GC readings
(3) "X" indicates undetected levels

APPENDIX A
LAB RESULTS

TOTAL ANALYTICAL SERVICES FOR A SAFE ENVIRONMENT
NEI nytest environmental inc

Lab. No.: 86-12711(B)
P.O. No.: Pending
October 31, 1986

REPORT OF TESTS

FOR

FANNING PHILLIPS & MOLNAR
80 SKYLINE DRIVE
PLAINVIEW, NEW YORK 11803

Report prepared by:

Parag K. Shah, Ph.D.
Organic Lab. Manager

Report prepared by:

Peggy Sacks PS
Q.C. Manager

CERTIFICATION

We certify that this report is a true report of results obtained from our tests of this material.

Respectfully submitted,

Nytest Environmental Inc.

Remo Gigante
Laboratory Director

Att: Mr. M. Klien

RG/jw

TOTAL ANALYTICAL SERVICES FOR A SAFE ENVIRONMENT
NEI nytest environmental inc.

REPORT OF TESTS

Date: October 31, 1986

Lab. No.: 86-12711(B)

Client	Fanning Phillips & Molnar
Material	Twelve (12) Soil Samples
Identification	As Below (Samples Received 10/10/86)
Client's Order No.	Pending
Submitted for	Chemcial Analysis

The submitted soil samples received on 10/10/86 were identified as the following:

B-2
B-6 Mid-North
DP #1 Surface
DP #1 3'
DP #3 Surface
DP #3 3'
DP #4 Surface
DP #4 3'
DP #5 Surface
DP #5 3'
DP #6 Surface
DP #6 3'

RESULTS

See the following pages.

Sample Number
B-2

Organics Analysis Data Sheet
(Page 1)

Lab. No. 86-12711(B)

Laboratory Name: Nytest Environmental Inc.
Lab Sample ID No:
Sample Matrix: Soil
Data Release Authorized By:

Case No
QC Report No
Contract No
Date Sample Received: 10/10/86

Volatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared:
Date Analyzed: 10/13/86
Conc/Dil Factor 1 pH
Percent Moisture: (Not Decanted)

CAS Number		ug/Kg
74-87-3	Chloromethane	10 u
74-83-9	Bromomethane	10 u
75-01-4	Vinyl Chloride	10 u
75-00-3	Chloroethane	10 u
75-09-2	Methylene Chloride	5 u
67-64-1	Acetone	10 u
75-15-0	Carbon Disulfide	5 u
75-35-4	1, 1-Dichloroethene	5 u
75-34-3	1, 1-Dichloroethane	5 u
156-60-5	Trans-1, 2-Dichloroethene	5 u
67-66-3	Chloroform	5 u
107-06-2	1, 2-Dichloroethane	5 u
78-93-3	2-Butanone	10 u
71-55-6	1, 1, 1-Trichloroethane	5 u
56-23-5	Carbon Tetrachloride	5 u
108-05-4	Vinyl Acetate	10 u
75-27-4	Bromodichloromethane	5 u

CAS Number		ug/Kg
78-87-5	1, 2-Dichloropropane	5 u
10061-02-6	Trans-1, 3-Dichloropropene	5 u
79-01-6	Trichloroethene	5 u
124-48-1	Dibromochloromethane	5 u
79-00-5	1, 1, 2-Trichloroethane	5 u
71-43-2	Benzene	5 u
10061-01-5	cis-1, 3-Dichloropropene	5 u
110-75-8	2-Chloroethylvinylether	10 u
75-25-2	Bromoform	5 u
591-78-6	4-Methyl-2-Pentanone	10 u
108-10-1	2-Hexanone	10 u
127-18-4	Tetrachloroethene	5 u
79-34-5	1, 1, 2, 2-Tetrachloroethane	5 u
108-88-3	Toluene	5 u
108-90-7	Chlorobenzene	5 u
100-41-4	Ethylbenzene	5 u
100-42-5	Styrene	5 u
	Total Xylenes	5 u

Data Reporting Qualifiers

For reporting results to EPA the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However, the definition of each flag must be explicit.

Value	If the result is a value greater than or equal to the detection limit report the value
U	Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action. (This is not necessarily the instrument detection limit.) The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample
J	Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g. 10J). If limit of detection is 10 μg/l and a concentration of 3 μg/l is calculated, report as 3J
C	This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides ≥10 ng/ul in the final extract should be confirmed by GC/MS
B	This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action
Other	Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

Page: 2A

Lab. No.: 86-12711(B)

Sample Identification: B-2

CAS Number		Results in ug/kg
095-50-1	1,2-Dichlorobenzene	10 u
541-73-1	1,3-Dichlorobenzene	10 u
106-46-7	1,4-Dichlorobenzene	10 u

Sample Number
B-6

Organics Analysis Data Sheet
(Page 1)

Lab. No. 86-12711(B)

Laboratory Name: Nytest Environmental Inc.
Case No:
Lab Sample ID No:
QC Report No:
Sample Matrix: Soil
Contract No.
Data Release Authorized By:
Date Sample Received: 10/10/86

Volatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared:
Date Analyzed: 10/13/86
Conc/Dil Factor: 1 pH
Percent Moisture: (Not Decanted)

CAS Number		ug/kg
74-87-3	Chloromethane	10 u
74-83-9	Bromomethane	10 u
75-01-4	Vinyl Chloride	10 u
75-00-3	Chloroethane	10 u
75-09-2	Methylene Chloride	5 u
67-64-1	Acetone	10 u
75-15-0	Carbon Disulfide	5 u
75-35-4	1, 1-Dichloroethene	5 u
75-34-3	1, 1-Dichloroethane	5 u
156-60-5	Trans-1, 2-Dichloroethene	5 u
67-66-3	Chloroform	5 u
107-06-2	1, 2-Dichloroethane	5 u
78-93-3	2-Butanone	10 u
71-55-6	1, 1, 1-Trichloroethane	5 u
56-23-5	Carbon Tetrachloride	5 u
108-05-4	Vinyl Acetate	10 u
75-27-4	Bromodichloromethane	5 u

CAS Number		ug/Kg
78-87-5	1, 2-Dichloropropane	5 u
10061-02-6	Trans-1, 3-Dichloropropene	5 u
79-01-6	Trichloroethene	5 u
124-48-1	Dibromochloromethane	5 u
79-00-5	1, 1, 2-Trichloroethane	5 u
71-43-2	Benzene	5 u
10061-01-5	cis-1, 3-Dichloropropene	5 u
110-75-8	2-Chloroethylvinylether	10 u
75-25-2	Bromoform	5 u
591-78-6	4-Methyl-2-Pentanone	10 u
108-10-1	2-Hexanone	10 u
127-18-4	Tetrachloroethene	5 u
79-34-5	1, 1, 2, 2-Tetrachloroethane	5 u
108-88-3	Toluene	5 u
108-90-7	Chlorobenzene	5 u
100-41-4	Ethylbenzene	5 u
100-42-5	Styrene	5 u
	Total Xylenes	5 u

Data Reporting Qualifiers

For reporting results to EPA, the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However, the definition of each flag must be explicit.

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action. (This is not necessarily the instrument detection limit.) The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.
J	Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g. 10J). If limit of detection is 10 μg/l and a concentration of 3 μg/l is calculated, report as 3J.
C	This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides ≥10 ng/ul in the final extract should be confirmed by GC/MS.
B	This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action.
Other	Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report.

Page: 3A

Lab. No.: 86-12711 (B)

Sample Identification: B-6

CAS Number		Results in ug/kg
095-50-1	1,2-Dichlorobenzene	10 u
541-73-1	1,3-Dichlorobenzene	10 u
106-46-7	1,4-Dichlorobenzene	10 u

Sample Number
DP #1 Surface

Organics Analysis Data Sheet
(Page 1)

Lab. No. 86-12711(B)

Laboratory Name: Nytest Environmental Inc.
Case No
Lab Sample ID No:
QC Report No
Sample Matrix: Soil
Contract No
Data Release Authorized By:
Date Sample Received 10/10/86

Volatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared:
Date Analyzed: 10/13/86
Conc/Dil Factor: 1 pH
Percent Moisture: (Not Decanted)

CAS Number		ug/Kg
74-87-3	Chloromethane	10 u
74-83-9	Bromomethane	10 u
75-01-4	Vinyl Chloride	10 u
75-00-3	Chloroethane	10 u
75-09-2	Methylene Chloride	5 u
67-64-1	Acetone	10 u
75-15-0	Carbon Disulfide	5 u
75-35-4	1, 1-Dichloroethene	5 u
75-34-3	1, 1-Dichloroethane	5 u
156-60-5	Trans-1, 2-Dichloroethene	5 u
67-66-3	Chloroform	5 u
107-06-2	1, 2-Dichloroethane	5 u
78-93-3	2-Butanone	10 u
71-55-6	1, 1, 1-Trichloroethane	5 u
56-23-5	Carbon Tetrachloride	5 u
108-05-4	Vinyl Acetate	10 u
75-27-4	Bromodichloromethane	5 u

CAS Number		ug/Kg
78-87-5	1, 2-Dichloropropane	5 u
10061-02-6	Trans-1, 3-Dichloropropene	5 u
79-01-6	Trichloroethene	5 u
124-48-1	Dibromochloromethane	5 u
79-00-5	1, 1, 2-Trichloroethane	5 u
71-43-2	Benzene	5 u
10061-01-5	cis-1, 3-Dichloropropene	5 u
110-75-8	2-Chloroethylvinylether	10 u
75-25-2	Bromoform	5 u
591-78-6	4-Methyl-2-Pentanone	10 u
108-10-1	2-Hexanone	10 u
127-18-4	Tetrachloroethene	5 u
79-34-5	1, 1, 2, 2-Tetrachloroethane	5 u
108-88-3	Toluene	5 u
108-90-7	Chlorobenzene	5 u
100-41-4	Ethylbenzene	5 u
100-42-5	Styrene	5 u
	Total Xylenes	5 u

Data Reporting Qualifiers

For reporting results to EPA, the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However, the definition of each flag must be explicit.

Value If the result is a value greater than or equal to the detection limit report the value

U Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action. (This is not necessarily the instrument detection limit.) The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.

J Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g. 10J). If limit of detection is 10 μg/l and a concentration of 3 μg/l is calculated, report as 3J.

C This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides ≥ 10 ng/ul in the final extract should be confirmed by GC/MS.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action.

Other Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report.

Page: 4A

Lab. No.: 86-12711(B)

Sample Identification: DP #1 Surface

CAS Number		Results in ug/kg
095-50-1	1,2-Dichlorobenzene	10 u
541-73-1	1,3-Dichlorobenzene	10 u
106-46-7	1,4-Dichlorobenzene	10 u

Sample Number
DP#1 3'

Organics Analysis Data Sheet
(Page 1)

Lab No. 86-12711 (B)

Laboratory Name: Nytest Environmental Inc.
Case No
Lab Sample ID No:
QC Report No
Sample Matrix: Soil
Contract No
Data Release Authorized By:
Date Sample Received

Volatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared:
Date Analyzed: 10/13/86
Conc/Dil Factor: 1 pH
Percent Moisture: (Not Decanted)

CAS Number		ug/Kg
74-87-3	Chloromethane	10 u
74-83-9	Bromomethane	10 u
75-01-4	Vinyl Chloride	10 u
75-00-3	Chloroethane	10 u
75-09-2	Methylene Chloride	5 u
67-64-1	Acetone	10 u
75-15-0	Carbon Disulfide	5 u
75-35-4	1, 1-Dichloroethene	5 u
75-34-3	1, 1-Dichloroethane	5 u
156-60-5	Trans-1, 2-Dichloroethene	5 u
67-66-3	Chloroform	5 u
107-06-2	1, 2-Dichloroethane	5 u
78-93-3	2-Butanone	10 u
71-55-6	1, 1, 1-Trichloroethane	5 u
56-23-5	Carbon Tetrachloride	5 u
108-05-4	Vinyl Acetate	10 u
75-27-4	Bromodichloromethane	5 u

CAS Number		ug/Kg
78-87-5	1, 2-Dichloropropane	5 u
10061-02-6	Trans-1, 3-Dichloropropene	5 u
79-01-6	Trichloroethene	5 u
124-48-1	Dibromochloromethane	5 u
79-00-5	1, 1, 2-Trichloroethane	5 u
71-43-2	Benzene	5 u
10061-01-5	cis-1, 3-Dichloropropene	5 u
110-75-8	2-Chloroethylvinylether	10 u
75-25-2	Bromoform	5 u
591-78-6	4-Methyl-2-Pentanone	10 u
108-10-1	2-Hexanone	10 u
127-18-4	Tetrachloroethene	5 u
79-34-5	1, 1, 2, 2-Tetrachloroethane	5 u
108-88-3	Toluene	5 u
108-90-7	Chlorobenzene	5 u
100-41-4	Ethylbenzene	5 u
100-42-5	Styrene	5 u
	Total Xylenes	5 u

Data Reporting Qualifiers

For reporting results to EPA, the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However, the definition of each flag must be explicit.

Value	If the result is a value greater than or equal to the detection limit report the value
U	Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action. (This is not necessarily the instrument detection limit.) The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.
J	Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g. 10J). If limit of detection is 10 μg/l and a concentration of 3 μg/l is calculated, report as 3J.
C	This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides ≥10 ng/ul in the final extract should be confirmed by GC/MS.
B	This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action.
Other	Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report.

Lab. No.: 86-12711(B)

Sample Identification: DP#1 3'

CAS Number		Results in ug/kg
095-50-1	1,2-Dichlorobenzene	10 u
541-73-1	1,3-Dichlorobenzene	10 u
106-46-7	1,4-Dichlorobenzene	10 u

Sample Number
DP #3 Surface

Organics Analysis Data Sheet
(Page 1)

Lab. No. 86-12711(B)

Laboratory Name Nytest Environmental Inc.
Lab Sample ID No:
Sample Matrix: Soil
Data Release Authorized By:

Case No
QC Report No
Contract No:
Date Sample Received 10/10/86

Volatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared:
Date Analyzed: 10/13/86
Conc/Dil Factor: 1 pH
Percent Moisture: (Not Decanted)

CAS Number		ug/Kg
74-87-3	Chloromethane	10 u
74-83-9	Bromomethane	10 u
75-01-4	Vinyl Chloride	10 u
75-00-3	Chloroethane	10 u
75-09-2	Methylene Chloride	5 u
67-64-1	Acetone	10 u
75-15-0	Carbon Disulfide	5 u
75-35-4	1, 1-Dichloroethene	5 u
75-34-3	1, 1-Dichloroethane	5 u
156-60-5	Trans-1, 2-Dichloroethene	5 u
67-66-3	Chloroform	5 u
107-06-2	1, 2-Dichloroethane	5 u
78-93-3	2-Butanone	10 u
71-55-6	1, 1, 1-Trichloroethane	5 u
56-23-5	Carbon Tetrachloride	5 u
108-05-4	Vinyl Acetate	10 u
75-27-4	Bromodichloromethane	5 u

CAS Number		ug/Kg
78-87-5	1, 2-Dichloropropane	5 u
10061-02-6	Trans-1, 3-Dichloropropene	5 u
79-01-6	Trichloroethene	5 u
124-48-1	Dibromochloromethane	5 u
79-00-5	1, 1, 2-Trichloroethane	5 u
71-43-2	Benzene	5 u
10061-01-5	cis-1, 3-Dichloropropene	5 u
110-75-8	2-Chloroethylvinylether	10 u
75-25-2	Bromoform	5 u
591-78-6	4-Methyl-2-Pentanone	10 u
108-10-1	2-Hexanone	10 u
127-18-4	Tetrachloroethene	5 u
79-34-5	1, 1, 2, 2-Tetrachloroethane	5 u
108-88-3	Toluene	5 u
108-90-7	Chlorobenzene	5 u
100-41-4	Ethylbenzene	5 u
100-42-5	Styrene	5 u
	Total Xylenes	5 u

Data Reporting Qualifiers

For reporting results to EPA, the following results qualifiers are used Additional flags or footnotes explaining results are encouraged However, the definition of each flag must be explicit

Value	If the result is a value greater than or equal to the detection limit report the value
U	Indicates compound was analyzed for but not detected Report the minimum detection limit for the sample with the U (e g 10U) based on necessary concentration /dilution action (This is not necessarily the instrument detection limit) The footnote should read U Compound was analyzed for but not detected The number is the minimum attainable detection limit for the sample
J	Indicates an estimated value This flag is used either when estimating a concentration for tentatively identified compounds where a 1 1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e g 10J) If limit of detection is 10 µg/l and a concentration of 3 µg/l is calculated report as 3J
C	This flag applies to pesticide parameters where the identification has been confirmed by GC/MS Single component pesticides ≥10 ng/ul in the final extract should be confirmed by GC/MS
B	This flag is used when the analyte is found in the blank as well as a sample It indicates possible/probable blank contamination and warns the data user to take appropriate action
Other	Other specific flags and footnotes may be required to properly define the results If used they must be fully described and such description attached to the data summary report

Page: 6A

Lab. No.: 86-12711(B)

Sample Identification: DE #3 Surface

CAS Number		Results in ug/kg
095-50-1	1,2-Dichlorobenzene	10 u
541-73-1	1,3-Dichlorobenzene	10 u
106-46-7	1,4-Dichlorobenzene	10 u

Sample Number
DP #3 3'

Organics Analysis Data Sheet
(Page 1)

Lab. No. 86-12711(B)

Laboratory Name: Nytest Environmental Inc.

Case No:

Lab Sample ID No:

QC Report No:

Sample Matrix: Soil

Contract No:

Data Release Authorized By:

Date Sample Received: 10/10/86

Volatile Compounds

Concentration: [✓ Low] Medium (Circle One)

Date Extracted/Prepared:

Date Analyzed: 10/13/86

Conc/Dil Factor: 1 pH

Percent Moisture: (Not Decanted)

CAS Number		ug/Kg
74-87-3	Chloromethane	10 u
74-83-9	Bromomethane	10 u
75-01-4	Vinyl Chloride	10 u
75-00-3	Chloroethane	10 u
75-09-2	Methylene Chloride	5 u
67-64-1	Acetone	10 u
75-15-0	Carbon Disulfide	5 u
75-35-4	1, 1-Dichloroethene	5 u
75-34-3	1, 1-Dichloroethane	5 u
156-60-5	Trans-1, 2-Dichloroethene	5 u
67-66-3	Chloroform	5 u
107-06-2	1, 2-Dichloroethane	5 u
78-93-3	2-Butanone	10 u
71-55-6	1, 1, 1-Trichloroethane	5 u
56-23-5	Carbon Tetrachloride	5 u
108-05-4	Vinyl Acetate	10 u
75-27-4	Bromodichloromethane	5 u

CAS Number		ug/Kg
78-87-5	1, 2-Dichloropropane	5 u
10061-02-6	Trans-1, 3-Dichloropropene	5 u
79-01-6	Trichloroethene	5 u
124-48-1	Dibromochloromethane	5 u
79-00-5	1, 1, 2-Trichloroethane	5 u
71-43-2	Benzene	5 u
10061-01-5	cis-1, 3-Dichloropropene	5 u
110-75-8	2-Chloroethylvinylether	10 u
75-25-2	Bromoform	5 u
591-78-6	4-Methyl-2-Pentanone	10 u
108-10-1	2-Hexanone	10 u
127-18-4	Tetrachloroethene	5 u
79-34-5	1, 1, 2, 2-Tetrachloroethane	5 u
108-88-3	Toluene	5 u
108-90-7	Chlorobenzene	5 u
100-41-4	Ethylbenzene	5 u
100-42-5	Styrene	5 u
	Total Xylenes	5 u

Data Reporting Qualifiers

For reporting results to EPA, the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However, the definition of each flag must be explicit.

Value	If the result is a value greater than or equal to the detection limit report the value
U	Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action. (This is not necessarily the instrument detection limit.) The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.
J	Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g. 10J). If limit of detection is 10 μg/l and a concentration of 3 μg/l is calculated, report as 3J
C	This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides ≥ 10 ng/ul in the final extract should be confirmed by GC/MS
B	This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action
Other	Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

Page: 7A

Lab. No.: 86-12711(B)

Sample Identification: DP #3 3'

CAS Number		Results in ug/ kg
095-50-1	1,2-Dichlorobenzene	10 u
541-73-1	1,3-Dichlorobenzene	10 u
106-46-7	1,4-Dichlorobenzene	10 u

Sample Number
DP #4 Surface

Organics Analysis Data Sheet
(Page 1)

Lab. No. 86-12711(B)

Laboratory Name: Nytest Environmental Inc.
Case No:
Lab Sample ID No:
QC Report No:
Sample Matrix: Soil
Contract No:
Data Release Authorized By:
Date Sample Received: 10/10/86

Volatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared:
Date Analyzed: 10/13/86
Conc/Dil Factor: 1 pH
Percent Moisture: (Not Decanted)

CAS Number		ug/Kg
74-87-3	Chloromethane	10 u
74-83-9	Bromomethane	10 u
75-01-4	Vinyl Chloride	10 u
75-00-3	Chloroethane	10 u
75-09-2	Methylene Chloride	5 u
67-64-1	Acetone	10 u
75-15-0	Carbon Disulfide	5 u
75-35-4	1, 1-Dichloroethene	5 u
75-34-3	1, 1-Dichloroethane	5 u
156-60-5	Trans-1, 2-Dichloroethene	5 u
67-66-3	Chloroform	5 u
107-06-2	1, 2-Dichloroethane	5 u
78-93-3	2-Butanone	10 u
71-55-6	1, 1, 1-Trichloroethane	5 u
56-23-5	Carbon Tetrachloride	5 u
108-05-4	Vinyl Acetate	10 u
75-27-4	Bromodichloromethane	5 u

CAS Number		ug/Kg
78-87-5	1, 2-Dichloropropane	5 u
10061-02-6	Trans-1, 3-Dichloropropene	5 u
79-01-6	Trichloroethene	5 u
124-48-1	Dibromochloromethane	5 u
79-00-5	1, 1, 2-Trichloroethane	5 u
71-43-2	Benzene	5 u
10061-01-5	cis-1, 3-Dichloropropene	5 u
110-75-8	2-Chloroethylvinylether	10 u
75-25-2	Bromoform	5 u
591-78-6	4-Methyl-2-Pentanone	10 u
108-10-1	2-Hexanone	10 u
127-18-4	Tetrachloroethene	5 u
79-34-5	1, 1, 2, 2-Tetrachloroethane	5 u
108-88-3	Toluene	5 u
108-90-7	Chlorobenzene	5 u
100-41-4	Ethylbenzene	5 u
100-42-5	Styrene	5 u
	Total Xylenes	5 u

Data Reporting Qualifiers

For reporting results to EPA, the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However, the definition of each flag must be explicit.

Value	If the result is a value greater than or equal to the detection limit, report the value
U	Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g., 10U) based on necessary concentration/dilution action. (This is not necessarily the instrument detection limit.) The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample
J	Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g., 10J). If limit of detection is 10 μg/l and a concentration of 3 μg/l is calculated, report as 3J
C	This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides ≥ 10 ng/ul in the final extract should be confirmed by GC/MS
B	This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action
Other	Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

Page: 8A

Lab. No.: 86-12711(B)

Sample Identification: DP #4 Surface

CAS Number		Results in ug/kg
095-50-1	1,2-Dichlorobenzene	10 u
541-73-1	1,3-Dichlorobenzene	10 u
106-46-7	1,4-Dichlorobenzene	10 u

Sample Number
DP#4 3'

Organics Analysis Data Sheet
(Page 1)

Lab No. 86-12711 (B)

Laboratory Name: Nytest Environmental Inc.
Lab Sample ID No:
Sample Matrix: Soil
Data Release Authorized By:

Case No
QC Report No
Contract No
Date Sample Received: 10/10/86

Volatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared:
Date Analyzed: 10/13/86
Conc/Dil Factor: 1 pH
Percent Moisture: (Not Decanted)

CAS Number		ug/Kg
74-87-3	Chloromethane	10 u
74-83-9	Bromomethane	10 u
75-01-4	Vinyl Chloride	10 u
75-00-3	Chloroethane	10 u
75-09-2	Methylene Chloride	5 u
67-64-1	Acetone	10 u
75-15-0	Carbon Disulfide	5 u
75-35-4	1, 1-Dichloroethene	5 u
75-34-3	1, 1-Dichloroethane	5 u
156-60-5	Trans-1, 2-Dichloroethene	5 u
67-66-3	Chloroform	5 u
107-06-2	1, 2-Dichloroethane	5 u
78-93-3	2-Butanone	10 u
71-55-6	1, 1, 1-Trichloroethane	5 u
56-23-5	Carbon Tetrachloride	5 u
108-05-4	Vinyl Acetate	10 u
75-27-4	Bromodichloromethane	5 u

CAS Number		ug/Kg
78-87-5	1, 2-Dichloropropane	5 u
10061-02-6	Trans-1, 3-Dichloropropene	5 u
79-01-6	Trichloroethene	5 u
124-48-1	Dibromochloromethane	5 u
79-00-5	1, 1, 2-Trichloroethane	5 u
71-43-2	Benzene	5 u
10061-01-5	cis-1, 3-Dichloropropene	5 u
110-75-8	2-Chloroethylvinylether	10 u
75-25-2	Bromoform	5 u
591-78-6	4-Methyl-2-Pentanone	10 u
108-10-1	2-Hexanone	10 u
127-18-4	Tetrachloroethene	5 u
79-34-5	1, 1, 2, 2-Tetrachloroethane	5 u
108-88-3	Toluene	5 u
108-90-7	Chlorobenzene	5 u
100-41-4	Ethylbenzene	5 u
100-42-5	Styrene	5 u
	Total Xylenes	5 u

Data Reporting Qualifiers

For reporting results to EPA, the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However, the definition of each flag must be explicit.

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action. (This is not necessarily the instrument detection limit.) The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.
J	Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g. 10J). If limit of detection is 10 µg/l and a concentration of 3 µg/l is calculated, report as 3J.
C	This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides ≥ 10 ng/ul in the final extract should be confirmed by GC/MS.
B	This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action.
Other	Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report.

Lab. No.: 86-12711(B)

Sample Identification: DP#4 3'

CAS Number		Results in ug/kg
095-50-1	1,2-Dichlorobenzene	10 u
541-73-1	1,3-Dichlorobenzene	10 u
106-46-7	1,4-Dichlorobenzene	10 u

Sample Number
DP#5 Surface

Lab No. 86-12711(B)

Organics Analysis Data Sheet
(Page 1)

Laboratory Name Nytest Environmental Inc.

Case No

Lab Sample ID No

QC Report No

Sample Matrix Soil

Contract No

Data Release Authorized By:

Date Sample Received 10/10/86

Volatile Compounds

Concentration: [✓ Low] Medium (Circle One)

Date Extracted/Prepared:

Date Analyzed: 10/13/86

Conc/Dil Factor: 1 pH

Percent Moisture: (Not Decanted)

CAS Number		ug/Kg
74-87-3	Chloromethane	10 u
74-83-9	Bromomethane	10 u
75-01-4	Vinyl Chloride	10 u
75-00-3	Chloroethane	10 u
75-09-2	Methylene Chloride	5 u
67-64-1	Acetone	10 u
75-15-0	Carbon Disulfide	5 u
75-35-4	1, 1-Dichloroethene	5 u
75-34-3	1, 1-Dichloroethane	5 u
156-60-5	Trans-1, 2-Dichloroethene	5 u
67-66-3	Chloroform	5 u
107-06-2	1, 2-Dichloroethane	5 u
78-93-3	2-Butanone	10 u
71-55-6	1, 1, 1-Trichloroethane	5 u
56-23-5	Carbon Tetrachloride	5 u
108-05-4	Vinyl Acetate	10 u
75-27-4	Bromodichloromethane	5 u

CAS Number		ug/Kg
78-87-5	1, 2-Dichloropropane	5 u
10061-02-6	Trans-1, 3-Dichloropropene	5 u
79-01-6	Trichloroethene	5 u
124-48-1	Dibromochloromethane	5 u
79-00-5	1, 1, 2-Trichloroethane	5 u
71-43-2	Benzene	5 u
10061-01-5	cis-1, 3-Dichloropropene	5 u
110-75-8	2-Chloroethylvinylether	10 u
75-25-2	Bromoform	5 u
591-78-6	4-Methyl-2-Pentanone	10 u
108-10-1	2-Hexanone	10 u
127-18-4	Tetrachloroethene	5 u
79-34-5	1, 1, 2, 2-Tetrachloroethane	5 u
108-88-3	Toluene	5 u
108-90-7	Chlorobenzene	5 u
100-41-4	Ethylbenzene	5 u
100-42-5	Styrene	5 u
	Total Xylenes	5 u

Data Reporting Qualifiers

For reporting results to EPA, the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However, the definition of each flag must be explicit.

Value	If the result is a value greater than or equal to the detection limit report the value
U	Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action. (This is not necessarily the instrument detection limit.) The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample
J	Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g. 10J). If limit of detection is 10 μg/l and a concentration of 3 μg/l is calculated, report as 3J
C	This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides ≥10 ng/ul in the final extract should be confirmed by GC/MS
B	This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action
Other	Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

Page: 10A.

Lab. No.: 86-12711(B)

Sample Identification: DP#5 Surface

CAS Number		Results in ug/kg
095-50-1	1,2-Dichlorobenzene	10 u
541-73-1	1,3-Dichlorobenzene	10 u
106-46-7	1,4-Dichlorobenzene	10 u

Sample Number
DP#5 3'

Organics Analysis Data Sheet
(Page 1)

Lab No. 86-12711(B)

Laboratory Name Nytest Environmental Inc.
Case No
ab Sample ID No
QC Report No
Sample Matrix Soil
Contract No
ata Release Authorized By:
Date Sample Received 10/10/86

Volatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared:
Date Analyzed: 10/13/86
Conc/Dil Factor: 1 pH
Percent Moisture: (Not Decanted)

CAS Number		ug/Kg
74-87-3	Chloromethane	10 u
74-83-9	Bromomethane	10 u
75-01-4	Vinyl Chloride	10 u
75-00-3	Chloroethane	10 u
75-09-2	Methylene Chloride	5 u
57-64-1	Acetone	10 u
75-15-0	Carbon Disulfide	5 u
75-35-4	1, 1-Dichloroethene	5 u
75-34-3	1, 1-Dichloroethane	5 u
156-60-5	Trans-1, 2-Dichloroethene	5 u
67-66-3	Chloroform	5 u
107-06-2	1, 2-Dichloroethane	5 u
78-93-3	2-Butanone	10 u
71-55-6	1, 1, 1-Trichloroethane	5 u
56-23-5	Carbon Tetrachloride	5 u
08-05-4	Vinyl Acetate	10 u
75-27-4	Bromodichloromethane	5 u

CAS Number		ug/Kg
78-87-5	1, 2-Dichloropropane	5 u
10061-02-6	Trans-1, 3-Dichloropropene	5 u
79-01-6	Trichloroethene	5 u
124-48-1	Dibromochloromethane	5 u
79-00-5	1, 1, 2-Trichloroethane	5 u
71-43-2	Benzene	5 u
10061-01-5	cis-1, 3-Dichloropropene	5 u
110-75-8	2-Chloroethylvinylether	10 u
75-25-2	Bromoform	5 u
591-78-6	4-Methyl-2-Pentanone	10 u
108-10-1	2-Hexanone	10 u
127-18-4	Tetrachloroethene	5 u
79-34-5	1, 1, 2, 2-Tetrachloroethane	5 u
108-88-3	Toluene	5 u
108-90-7	Chlorobenzene	5 u
100-41-4	Ethylbenzene	5 u
100-42-5	Styrene	5 u
	Total Xylenes	5 u

Data Reporting Qualifiers

For reporting results to EPA, the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However, the definition of each flag must be explicit.

Value If the result is a value greater than or equal to the detection limit, report the value.

U Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action. (This is not necessarily the instrument detection limit.) The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.

J Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g. 10J). If limit of detection is 10 µg/l and a concentration of 3 µg/l is calculated, report as 3J.

C This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides ≥ 10 ng/ul in the final extract should be confirmed by GC/MS.

B This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action.

Other Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report.

Page: 11A.

Lab. No.: 86-12711(B)

Sample Identification: DP#6 Surface

CAS Number		Results in ug/kg
095-50-1	1,2-Dichlorobenzene	10 u
541-73-1	1,3-Dichlorobenzene	10 u
106-46-7	1,4-Dichlorobenzene	10 u

Sample Number
DP#6 Surface

Lab No. 86-12711(B)

Organics Analysis Data Sheet
(Page 1)

Laboratory Name: Nytest Environmental Inc.
Case No
Lab Sample ID No
QC Report No
Sample Matrix: Soil
Contract No
Data Release Authorized By:
Date Sample Received: 10/10/86

Volatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared
Date Analyzed: 10/13/86
Conc/Dil Factor: 1 pH
Percent Moisture: (Not Decanted)

CAS Number		ug/Kg
74-87-3	Chloromethane	10 u
74-83-9	Bromomethane	10 u
75-01-4	Vinyl Chloride	10 u
75-00-3	Chloroethane	10 u
75-09-2	Methylene Chloride	5 u
67-64-1	Acetone	10 u
75-15-0	Carbon Disulfide	5 u
75-35-4	1, 1-Dichloroethene	5 u
75-34-3	1, 1-Dichloroethane	5 u
56-60-5	Trans-1, 2-Dichloroethene	5 u
67-66-3	Chloroform	5 u
07-06-2	1, 2-Dichloroethane	5 u
78-93-3	2-Butanone	10 u
71-55-6	1, 1, 1-Trichloroethane	5 u
56-23-5	Carbon Tetrachloride	5 u
08-05-4	Vinyl Acetate	10 u
75-27-4	Bromodichloromethane	5 u

CAS Number		ug/Kg
78-87-5	1, 2-Dichloropropane	5 u
10061-02-6	Trans-1, 3-Dichloropropene	5 u
79-01-6	Trichloroethene	5 u
124-48-1	Dibromochloromethane	5 u
79-00-5	1, 1, 2-Trichloroethane	5 u
71-43-2	Benzene	5 u
10061-01-5	cis-1, 3-Dichloropropene	5 u
110-75-8	2-Chloroethylvinylether	10 u
75-25-2	Bromoform	5 u
591-78-6	4-Methyl-2-Pentanone	10 u
108-10-1	2-Hexanone	10 u
127-18-4	Tetrachloroethene	5 u
79-34-5	1, 1, 2, 2-Tetrachloroethane	5 u
108-88-3	Toluene	5 u
108-90-7	Chlorobenzene	5 u
100-41-4	Ethylbenzene	5 u
100-42-5	Styrene	5 u
	Total Xylenes	5 u

Data Reporting Qualifiers

For reporting results to EPA, the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However, the definition of each flag must be explicit.

Value	If the result is a value greater than or equal to the detection limit, report the value
U	Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action. (This is not necessarily the instrument detection limit.) The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.
J	Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g. 10J). If limit of detection is 10 µg/l and a concentration of 3 µg/l is calculated, report as 3J
C	This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides ≥10 ng/ul in the final extract should be confirmed by GC/MS
B	This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action
Other	Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

Page: 12A.

Lab. No.: 86-12711(B)

Sample Identification: DP#6 Surface

CAS Number		Results in ug/kg
095-50-1	1,2-Dichlorobenzene	10 u
541-73-1	1,3-Dichlorobenzene	10 u
106-46-7	1,4-Dichlorobenzene	10 u

Sample Number
DP#6 3'

Organics Analysis Data Sheet
(Page 1)

Lab No. 86-12711(B)

Laboratory Name Nytest Environmental Inc.
Case No
ab Sample ID No
QC Report No
Sample Matrix Soil
Contract No
ata Release Authorized By:
Date Sample Received 10/10/86

Volatile Compounds

Concentration: [✓ Low] Medium (Circle One)
Date Extracted/Prepared:
Date Analyzed: 10/13/86
Conc/Dil Factor: 1 pH
Percent Moisture: (Not Decanted)

CAS umber		ug/Kg
4-87-3	Chloromethane	10 u
74-83-9	Bromomethane	10 u
75-01-4	Vinyl Chloride	10 u
5-00-3	Chloroethane	10 u
75-09-2	Methylene Chloride	5 u
67-64-1	Acetone	10 u
5-15-0	Carbon Disulfide	5 u
75-35-4	1, 1-Dichloroethene	5 u
75-34-3	1, 1-Dichloroethane	5 u
56-60-5	Trans-1, 2-Dichloroethene	5 u
67-66-3	Chloroform	5 u
107-06-2	1, 2-Dichloroethane	5 u
-93-3	2-Butanone	10 u
71-55-6	1, 1, 1-Trichloroethane	5 u
56-23-5	Carbon Tetrachloride	5 u
8-05-4	Vinyl Acetate	10 u
-27-4	Bromodichloromethane	5 u

CAS Number		or ug/Kg
78-87-5	1, 2-Dichloropropane	5 u
10061-02-6	Trans-1, 3-Dichloropropene	5 u
79-01-6	Trichloroethene	5 u
124-48-1	Dibromochloromethane	5 u
79-00-5	1, 1, 2-Trichloroethane	5 u
71-43-2	Benzene	5 u
10061-01-5	cis-1, 3-Dichloropropene	5 u
110-75-8	2-Chloroethylvinylether	10 u
75-25-2	Bromoform	5 u
591-78-6	4-Methyl-2-Pentanone	10 u
108-10-1	2-Hexanone	10 u
127-18-4	Tetrachloroethene	5 u
79-34-5	1, 1, 2, 2-Tetrachloroethane	5 u
108-88-3	Toluene	5 u
108-90-7	Chlorobenzene	5 u
100-41-4	Ethylbenzene	5 u
100-42-5	Styrene	5 u
	Total Xylenes	5 u

Data Reporting Qualifiers

For reporting results to EPA, the following results qualifiers are used. Additional flags or footnotes explaining results are encouraged. However, the definition of each flag must be explicit.

Value	If the result is a value greater than or equal to the detection limit report the value
	Indicates compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g. 10U) based on necessary concentration/dilution action. (This is not necessarily the instrument detection limit.) The footnote should read U Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample
J	Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicated the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g. 10J). If limit of detection is 10 µg/l and a concentration of 3 µg/l is calculated report as 3J
C	This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides ≥10 ng/ul in the final extract should be confirmed by GC/MS
B	This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action
Other	Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report

Page: 13A.

Lab. No.: 86-12711(B)

Sample Identification: DP#6 3'

CAS Number		Results in ug/ kg
095-50-1	1,2-Dichlorobenzene	10 u
541-73-1	1,3-Dichlorobenzene	10 u
106-46-7	1,4-Dichlorobenzene	10 u

TOTAL ANALYTICAL SERVICES FOR A SAFE ENVIRONMENT

NEI nytest environmental inc

CHAIN OF CUSTODY RECORD

JECT NO.

PROJECT NAME: REALCO UNIONDALE / FANNING, PHILLIPS AND MOLNAR

NT NAME. FPM (FANNING, PHILLIPS + MOLNAR

LAB.#

MPLE NO.	DATE	TIME	COMP	GRAB	SAMPLE LOCATION	NO. OF CON-TAINERS	NITROGEN	OIL & GREASE	CYANIDE	PHENOL	VOLATILE	METALS	ORGANICS	BACTERIAL	TOC COD	OTHER	UNPRESERVED	REMARKS ADDITIONAL REQUIREMENTS
#1	10/10	2:15		✓	Dp #1 (Surface) (front)	1 (40ml)												TEST 601 + 602
#1	10/10	"		✓	Dp#1 (3' Depth) (Front)	1 40ml												"
#3				✓	Dp#3 (Surface) (Front)	1 40ml												"
#3				✓	Dp#3 (3') (Back)	1 40ml												"
#4				✓	Dp#4 Surface (Back)	1												"
#4				✓	Dp#4 (3') (Back)	1												"
#5				✓	Dp#5 (Surface) (Back)	1												"
#5				✓	Dp#5 (3') (Back)	1												"
#6				✓	Dp#6 (Surface) Back	1												"
#6				✓	Dp#6 (3') Back	1												"
-2				✓	B-2 (Middle) (2')	1												"
-6				✓	B-6 (Mid-North) (1')	1												"
NOWN				✓	UNKNOWN SUBSTANCE (BACK)	1 [illegible]												E. P. TOXICITY (Metals only)
oped Via:					Total	13												

ished by (Signature) Martin O. Klein

Date/Time 10/10/86 2:25 pm

Agent of: FPM

Rec'd. by (Signature)

Date/Time 10-10-86 2:25

Agent of: NYT

Name MARTIN O. KLEIN

Printed Name K. TAORO

ished by (Signature)

Date/Time

Agent of:

Rec'd. by (Signature)

Date/Time

Agent of:

Name

Printed Name

ished by (Signature)

Date/Time 10/10 2:30

Received for Laboratory by: (Signature)

Date/Time 10-10 2:30

Remarks. CONTACT: FANNING, PHILLIPS AND MOLNAR
80 Skyline Drive
Plainview, N.Y. 11803
Phone# 516 938-2200
ATTN.: MARTIN O. KLEIN

ONE WK.

Name K. TAORO

Printed Name

ler (Signature) Martin O. Klein

Samplers Name (Print) MARTIN O. KLEIN.

AMMENDMENT #1
UNKNOWN SUBSTANCE LABORATORY ANALYSIS

TOTAL ANALYTICAL SERVICES FOR A SAFE ENVIRONMENT
NEI nytest environmental inc.

Lab. No.: 86-12711(A)

P.O. NO.: Pending

REPORT OF ANALYSIS

- FOR -

FANNING PHILLIPS & MOLNAR
80 SKYLINE DRIVE
PLAINVIEW, NEW YORK 11803

OCTOBER 31, 1986

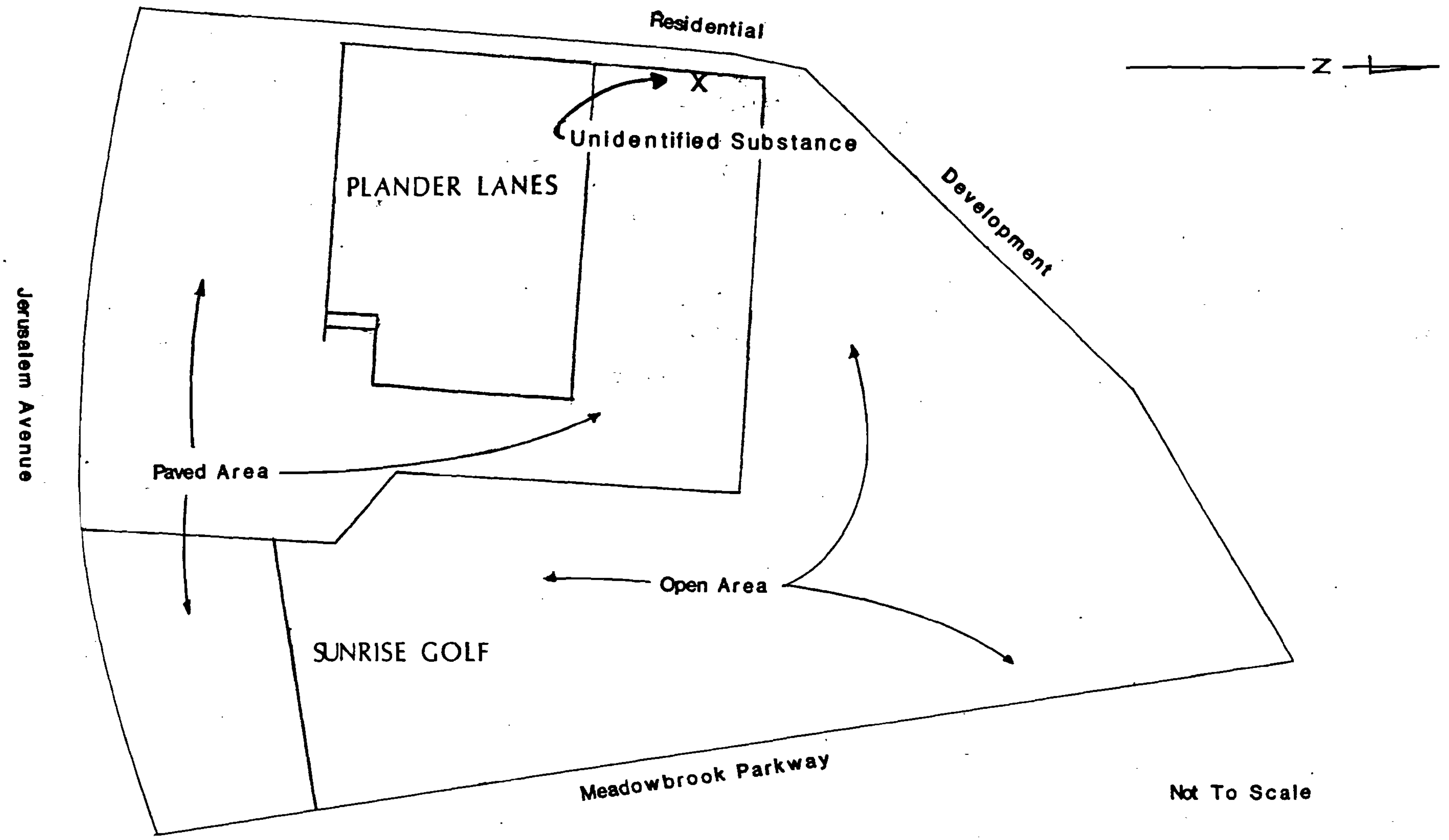
call box 1021 □ 75 urban avenue, westbury, n.y. 11590 □ (516) 334/7770, (718) 297/1449

LABORATORY RESULTS FOR THE "UNKNOWN SUBSTANCE" INTRODUCED IN THE SITE CONTAMINATION STUDY IN UNIONDALE - OCTOBER 14, 1986

Summary of laboratory results:

During site investigation, an unidentified substance was observed in the rear parking lot at Planders Lane Bowling Alley (see Figure 1 for location). A sample was collected and sent to the laboratory to be tested for E.P. Toxicity (metals only)

Laboratory results confirm undetectable levels of metals in the "Unknown Substance." The following pages explain in more detail the testing and analysis performed by the laboratory.



F,P&M

FIGURE 1 -SITE PLAN AND LOCATION OF UNKNOWN SUBSTANCE

LABORATORY TEST RESULTS

Page: CONTENTS

Lab. No.: 86-12711(A)

TABLE OF CONTENTS

Lab. No.: 86-12711(A)

1.0 References

1.1 Client purchase order number: Pending

1.2 Lab. No. 86-12711(A)

1.3 Identification and listing of Hazardous Waste. Federal Register, Vol. 45 No. 98, May 19, 1980

1.4 Handbook for analytical Quality Control in Water-Wastewater Laboratories - EPA-600/4-79-019, March, 1979

2.0 Description of Tests

2.1 E P Toxicity: Ref. 1.3 para. 261.24

Identifies materials whose constituents may have a tendency to leach or migrate when disposed of improperly. The liquid phase of a sample is separated. The solid phase is extracted at pH 5 with aqueous acetic acid for 24 hours. The extract is combined with the liquid phase and analyzed.

3.0 Test Requirements

E P Toxicity - Table 1

4.0 Sample Identification

Unknown Substance

Page 2 Lab No 86-12711(A)

5.0 Sample Identification and Results

5.1 Sample Marked Unknown Substance

Date sampled: Not Available

Collected by: Fanning Phillips & Molnar

Date Received by Nytest Environmental Inc.: 10/10/86

5.1.1 Results

E P Toxicity (PPM)	Max. Allowable Levels	Found
Arsenic	5.0	< 0.05
Barium	100.0	< 1.00
Cadmium	1.0	< 0.01
Chromium	5.0	< 0.05
Lead	5.0	< 0.05
Mercury	0.2	< 0.02
Selenium	1.0	< 0.01
Silver	5.0	< 0.05

< = Less than

Lab. No.: 86-12711(A)

6.0 CONCLUSION

The submitted sample did not exhibit the characteristic of E P Toxicity for metals.

7.0 CERTIFICATION AND SIGNATURES

Report prepared by:

Parag K. Shah, Ph.D.
Organic Laboratory Manager

Report reviewed by:

Peggy Sacks PS
Q.C. Manager

CERTIFICATION

We certify that this report is a true report of results obtained from our tests of this material.

Respectfully submitted,

Nytest Environmental Inc.

Remo Gigante
Laboratory Director

Att: Mr. M. Klien

jw

8.0 CHAIN OF CUSTODY

TOTAL ANALYTICAL SERVICES FOR A SAFE ENVIRONMENT

NEI nytest environmental inc.

CHAIN OF CUSTODY RECORD

ROJECT NO.

PROJECT NAME: REALCO UNIONDALE / FANNING, PHILLIPS AND MOLNAR

IENT NAME: FPM (FANNING, PHILLIPS + MOLNAR

LAB.#

AMPLE D. NO.	DATE	TIME	COMP	GRAB	SAMPLE LOCATION	NO. OF CON- TAINERS	NITROGEN	OIL & GREASE	CYANIDE	PHENOL	VOLATILE	METALS	ORGANICS	BACTERIAL	TOC COD	OTHER	UNPRESERVED	REMARKS ADDITIONAL REQUIREMENTS
p#1	10/10	2:15		✓	Dp#1 (Surface) (Front)	1 (40ml)												TEST 601 + 602
p#1	10/10	"		✓	Dp#1 (3' Depth) (Front)	1 40ml												"
#3		↓		✓	Dp#3 (Surface) (Front)	1 40ml												"
p#3	↓			✓	Dp#3 (3') (Back)	1 40ml												"
#4				✓	Dp#4 Surface (Back)	1 ↓												"
p #4				✓	Dp#4 (3') (Back)	1												"
#5				✓	Dp#5 (Surface) (Back)	1												"
p#5				✓	Dp#5 (3') (Back)	1												"
#6				✓	Dp#6 (Surface) Back	1												"
p#6				✓	Dp#6 (3') Back	1												"
-2				✓	B-2 (Middle) (2')	1												"
-6				✓	B-6 (Mid-North) (1')	1												"
known				✓	UNKNOWN SUBSTANCE (BACK)	1 mason jar												E.P. TOXICITY (Metals only)
				✗														

hipped Via:

Total 13

inquished by (Signature) Martin O. Klein

nted Name MARTIN O. KLEIN

Date/Time 10/10/86 2:25 pm

Agent of: FPM

Rec'd. by (Signature) K. Taoko

Printed Name K TAOKO

Date/Time 10-10-86 2:25

Agent of: NYT

inquished by (Signature)

Date/Time

Agent of:

Rec'd. by (Signature)

Date/Time

Agent of:

nted Name K

Printed Name

inquished by (Signature) K. Taoko

nted Name K. TAOKO

Date/Time 10/10 2:30

Received for Laboratory by: (Signature)

Printed Name FRANCISCO BOZZI

Date/Time 10-10 2:30

Remarks: CONTACT: FANNING, PHILLIPS AND MOLNAR
80 Skyline Drive
Plainview, N.Y. 11803
Phone# 516 938-2200
ATTN.: MARTIN O. KLEIN

ONE WK. 10/17/86

npler (Signature) Martin O. Klein

Samplers Name (Print) MARTIN O. KLEIN.

AMMENDMENT #2
SITE CONTAMINATION STUDY
UNIONDALE

AMMENDMENT TO SITE CONTAMINATION STUDY:

UNIONDALE PREPARED FOR REALCO

PURPOSE: On July 11, a buried tank was found on the Uniondale site located on Jerusalem Avenue. This tank was not identified in the Site Contamination Study prepared for Realco, dated October 14, 1986, by Fanning, Phillips and Molnar. On July 25, 1988, an OVA was conducted to determine the likelihood of leakage from this tank and to ascertain the approximate dimentions of the tank.

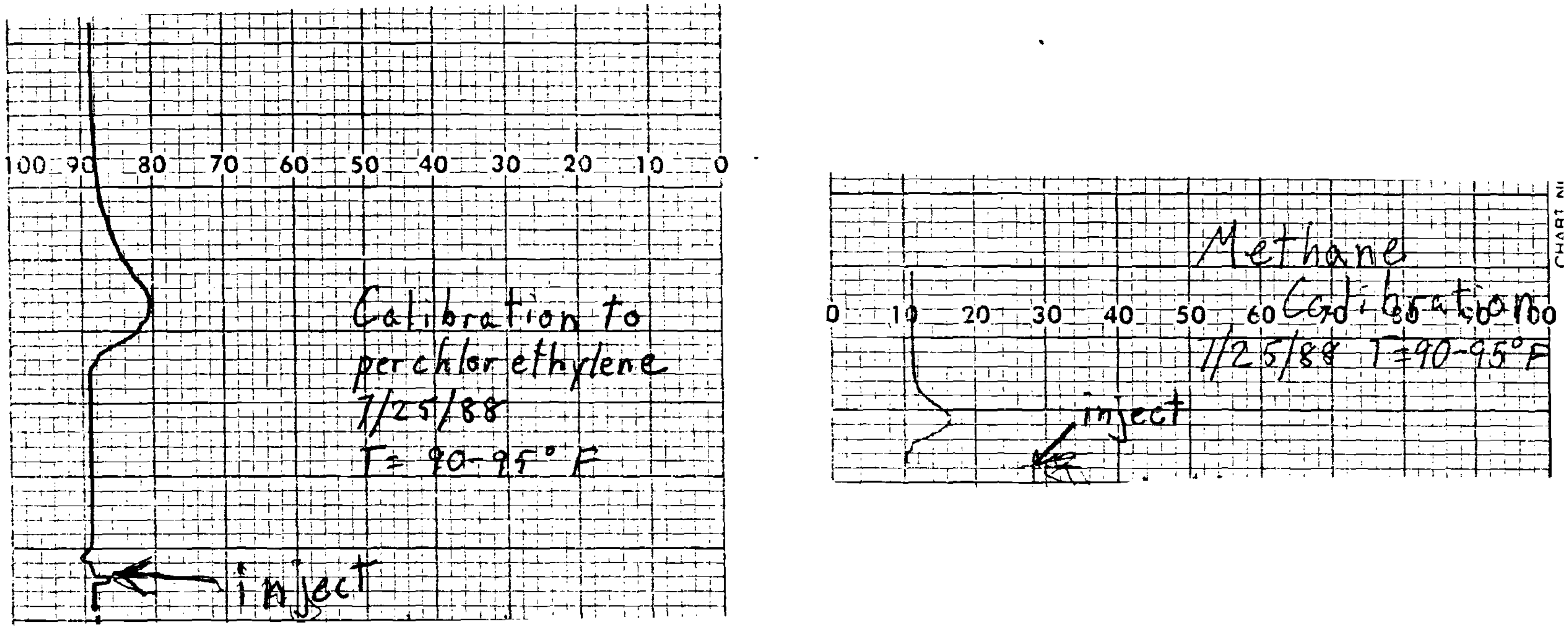
DATE: July 25, 1988

WEATHER CONDITION: Hazy, Hot, Humid. Temperature 90° F

PRESENT:
Fanning, Phillips and Molnar
Andrew Ritchie Civil Engineer
Jay Best Chemist

DETAILS:

- Arrived on site at 9:00 a.m.
- The tank survey was begun at approximately 1 p.m.
- The Gas Chromatograph (see Figure A.3) was calibrated to methane and standards were run for methane and perchloroethylene response times. The response times were 18 seconds and 119 seconds, respectively.
- To determine the depth of the tank, a plunge bar was inserted into the opening of the tank. The plunge bar is 5' tall and did not contact bottom. This indicates that the tank is at least 5' deep.
- Tank head space
    - o An Organic Vapor Analyzer was used to determine total organic vapors present in the tank head space and indicated greater than 1,000 ppm organic vapor relative to methane.
    - o A Gas Chromatograph (see Figure A.4) of the head space



Calibration to perchlorethylene 7/25/88 T= 90-95° F

inject

Methane Calibration 7/25/88 T=90-95°F

inject

CALIBRATION TO PERCHLORETHYLENE

CALIBRATION TO METHANE

FIGURE A.3 - OVA/GC CALIBRATION

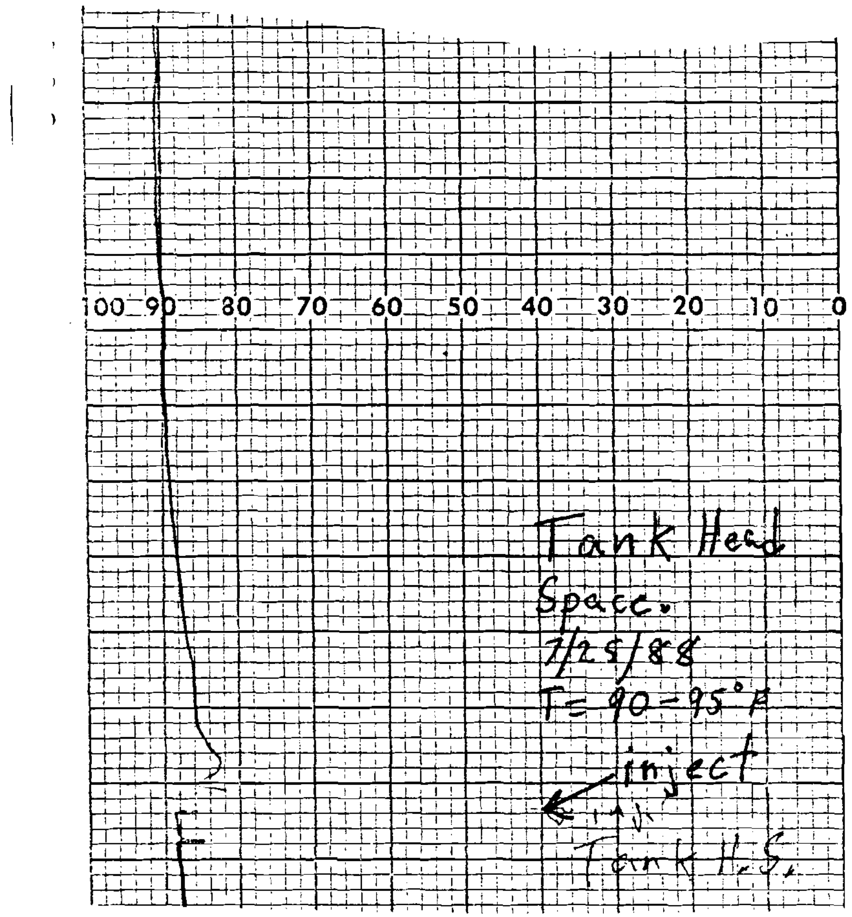


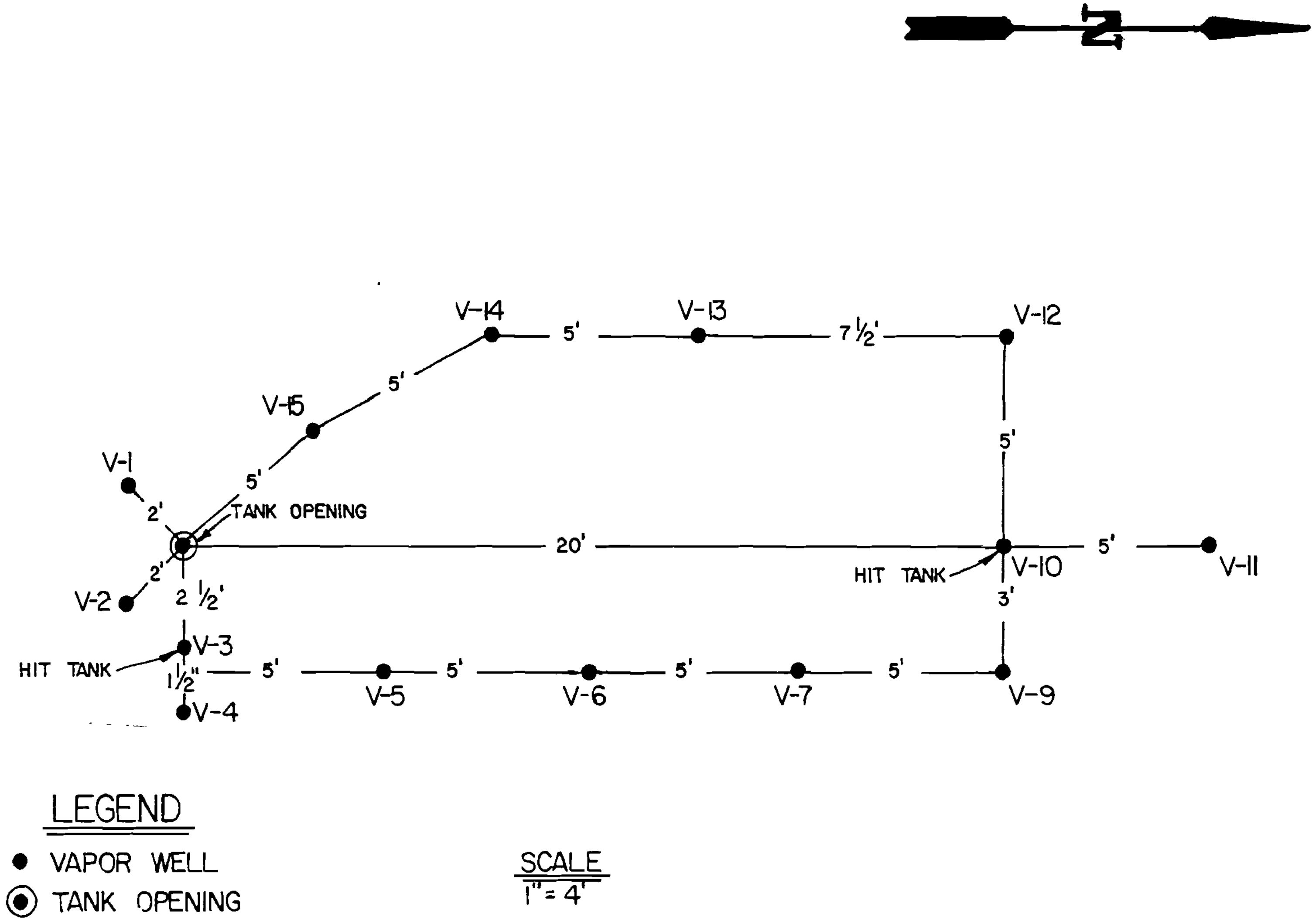
FIGURE A.4 -FUEL TANK HEAD SPACE ANALYSIS showed a peak at 18 seconds, which corresponds to the retention time of methane. In addition, there were a number of very low rises in the base line of the strip chart during the GC run; one definate peak at 48 seconds and another at 186 seconds, indicating other Volatile Organic Compounds VOCs. It is difficult to be conclusive about these peaks without laboratory analysis because the nature of the compounds associated with fuel oil or diesel fuel is such that their detection would be limited by the lower sensitivity of the OVA to heavier molecular weight VOCs.

- Liquid can be seen from the surface. This liquid had a petroleum hydrocarbon odof similar to that of diesel or kerosine.

- OVA survey
  - A plunge bar was used to create a 4' deep x 1/2" diameter vapor well.
  - The intake tube of the OVA was then inserted into the vapor well. The vapors within the soil pore space are then routed to a flame ionization detector of the OVA unit.
  - Fifteen vapor wells were analyzed around the tank shown in Figure A.2.
  - Only two vapor wells had a reading above background levels (1-10):

V-12...........40 ppm initial peak, 9 ppm steady state
V-15...........20 ppm initial peak, 10 ppm steady state

These were not judged to be significant due to the steady state readings and no G.C. was done.



F,P&M

FIGURE A.2 – OVA SURVEY AROUND BURIED TANK

CONCLUSIONS:

- The tank is located as shown in Figure A.1. It is indicated as "Buried Fuel Tank".
- The tank contains considerable amounts of fuel. Approximately half full.
- Dimensions can be estimated to be

  25' x 5' x 6'.
- Estimation of volume
  - Assuming cylindrical shape

    r = 3', l = 25'

    Volume = r l

    = 707 ft

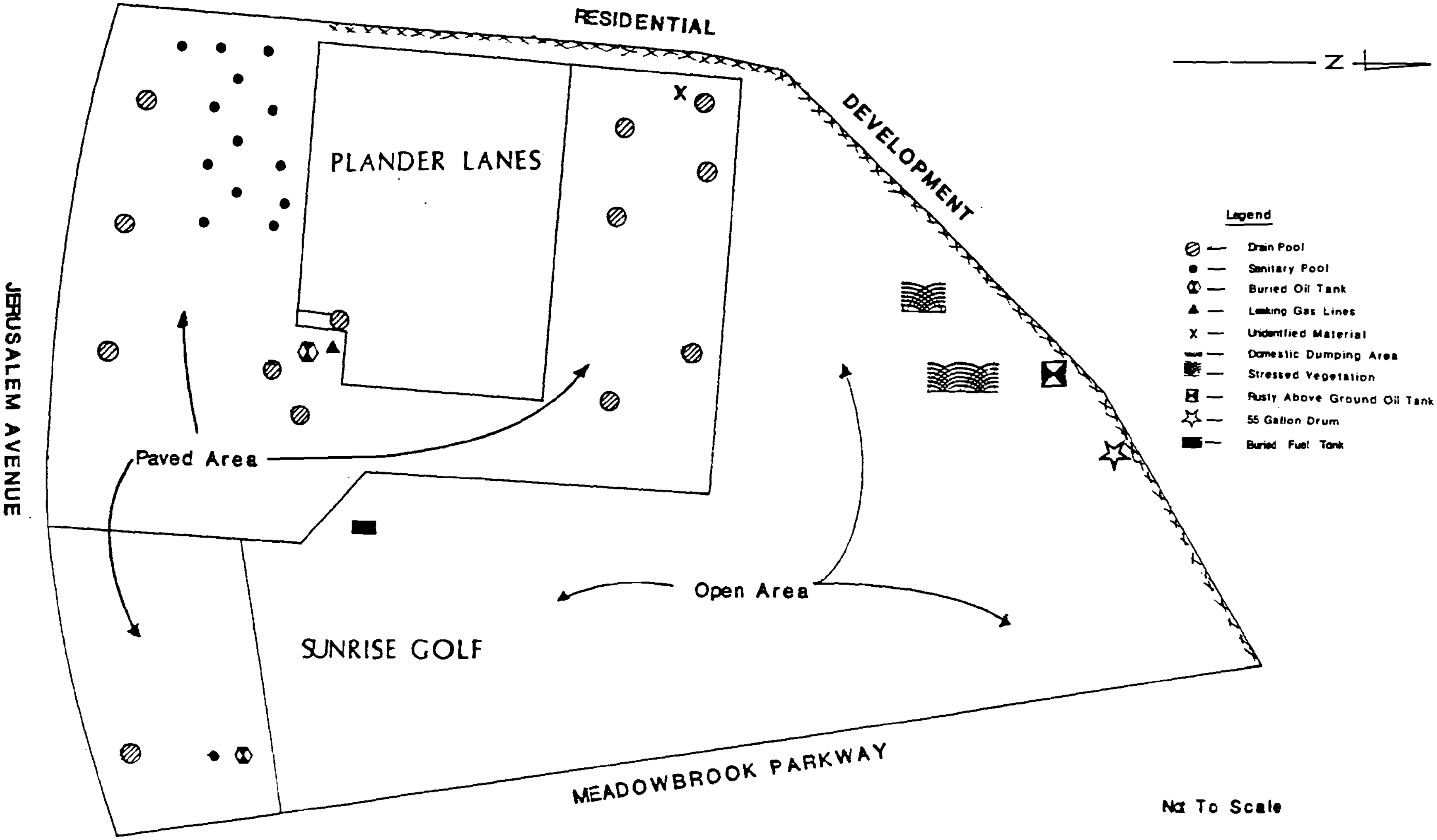
    Using the conversion, 1 ft = 7.46 gal

    The tank volume is approximately 5,273 gallons

    This is a rough estimate, however. If the tank were only 1 foot larger in diameter then the tank would be nearly 7,200 gallons.
  - Based on the results of theOVA survey it can be concluded that the tank does not leak.

RECOMMENDATIONS:

- The tank will have to be removed and disposed of according to Federal, State and local regulations.
- During any future excavation, drilling or construction, a contigency plan should be developed and implemented to consider the possibility of other unknowns (i.e. tanks, drums, etc.) that may be buried on site.



F,P&M

FIGURE A.1 - SITE PLAN AND LOCATIONS OF POTENTIAL CONTAMINATION

APPENDIX 2
TRAFFIC IMPACT STUDY

Eschbacher
& Associates
Consulting Engineers

TRAFFIC IMPACT STUDY
for
PROPOSED SHOPPING CENTER
on
JERUSALEM AVENUE
in
UNIONDALE, NEW YORK

Prepared by:

Robert M. Eschbacher, P.E.
ESCHBACHER & ASSOCIATES
7 Seaman Avenue
Bethpage, NY 11714
(516) 931-9090

June 10, 1988

TABLE OF CONTENTS

I. INTRODUCTION

Uniondale Realty Associates is proposing to construct a shopping center on Jerusalem Avenue in Uniondale, New York just west of the Meadowbrook Parkway. As shown on the site plan (drawing SP-1, dated September 1987 by Carman-Dunne, P.C.) the shopping center will consist of a 60,353 square foot supermarket and retail stores with an area of 77,461 square feet, on a 10.66 acre site with 691 parking spaces to be provided. In connection with this project, this study was undertaken as part of the environmental impact analysis process to examine the impact of the development on traffic.

This report presents the results of the traffic study and summarizes the data collection process, traffic analysis procedures and the study conclusions.

II. STUDY METHODOLOGY

The methodology used in this traffic study consisted of the following items:

1. The site plan was reviewed to obtain an understanding of the nature of the project scope.

2. Based on a field review of the existing roadway system, the key intersections which would be impacted by the project were identified. In this case, it was determined that the following intersections should be examined:

   - Jerusalem Avenue at Smith Street/Winthrop Drive, a signalized intersection located west of the project site.

   - Jerusalem Avenue at Northgate Drive (West and East), unsignalized intersections located opposite the project site.

   - Jerusalem Avenue at N. Jerusalem Road, a signalized intersection located east of the project site.

3. Traffic counts were collected for the key intersections during the morning and afternoon peak hours for a mid-week day, and also for the Saturday mid-day peak hour.

4. The traffic capacities of these locations were analyzed for the existing conditions.

5. The additional traffic to be generated by the proposed development was projected and the travel origins and destinations of this additional traffic were estimated.

6. These projected traffic volumes were then added to the existing volumes and the traffic capacities were re-analyzed.

7. The results of the existing and proposed conditions were then compared to assess the impact of the project.

III. EXISTING CONDITIONS

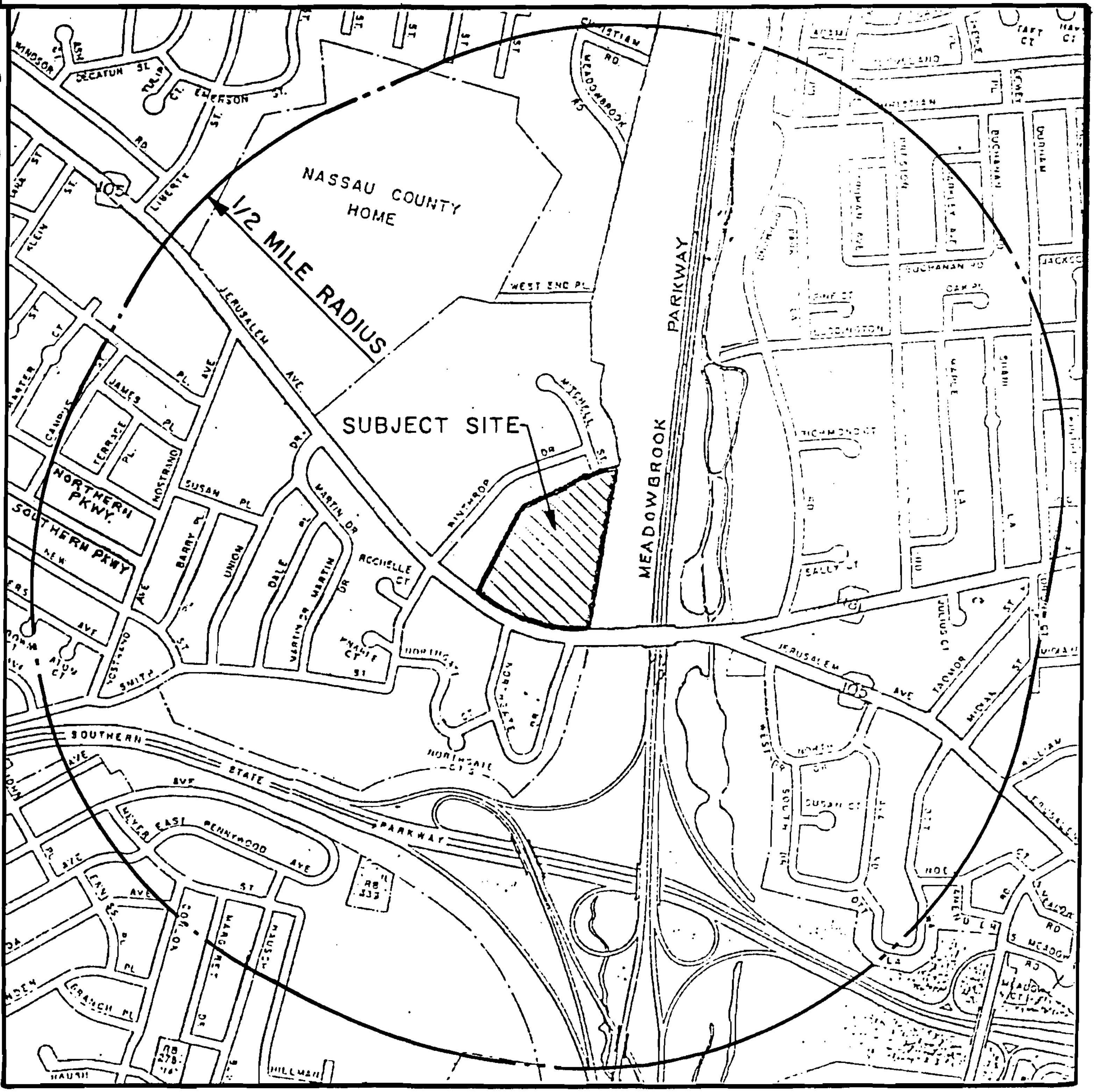
The project site is located on the north side of Jerusalem Avenue, between Winthrop Drive and the Meadowbrook Parkway, and is opposite Northgate Drive (East and West), as shown on the following location map.

In this area, Jerusalem Avenue is an east-west Nassau County arterial roadway, with two lanes of traffic in each direction and with parking on both sides. The posted speed limit is 40 miles per hour. In the area of the project site, Jerusalem Avenue has a horizontal curve which presents a sight distance problem which limits the ability of vehicles attempting to leave the site from seeing westbound traffic.

To the west of the project site, Jerusalem Avenue intersects with Smith Street/Winthrop Drive at a signalized location. Winthrop Drive is a two lane roadway which provides access to a small residential area to the north of Jerusalem Avenue, while Smith Street is a two lane roadway also providing access to a primarily residential area.

To the east of the project site, N. Jerusalem Road, another east-west arterial roadway, forms a signalized Y-intersection with Jerusalem Avenue. N. Jerusalem Road also has two travel lanes with parking in each direction.

The proposed access points to the shopping center are located opposite the two unsignalized intersections of Northgate Drive with Jerusalem Avenue. For this report, these points are designated Northgate Drive East and Northgate Drive West. Each location is proposed to remain controlled by Stop signs, with a right turn lane and a left turn lane exiting the shopping center. Northgate Drive is a two lane residential roadway, with an outlet to Smith Street.



LOCATION MAP

SCALE: 1"=800'

IV. DATA COLLECTION

Traffic Counts

Turning movement counts were obtained for the key intersections during the morning, evening and Saturday peak hours. The summaries of these existing traffic counts are in the Appendix to this report.

The peak hours were determined to be as follows:

Morning Peak Hour . . . . 7:00 - 8:00 A.M.
Evening Peak Hour . . . . 5:00 - 6:00 P.M.
Saturday Peak Hour. . . .12:00 - 1:00 P.M.

V. TRAFFIC ANALYSIS

Trip Generation

The additional traffic to be generated by the proposed development of the project was estimated by using the "Trip Generation Report" prepared by the Institute of Transportation Engineers (1982).

The detailed computations (presented in the Appendix) show that it can be expected that a total of 182 additional trips (99 entering, 83 exiting) will be generated during the A.M. peak hour of traffic for a mid-week day on the adjacent roadway system and a total of 785 additional trips (392 entering, 393 exiting) will be generated during the P.M. peak hour. For the peak hour on a Saturday, there will be 1,149 additional trips generated (576 entering, 573 exiting).

Trip Assignment

The next step in the process was to determine from which directions the additional generated trips would travel.

The resulting trip assignment information for the site-generated traffic is presented in the Appendix, based on existing traffic flows and the site's location in central Nassau County. In general, it was assumed that approximately 50% of the additional trips would arrive from and depart to the east of the site and 50% to/from the west.

Analysis Conditions

The key intersections were analyzed under two conditions:

1. Existing Condition.
2. Proposed Condition.

The Existing Condition analysis was based on traffic volumes, signalization features and roadway/intersection characteristics which are currently in existence.

The Proposed Condition analysis was based on adding the traffic to be generated by the project to the Existing Condition data. These analyses were then performed for the morning and evening peak hours for a mid-week day, as well as for the Saturday peak hour.

Intersection Analysis

The traffic capacities and levels of service for the key intersections were analyzed using the U.S. Department of Transportation, Federal Highway Administration, Highway Capacity Software computer program (Release 1.3), which is based on the procedures in the 1985 Highway Capacity Manual.

The intersection capacity analysis computer summary sheets and descriptions of the Levels of Service are in the Appendix, with the overall results summarized below:

		Level of Service	
Signalized Intersection	Peak Hour	Existing Condition	Proposed Condition
Jerusalem Ave.- Smith/Winthrop	A.M.	A	A
	P.M.	A	A
	Sat.	A	A
Jerusalem Ave.- N. Jerusalem Rd.	A.M.	B	B
	P.M.	B	B
	Sat.	B	B

This information shows that the results for the Proposed Condition analysis are the same for the Existing Condition, indicating that the additional traffic to be generated by the project will not cause the intersections to operate at a lower level of service. Thus, there is no need for mitigation measures. Furthermore, both intersections are operating currently at an acceptable level of service.

			Level of Service	
Unsignalized Intersection	Turning Movement	Peak Hour	Existing Condition	Proposed Condition
Jerusalem Ave.- Northgate (west)	SB left	A.M.	N/A	E
	" "	P.M.	N/A	F
	" "	Sat.	N/A	F
	SB right	A.M.	N/A	A
	" "	P.M.	N/A	A
	" "	Sat.	N/A	A
	NB left/right	A.M.	D	E
	" "	P.M.	D	E
	" "	Sat.	A	D
	EB left	A.M.	N/A	C
	" "	P.M.	N/A	B
	" "	Sat.	N/A	B
	WB left	A.M.	A	A
	" "	P.M.	C	C
	" "	Sat.	A	A

Unsignalized Intersection	Turning Movement	Peak Hour	Level of Service Existing Condition	 Proposed Condition
Jerusalem Ave.- Northgate (East)	SB left	A.M.	N/A	E
	" "	P.M.	N/A	F
	" "	Sat.	N/A	E
	SB right	A.M.	N/A	A
	" "	P.M.	N/A	A
	" "	Sat.	N/A	A
	NB left/right	A.M.	D	D
	" "	P.M.	D	E
	" "	Sat.	A	D
	EB left	A.M.	N/A	C
	" "	P.M.	N/A	B
	" "	Sat.	N/A	A
	WB left	A.M.	A	A
	" "	P.M.	C	D
	" "	Sat.	A	A

This information for unsignalized intersections indicates that traffic leaving the site and attempting to make a left turn will experience difficulty in finding gaps in the Jerusalem Avenue traffic flows. Vehicles on Northgate Drive (both intersections) attempting to make a left turn to proceed west on Jerusalem Avenue will also have difficulty.

Mitigation Measures

The capacity analysis results indicate a need for mitigation at the proposed shopping center access points.

It is recommended that all left turns from the shopping center take place at one driveway and that a traffic signal be installed at that location. A preliminary analysis reveals that a signal would be warranted and would operate at a satisfactory level of service. A traffic signal will also facilitate the movement of pedestrians from the residential area opposite the project site by periodically stopping Jerusalem Avenue traffic. Further discussions concerning this proposed signalization should be held with Nassau County officials. In conjunction with this signalization, left turn lanes should be provided for the westbound and eastbound traffic on Jerusalem Avenue.

It is also recommended that appropriate warning signs be placed in advance of the east driveway on westbound Jerusalem Avenue because of the limited sight distance.

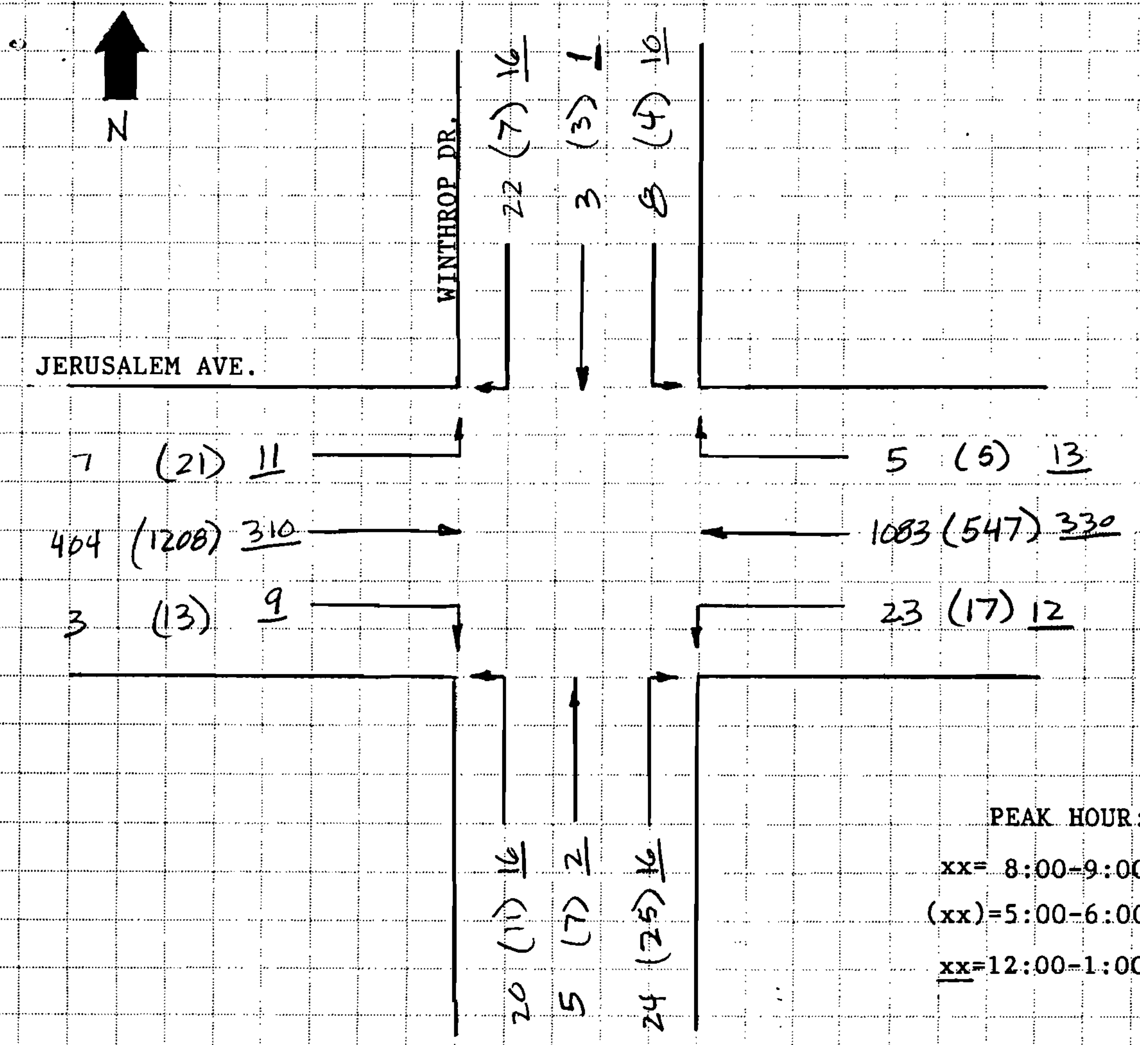
VI. CONCLUSIONS

Based upon the results of this traffic study it has been determined that, even though a significant amount of additional traffic will be generated by the proposed shopping center, with the incorporation of the recommended mitigation measures, the key intersections in the vicinity will operate at an acceptable level of service.

APPENDIX

ESCHBACHER & ASSOCIATES
Consulting Engineers

JOB JERUSALEM AVE. TRAFFIC STUDY
SHEET NO. OF
CALCULATED BY DATE
CHECKED BY DATE
SCALE



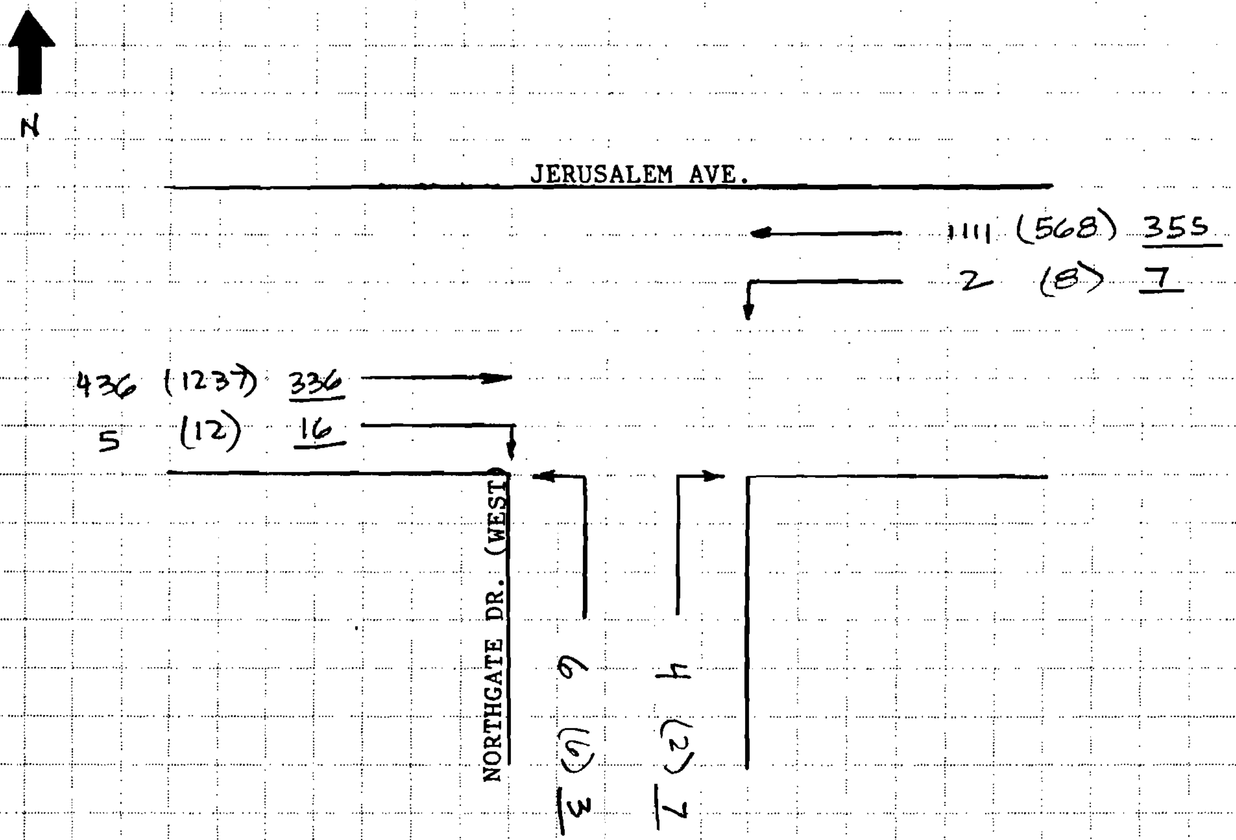
PEAK HOUR:
xx= 8:00-9:00 A.M.
(xx)=5:00-6:00 P.M.
xx=12:00-1:00 WEEKEND

DATE OF COUNTS: 5/26/88 A.M.
5/26/88 P.M.
5/28/88 WEEKEND

EXISTING PEAK HOUR TRAFFIC COUNTS A 1

ESCHBACHER & ASSOCIATES
Consulting Engineers

JOB JERUSALEM AVE. TRAFFIC STUDY
SHEET NO. OF
CALCULATED BY DATE
CHECKED BY DATE
SCALE



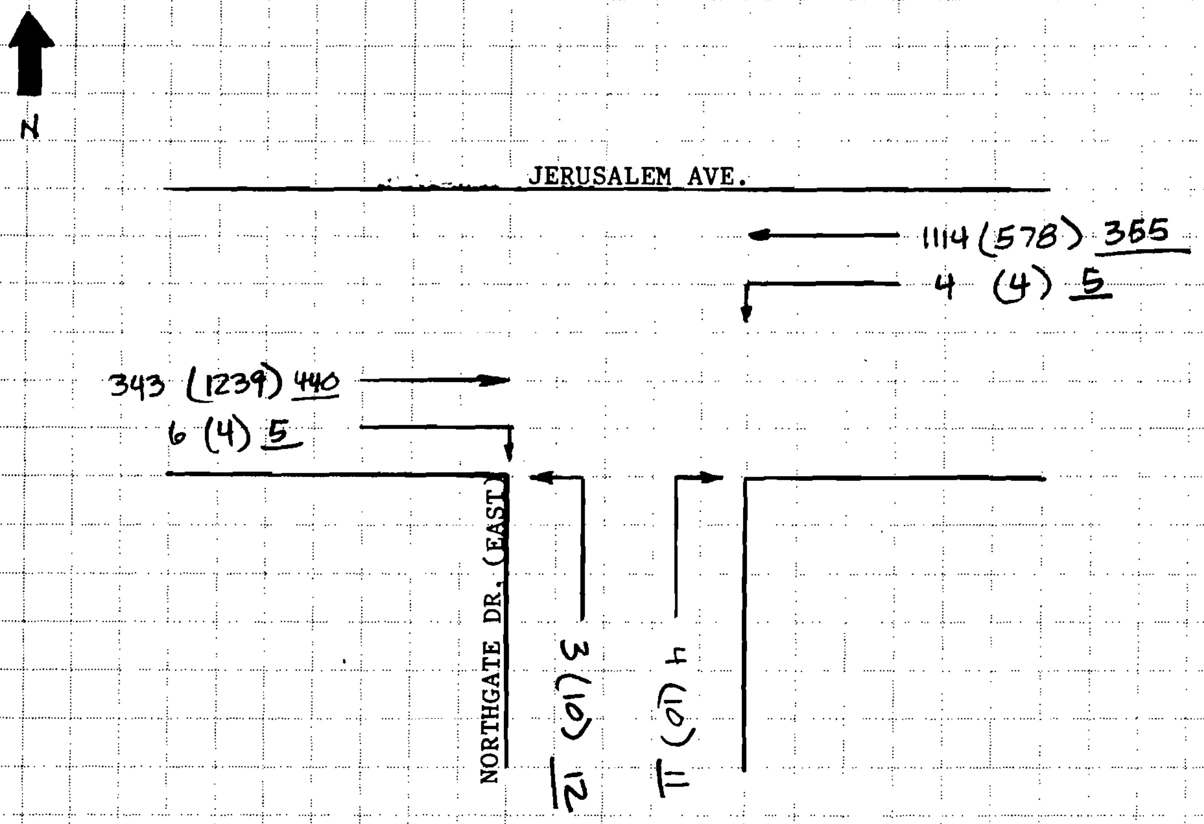
PEAK HOUR:
xx= 8:00-9:00 A.M.
(xx)= 5:00-6:00 P.M.
xx=12:00-1:00 WEEKEND

DATE OF COUNTS: 5/26/88 A.M.
5/26/88 P.M.
5/28/88 WEEKEND

EXISTING PEAK HOUR TRAFFIC COUNTS

ESCHBACHER & ASSOCIATES
Consulting Engineers

JOB JERUSALEM AVE. TRAFFIC STUDY
SHEET NO. OF
CALCULATED BY DATE
CHECKED BY DATE
SCALE



PEAK HOUR:

xx= 8:00-9:00 A.M.
(xx)= 5:00-6:00 P.M.
xx= 12:00-1:00 WEEKEND

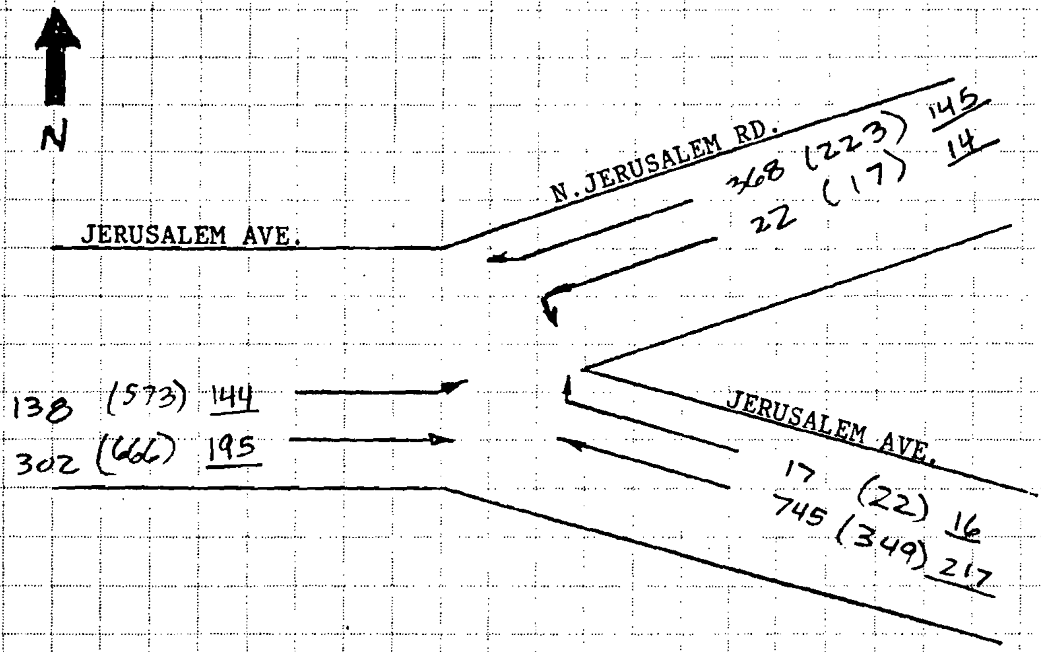
DATE OF COUNTS: 5/26/88 A.M.
5/26/88 P.M.
5/28/88 WEEKEND

EXISTING PEAK HOUR TRAFFIC COUNTS A 3

JOB JERUSALEM AVE. TRAFFIC STUDY

ESCHBACHER & ASSOCIATES
Consulting Engineers

SHEET NO. ____________ OF ____________
CALCULATED BY ____________ DATE ____________
CHECKED BY ____________ DATE ____________
SCALE ____________



PEAK HOUR:
xx= 8:00-9:00 A.M.
(xx)= 5:00-6:00 P.M.
xx=12:00-1:00 WEEKEND

DATE OF COUNTS: 5/26/88 A.M.
5/26/88 P.M.
5/28/88 WEEKEND

EXISTING PEAK HOUR TRAFFIC COUNTS A 4

TRIP GENERATION CALCULATIONS

Site Unit:	A	B,C,D
Land Use Type:	Supermarket	Retail Shopping
ITE Land Use Code:	850	821
Project Size:	60,353 G.S.F.	77,461 G.S.F.

TIME PERIOD	UNIT	GENERATION FACTOR	x	PROJECT SIZE	=	TRIPS (ROUNDED)	
AM Peak Hr (entering)	A	0.38	x	60.4	=	23	
" "	B,C,D	1.40	x	77.5	=	109	
	TOTAL					132	
						x .75* =	99
AM Peak Hour (exiting)	A	0.16	x	60.4	=	10	
" "	B,C,D	1.30	x	77.5	=	101	
	TOTAL					111	
						x .75* =	83
TOTAL AM Peak Hr							182
PM Peak Hr (entering)	A	4.54	x	60.4	=	274	
" "	B,C,D	3.20	x	77.5	=	248	
	TOTAL					522	
						x .75* =	392
PM Peak Hr (exiting)	A	4.29	x	60.4	=	259	
" "	B,C,D	3.40	x	77.5	=	264	
	TOTAL					523	
						x .75* =	393
TOTAL PM Peak Hr							785
Sat Peak Hr (entering)	A	6.17	x	60.4	=	373	
" "	B,C,D	5.10	x	77.5	=	395	
	TOTAL					768	
						x .75* =	576
Sat Peak Hr (exiting)	A	5.83	x	60.4	=	352	
" "	B,C,D	5.30	x	77.5	=	411	
	TOTAL					763	
						x .75* =	573
TOTAL SAT Peak Hr							1149

*Reduction factor for multi-use development and pass-by traffic.

ESCHBACHER & ASSOCIATES
Consulting Engineers

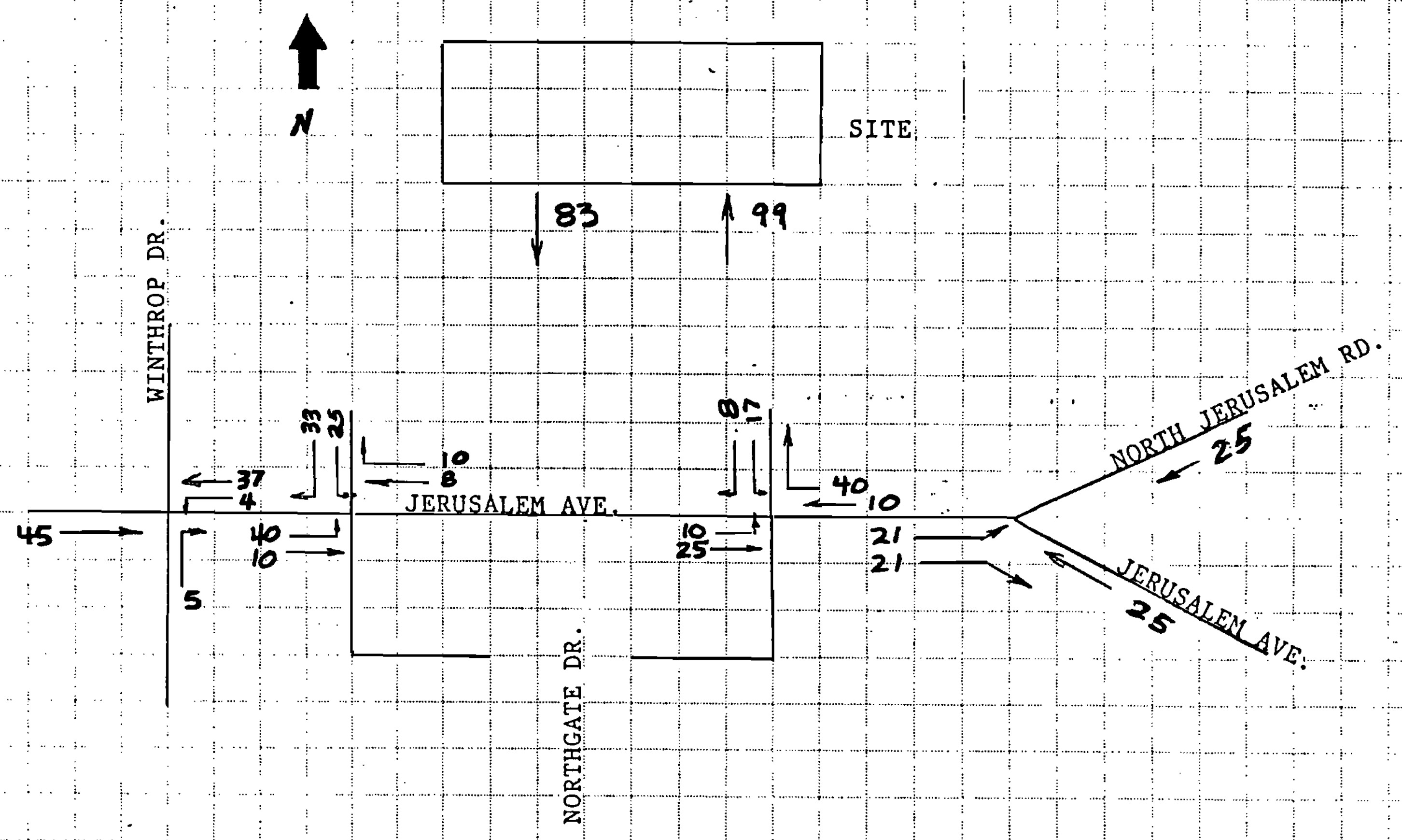
JOB JERUSALEM AVE. TRAFFIC STUDY

SHEET NO. ______ OF ______

CALCULATED BY ______ DATE ______

CHECKED BY ______ DATE ______

SCALE ______



SITE GENERATED TRAFFIC ASSIGNMENT (A.M. PEAK HOUR)

ESCHBACHER & ASSOCIATES
Consulting Engineers

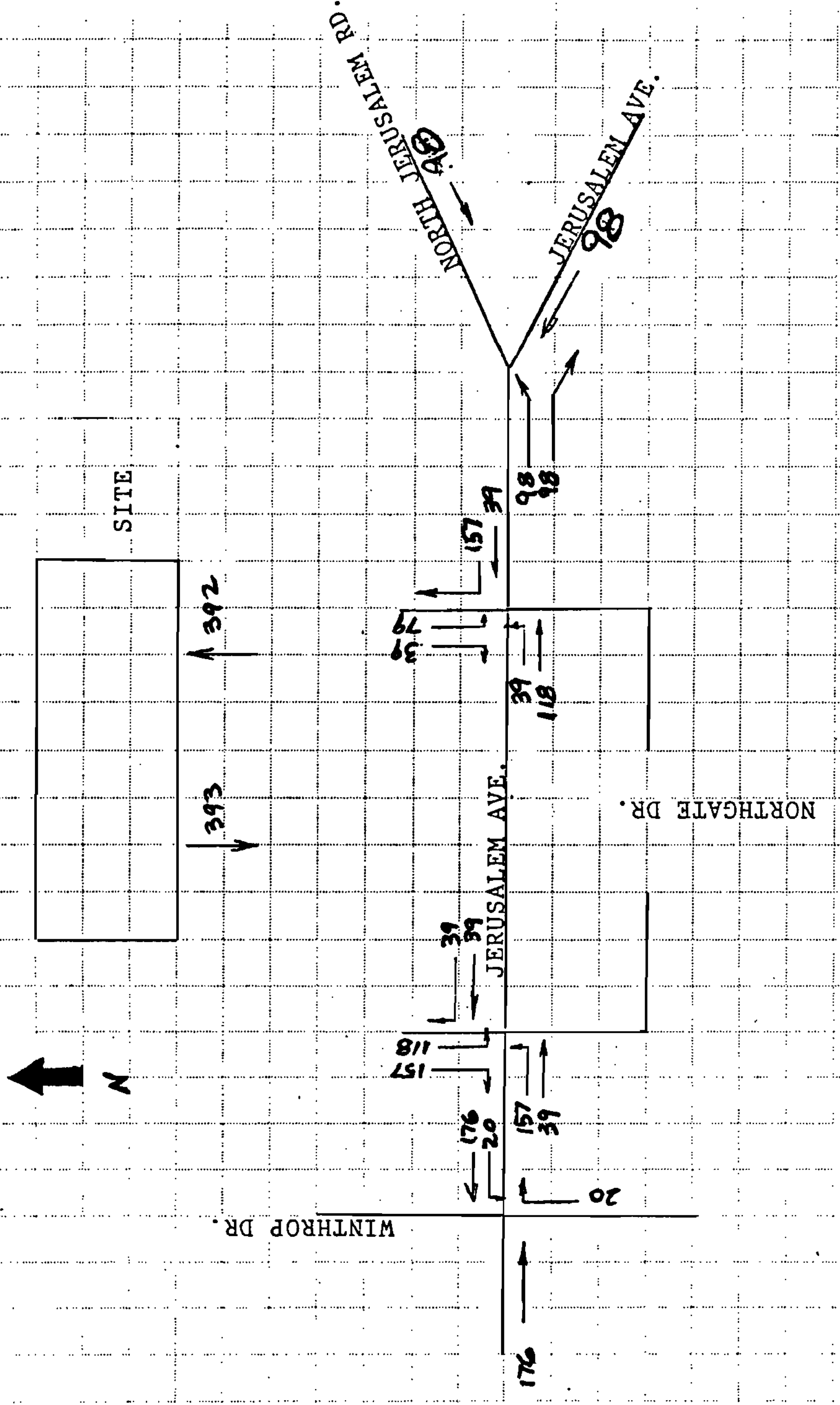
JOB JERUSALEM AVE. TRAFFIC STUDY

SHEET NO. ______ OF ______

CALCULATED BY ______ DATE ______

CHECKED BY ______ DATE ______

SCALE ______



SITE GENERATED TRAFFIC ASSIGNMENT (P.M. PEAK HOUR)

ESCHBACHER & ASSOCIATES
Consulting Engineers

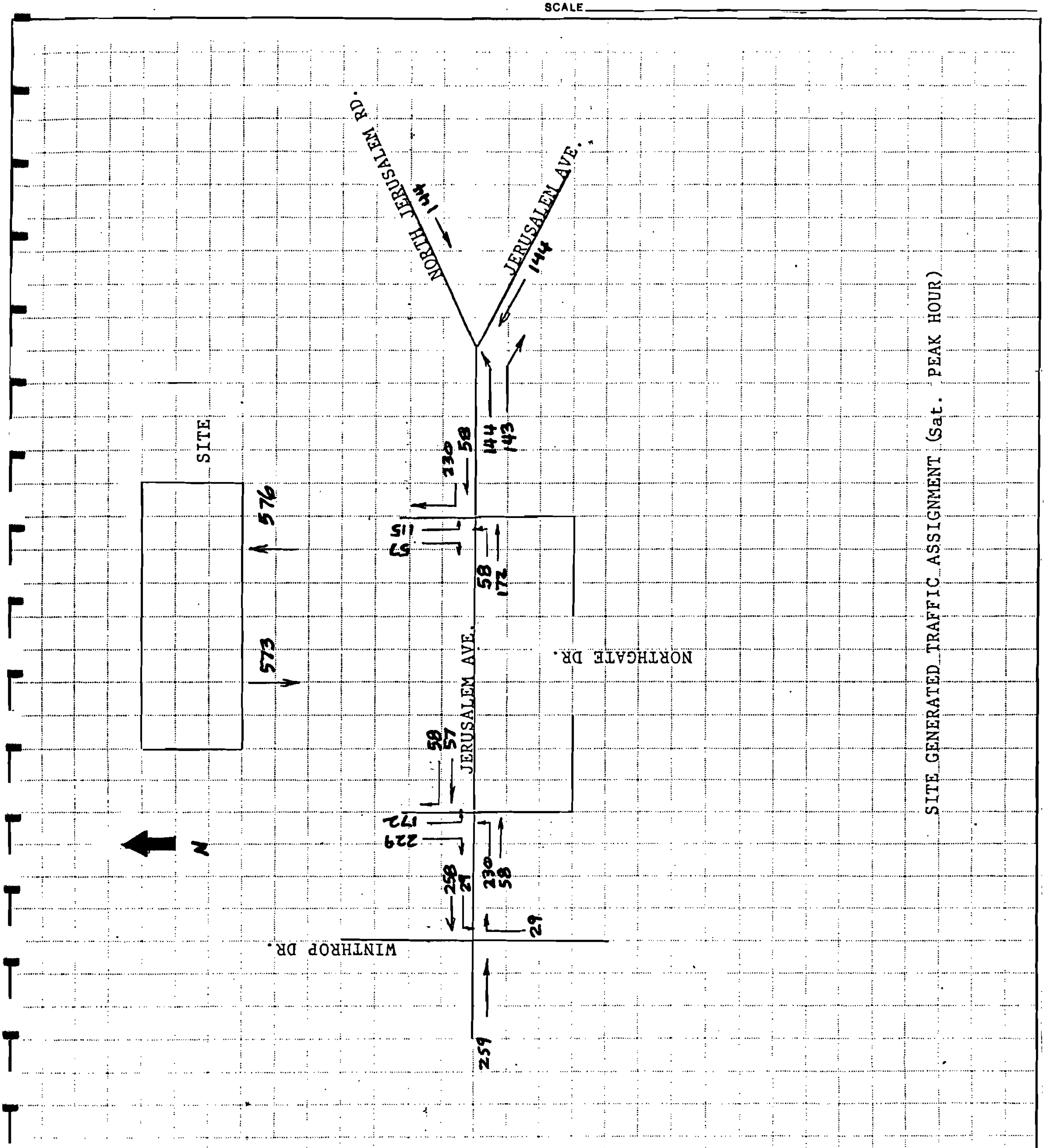
JOB JERUSALEM AVE. TRAFFIC STUDY

SHEET NO. ______ OF ______

CALCULATED BY ______ DATE ______

CHECKED BY ______ DATE ______

SCALE ______



SITE GENERATED TRAFFIC ASSIGNMENT (Sat. PEAK HOUR)

CAPACITY ANALYSIS SUMMARY SHEETS

The following pages present the summaries resulting from the Highway Capacity Analysis for the key intersections identified in this study. The complete computer printouts are available upon request.

The summaries are presented in the following order for each intersection:

1. A.M. Peak Hour - Existing Condition
2. A.M. Peak Hour - Proposed Condition
3. P.M. Peak Hour - Existing Condition
4. P.M. Peak Hour - Proposed Condition
5. Saturday Peak Hour - Existing Condition
6. Saturday Peak Hour - Proposed Condition

In order to ensure that the computer modeling process yields a more reasonable approximation of the observed existing performance characteristics, certain complex data input variables used in this analysis have been calibrated based on engineering judgment, thus permitting a more representative evaluation and comparison of the analysis results.

Level of Service Descriptions for Signalized Intersections
(Source: 1985 HCM)

Level of service for signalized intersections is defined in terms of delay. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. Specifically, level-of-service criteria are stated in terms of the average stopped delay per vehicle for a 15-minute analysis period.

Level-of-Service A

Describes operations with very low delay, i.e., less than 5.0 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.

Level-of-Service B

Describes operations with delay in the range of 5.1 to 15.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.

Level-of-Service C

Describes operations with delay in the range of 15.1 to 25.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear in this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.

Level-of-Service D

Describes operations with delay in the range of 25.1 to 40.0 seconds per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

Level-of-Service E

Describes operations with delay in the range 40.1 to 60.1 seconds per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.

Level-of-Service F

Describes operations with delay in excess of 60.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.00 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

```
1985 HCM: SIGNALIZED INTERSECTIONS
SUMMARY REPORT
************************************************************************
INTERSECTION..JERUSALEM AVE./WINTHROP DR.
AREA TYPE.....OTHER
ANALYST.......RME
DATE..........5-31-88
TIME..........AM PEAK (EXISTING)
COMMENT.......8:00-9:00
------------------------------------------------------------------------
           VOLUMES        :                    GEOMETRY
      EB    WB    NB    SB :      EB         WB          NB         SB
LT     7    23    20     8 : LT   12.0  LT   12.0  LTR  12.0  LTR  12.0
TH   404  1083     5     3 : TR   12.0  TR   12.0       12.0       12.0
RT     3     5    24    22 :      12.0       12.0       12.0       12.0
RR     1     2    12    10 :      12.0       12.0       12.0       12.0
                           :      12.0       12.0       12.0       12.0
                           :      12.0       12.0       12.0       12.0
------------------------------------------------------------------------
                            ADJUSTMENT FACTORS
     GRADE     HV    ADJ PKG  BUSES    PHF   PEDS    PED. BUT.   ARR. TYPE
      (%)     (%)    Y/N  Nm    Nb                   Y/N  min T
EB    0.00   2.00     Y   5     1     0.90    10      N    13.8       3
WB    0.00   2.00     Y   5     1     0.90    10      N    13.8       3
NB    0.00   2.00     Y   5     0     0.90    10      Y    19.8       3
SB    0.00   2.00     Y   5     0     0.90    10      Y    19.8       3
------------------------------------------------------------------------
                          SIGNAL SETTINGS          CYCLE LENGTH =  60.0
         PH-1   PH-2   PH-3   PH-4                PH-1   PH-2   PH-3   PH-4
EB  LT    X                            NB  LT      X
    TH    X                                TH      X
    RT    X                                RT      X
    PD    X                                PD      X
WB  LT    X                            SB  LT      X
    TH    X                                TH      X
    RT    X                                RT      X
    PD    X                                PD      X
GREEN    40.0   0.0    0.0    0.0      GREEN     12.0   0.0    0.0    0.0
YELLOW    4.0   0.0    0.0    0.0      YELLOW     4.0   0.0    0.0    0.0
------------------------------------------------------------------------
                            LEVEL OF SERVICE
    LANE GRP.   V/C     G/C       DELAY    LOS   APP. DELAY    APP. LOS
EB     LTR     0.265   0.683       2.8      A        2.8           A
WB     LTR     0.569   0.683       4.0      A        4.0           A
NB     LTR     0.144   0.217      14.5      B       14.5           B
SB     LTR     0.092   0.217      14.3      B       14.3           B
------------------------------------------------------------------------
INTERSECTION:      Delay =   4.1 (sec/veh)   V/C = 0.467     LOS = A
```

```
1985 HCM: SIGNALIZED INTERSECTIONS
SUMMARY REPORT
**************************************************************************
INTERSECTION..JERUSALEM AVE./WINTHROP DR.
AREA TYPE.....OTHER
ANALYST.......RME
DATE..........5-31-88
TIME..........AM PEAK (PROPOSED)
COMMENT.......8:00-9:00
--------------------------------------------------------------------------
            VOLUMES        :                     GEOMETRY
      EB   WB    NB    SB  :      EB          WB          NB          SB
LT     7    27    20     8 : LT   12.0   LT   12.0   LTR  12.0   LTR  12.0
TH   449  1120     5     3 : TR   12.0   TR   12.0        12.0        12.0
RT     3     5    29    22 :      12.0        12.0        12.0        12.0
RR     1     2    12    10 :      12.0        12.0        12.0        12.0
                           :      12.0        12.0        12.0        12.0
                           :      12.0        12.0        12.0        12.0
--------------------------------------------------------------------------
                             ADJUSTMENT FACTORS
      GRADE    HV    ADJ PKG  BUSES    PHF   PEDS    PED. BUT.    ARR. TYPE
      (%)     (%)    Y/N  Nm    Nb                  Y/N   min T
EB     0.00   2.00    Y    5     1    0.90     10    N     13.8       3
WB     0.00   2.00    Y    5     1    0.90     10    N     13.8       3
NB     0.00   2.00    Y    5     0    0.90     10    Y     19.8       3
SB     0.00   2.00    Y    5     0    0.90     10    Y     19.8       3
--------------------------------------------------------------------------
                           SIGNAL SETTINGS            CYCLE LENGTH =  60.0
          PH-1   PH-2   PH-3   PH-4      .       PH-1   PH-2   PH-3   PH-4
EB  LT      X                          NB  LT      X
    TH      X                              TH      X
    RT      X                              RT      X
    PD      X                              PD      X
WB  LT      X                          SB  LT      X
    TH      X                              TH      X
    RT      X                              RT      X
    PD      X                              PD      X
GREEN     40.0    0.0    0.0    0.0    GREEN     12.0    0.0    0.0    0.0
YELLOW     4.0    0.0    0.0    0.0    YELLOW     4.0    0.0    0.0    0.0
--------------------------------------------------------------------------
                             LEVEL OF SERVICE
     LANE GRP.   V/C     G/C      DELAY     LOS    APP. DELAY    APP. LOS
EB      LTR     0.306   0.683       2.9      A        2.9           A
WB      LTR     0.594   0.683       4.2      A        4.2           A
NB      LTR     0.165   0.217      14.5      B       14.5           B
SB      LTR     0.092   0.217      14.3      B       14.3           B
--------------------------------------------------------------------------
INTERSECTION:      Delay =   4.2 (sec/veh)   V/C = 0.490     LOS = A
```

```
1985 HCM: SIGNALIZED INTERSECTIONS
SUMMARY REPORT
*************************************************************************
INTERSECTION..JERUSALEM AVE./WINTHROP DR.
AREA TYPE.....OTHER
ANALYST.......RME
DATE..........5-31-88
TIME..........PM PEAK (EXISTING)
COMMENT.......5:00-6:00
-------------------------------------------------------------------------
            VOLUMES          :                  GEOMETRY
      EB    WB    NB    SB :      EB         WB          NB          SB
LT    21    10    11     4 : LT   12.0   LT  12.0   LTR  12.0   LTR  12.0
TH  1208   547     7     3 : TR   12.0   TR  12.0        12.0        12.0
RT    13     5    25     7 :      12.0       12.0        12.0        12.0
RR     6     2    12     3 :      12.0       12.0        12.0        12.0
                           :      12.0       12.0        12.0        12.0
                           :      12.0       12.0        12.0        12.0
-------------------------------------------------------------------------
                              ADJUSTMENT FACTORS
      GRADE    HV    ADJ PKG  BUSES   PHF   PEDS    PED. BUT.   ARR. TYPE
       (%)    (%)    Y/N  Nm   Nb                   Y/N  min T
EB     0.00   2.00    Y    5    1    0.90    10     N     13.8      3
WB     0.00   2.00    Y    5    1    0.90    10     N     13.8      3
NB     0.00   2.00    Y    5    0    0.90    10     Y     19.8      3
SB     0.00   2.00    Y    5    0    0.90    10     Y     19.8      3
-------------------------------------------------------------------------
                            SIGNAL SETTINGS          CYCLE LENGTH =  60.0
          PH-1   PH-2   PH-3   PH-4               PH-1   PH-2   PH-3   PH-4
EB  LT      X                              NB  LT    X
    TH      X                                  TH    X
    RT      X                                  RT    X
    PD      X                                  PD    X
WB  LT      X                              SB  LT    X
    TH      X                                  TH    X
    RT      X                                  RT    X
    PD      X                                  PD    X
GREEN     40.0   0.0    0.0    0.0    GREEN     12.0    0.0    0.0    0.0
YELLOW     4.0   0.0    0.0    0.0    YELLOW     4.0    0.0    0.0    0.0
-------------------------------------------------------------------------
                              LEVEL OF SERVICE
     LANE GRP.   V/C     G/C      DELAY    LOS   APP. DELAY    APP. LOS
EB      LTR     0.599   0.733      3.2      A        3.2           A
WB      L       0.083   0.733      1.7      A        3.1           A
        TR      0.537   0.733      3.1      A
NB      LTR     0.099   0.267     12.6      B       12.6           B
SB      LTR     0.036   0.267     12.4      B       12.4           B
-------------------------------------------------------------------------
INTERSECTION:      Delay =   3.4 (sec/veh)   V/C = 0.466     LOS = A
```

```
1985 HCM: SIGNALIZED INTERSECTIONS
SUMMARY REPORT
##########################################################################
INTERSECTION..JERUSALEM AVE./WINTHROP DR.
AREA TYPE.....OTHER
ANALYST.......RME
DATE..........5-31-88
TIME..........PM PEAK (PROPOSED)
COMMENT.......5:00-6:00
--------------------------------------------------------------------------
            VOLUMES        :                     GEOMETRY
      EB   WB     NB    SB :      EB          WB          NB          SB
LT     21    37    11    4 : LT   12.0   LT   12.0   LTR  12.0   LTR  12.0
TH   1384   723     7    3 : TR   12.0   TR   12.0        12.0        12.0
RT     13     5    45    7 :      12.0        12.0        12.0        12.0
RR      6     2    12    3 :      12.0        12.0        12.0        12.0
                           :      12.0        12.0        12.0        12.0
                           :      12.0        12.0        12.0        12.0
--------------------------------------------------------------------------
                             ADJUSTMENT FACTORS
      GRADE    HV    ADJ PKG  BUSES    PHF   PEDS    PED. BUT.   ARR. TYPE
      (%)     (%)    Y/N  Nm    Nb                  Y/N   min T
EB     0.00   2.00    Y    5     1    0.90     10     N     13.8       3
WB     0.00   2.00    Y    5     1    0.90     10     N     13.8       3
NB     0.00   2.00    Y    5     0    0.90     10     Y     19.8       3
SB     0.00   2.00    Y    5     0    0.90     10     Y     19.8       3
--------------------------------------------------------------------------
                           SIGNAL SETTINGS            CYCLE LENGTH =  60.0
          PH-1   PH-2   PH-3   PH-4              PH-1   PH-2   PH-3   PH-4
EB  LT      X                          NB  LT      X
    TH      X                              TH      X
    RT      X                              RT      X
    PD      X                              PD      X
WB  LT      X                          SB  LT      X
    TH      X                              TH      X
    RT      X                              RT      X
    PD      X                              PD      X
GREEN     40.0    0.0    0.0    0.0    GREEN     12.0    0.0    0.0    0.0
YELLOW     4.0    0.0    0.0    0.0    YELLOW     4.0    0.0    0.0    0.0
--------------------------------------------------------------------------
                             LEVEL OF SERVICE
     LANE GRP.   V/C     G/C      DELAY     LOS    APP. DELAY    APP. LOS
EB      LTR    0.703   0.733       4.0     A        4.0           A
WB      L      0.344   0.733       2.9     A        4.7           A
        TR     0.708   0.733       4.8     A
NB      LTR    0.169   0.267      12.9     B       12.9           B
SB      LTR    0.036   0.267      12.4     B       12.4           B
--------------------------------------------------------------------------
INTERSECTION:      Delay =   4.5 (sec/veh)   V/C = 0.565     LOS = A
```

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1985 HCM: SIGNALIZED INTERSECTIONS
SUMMARY REPORT
**************************************************************************
INTERSECTION..JERUSALEM AVE./WINTHROP DR.
AREA TYPE.....OTHER
ANALYST.......RME
DATE..........5-31-88
TIME..........SAT PEAK (EXISTING)
COMMENT.......12:00-1:00
--------------------------------------------------------------------------
            VOLUMES         :                GEOMETRY
      EB    WB    NB    SB  :      EB          WB          NB          SB
LT    11    12    16    10  : LT   12.0   LT   12.0   LTR  12.0   LTR  12.0
TH   310   330     2     1  : TR   12.0   TR   12.0        12.0        12.0
RT     9    13    16    16  :      12.0        12.0        12.0        12.0
RR     4     6     7     7  :      12.0        12.0        12.0        12.0
                            :      12.0        12.0        12.0        12.0
                            :      12.0        12.0        12.0        12.0
--------------------------------------------------------------------------
                             ADJUSTMENT FACTORS
      GRADE    HV    ADJ PKG  BUSES   PHF   PEDS    PED. BUT.    ARR. TYPE
       (%)     (%)   Y/N  Nm    Nb                  Y/N  min T
EB     0.00   2.00    Y    5     1    0.90    10     N    13.8        3
WB     0.00   2.00    Y    5     1    0.90    10     N    13.8        3
NB     0.00   2.00    Y    5     0    0.90    10     Y    19.8        3
SB     0.00   2.00    Y    5     0    0.90    10     Y    19.8        3
--------------------------------------------------------------------------
                           SIGNAL SETTINGS           CYCLE LENGTH =  60.0
          PH-1   PH-2   PH-3   PH-4                PH-1   PH-2   PH-3   PH-4
EB  LT     X                               NB  LT   X
    TH     X                                   TH   X
    RT     X                                   RT   X
    PD     X                                   PD   X
WB  LT     X                               SB  LT   X
    TH     X                                   TH   X
    RT     X                                   RT   X
    PD     X                                   PD   X
GREEN     40.0    0.0    0.0    0.0    GREEN     12.0    0.0    0.0    0.0
YELLOW     4.0    0.0    0.0    0.0    YELLOW     4.0    0.0    0.0    0.0
--------------------------------------------------------------------------
                            LEVEL OF SERVICE
     LANE GRP.   V/C    G/C     DELAY    LOS   APP. DELAY    APP. LOS
EB      LTR    0.157  0.733      1.8      A       1.8           A
WB      LTR    0.168  0.733      1.9      A       2.4           A
NB      LTR    0.084  0.267     12.5      B      12.5           B
SB      LTR    0.063  0.267     12.5      B      12.5           B
--------------------------------------------------------------------------
INTERSECTION:      Delay =   2.8 (sec/veh)   V/C = 0.146     LOS = A
```

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1985 HCM: SIGNALIZED INTERSECTIONS
SUMMARY REPORT
*************************************************************************
INTERSECTION..JERUSALEM AVE./WINTHROP DR.
AREA TYPE.....OTHER
ANALYST.......RME
DATE..........5-31-88
TIME..........SAT PEAK (PROPOSED)
COMMENT.......12:00-1:00
-------------------------------------------------------------------------
           VOLUMES        :                   GEOMETRY
       EB    WB    NB    SB :     EB         WB          NB          SB
LT     11    41    16    10 : LT   12.0   LT   12.0   LTR  12.0   LTR  12.0
TH    569   588     2     1 : TR   12.0   TR   12.0        12.0        12.0
RT      9    13    45    16 :      12.0        12.0        12.0        12.0
RR      4     6     7     7 :      12.0        12.0        12.0        12.0
                            :      12.0        12.0        12.0        12.0
                            :      12.0        12.0        12.0        12.0
-------------------------------------------------------------------------
                            ADJUSTMENT FACTORS
      GRADE     HV    ADJ PKG  BUSES   PHF   PEDS    PED. BUT.   ARR. TYPE
       (%)     (%)    Y/N  Nm   Nb                   Y/N  min T
EB     0.00   2.00     Y    5    1    0.90    10     N     13.8      3
WB     0.00   2.00     Y    5    1    0.90    10     N     13.8      3
NB     0.00   2.00     Y    5    0    0.90    10     Y     19.8      3
SB     0.00   2.00     Y    5    0    0.90    10     Y     19.8      3
-------------------------------------------------------------------------
                          SIGNAL SETTINGS         CYCLE LENGTH =  60.0
         PH-1   PH-2   PH-3   PH-4                PH-1   PH-2   PH-3   PH-4
EB  LT     X                              NB  LT    X
    TH     X                                  TH    X
    RT     X                                  RT    X
    PD     X                                  PD    X
WB  LT     X                              SB  LT    X
    TH     X                                  TH    X
    RT     X                                  RT    X
    PD     X                                  PD    X
GREEN    40.0    0.0    0.0    0.0    GREEN     12.0    0.0    0.0    0.0
YELLOW    4.0    0.0    0.0    0.0    YELLOW     4.0    0.0    0.0    0.0
-------------------------------------------------------------------------
                             LEVEL OF SERVICE
    LANE GRP.   V/C     G/C      DELAY     LOS    APP. DELAY    APP. LOS
EB     LTR     0.285   0.733      2.1       A         2.1            A
WB     LTR     0.330   0.733      2.2       A         3.3            A
NB     LTR     0.185   0.267     12.9       B        12.9            B
SB     LTR     0.063   0.267     12.5       B        12.5            B
-------------------------------------------------------------------------
INTERSECTION:     Delay =   3.3 (sec/veh)   V/C = 0.292     LOS = A
```

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1985 HCM: SIGNALIZED INTERSECTIONS
SUMMARY REPORT
*************************************************************************
INTERSECTION..JERUSALEM AVE./N.JERUSALEM RD.
AREA TYPE.....OTHER
ANALYST.......RME
DATE..........5-31-88
TIME..........AM PEAK (EXISTING)
COMMENT.......8:00-9:00
-------------------------------------------------------------------------
           VOLUMES        :                 GEOMETRY
      EB    WB    NB    SB :      EB          WB          NB          SB
LT     0     0     0    22 : T   10.0   T    12.0        12.0   LT   12.0
TH   138   745     0   368 : R   12.0   TR   12.0        12.0   TR   12.0
RT   302    17     0     0 : R   12.0        12.0        12.0        12.0
RR     0     0     0     0 :     12.0        12.0        12.0        12.0
                           :     12.0        12.0        12.0        12.0
                           :     12.0        12.0        12.0        12.0
-------------------------------------------------------------------------
                             ADJUSTMENT FACTORS
     GRADE    HV    ADJ PKG  BUSES   PHF   PEDS    PED. BUT.   ARR. TYPE
      (%)     (%)   Y/N  Nm   Nb                   Y/N  min T
EB    0.00   2.00    N    0    0    0.90     0     N     11.3       3
WB    0.00   2.00    N    0    0    0.90     0     N     11.3       3
NB    0.00   2.00    N    0    0    0.90     0     N     22.3       3
SB    0.00   2.00    N    0    0    0.90     0     N     22.3       3
-------------------------------------------------------------------------
                           SIGNAL SETTINGS          CYCLE LENGTH =  60.0
           PH-1   PH-2   PH-3   PH-4                PH-1   PH-2   PH-3   PH-4
EB  LT      X                             NB  LT
    TH      X                                 TH
    RT      X                                 RT
    PD                                        PD
WB  LT      X                             SB  LT     X
    TH      X                                 TH     X
    RT      X                                 RT     X
    PD                                        PD
GREEN     30.0    0.0    0.0    0.0       GREEN    22.0    0.0    0.0    0.0
YELLOW     4.0    0.0    0.0    0.0       YELLOW    4.0    0.0    0.0    0.0
-------------------------------------------------------------------------
                             LEVEL OF SERVICE
     LANE GRP.   V/C     G/C     DELAY    LOS   APP. DELAY    APP. LOS
EB      T       0.179   0.517     5.9      B        6.1           B
        R       0.255   0.517     6.2      B
WB      TR      0.484   0.517     7.3      B        7.5           B
SB      LTR     0.336   0.383    10.0      B       10.0           B
-------------------------------------------------------------------------
INTERSECTION:      Delay =   7.8 (sec/veh)   V/C = 0.421     LOS = B
```

```
1985 HCM: SIGNALIZED INTERSECTIONS
SUMMARY REPORT
*************************************************************************
INTERSECTION..JERUSALEM AVE./N.JERUSALEM RD.
AREA TYPE.....OTHER
ANALYST.......RME
DATE..........5-31-88
TIME..........AM PEAK (PROPOSED)
COMMENT.......8:00-9:00
-------------------------------------------------------------------------
            VOLUMES          :                 GEOMETRY
      EB    WB    NB    SB   :     EB          WB          NB          SB
LT     0     0     0    22 : T    10.0   T    12.0        12.0   LT   12.0
TH   159   770     0   393 : R    12.0   TR   12.0        12.0   TR   12.0
RT   323    17     0     0 : R    12.0        12.0        12.0        12.0
RR     0     0     0     0 :      12.0        12.0        12.0        12.0
                             :      12.0        12.0        12.0        12.0
                             :      12.0        12.0        12.0        12.0
-------------------------------------------------------------------------
                               ADJUSTMENT FACTORS
      GRADE     HV    ADJ PKG  BUSES   PHF   PEDS    PED. BUT.    ARR. TYPE
       (%)     (%)    Y/N  Nm   Nb                   Y/N  min T
EB     0.00   2.00     N   0     0     0.90     0     N    11.3        3
WB     0.00   2.00     N   0     0     0.90     0     N    11.3        3
NB     0.00   2.00     N   0     0     0.90     0     N    22.3        3
SB     0.00   2.00     N   0     0     0.90     0     N    22.3        3
-------------------------------------------------------------------------
                             SIGNAL SETTINGS        CYCLE LENGTH =  60.0
          PH-1   PH-2   PH-3   PH-4              PH-1   PH-2   PH-3   PH-4
EB  LT      X                             NB  LT
    TH      X                                 TH
    RT      X                                 RT
    PD                                        PD
WB  LT      X                             SB  LT     X
    TH      X                                 TH     X
    RT      X                                 RT     X
    PD                                        PD
GREEN    30.0    0.0    0.0    0.0    GREEN     22.0    0.0    0.0    0.0
YELLOW    4.0    0.0    0.0    0.0    YELLOW     4.0    0.0    0.0    0.0
-------------------------------------------------------------------------
                               LEVEL OF SERVICE
    LANE GRP.   V/C     G/C      DELAY    LOS    APP. DELAY     APP. LOS
EB      T      0.206   0.517       6.0     B         6.1            B
        R      0.273   0.517       6.2     B
WB      TR     0.500   0.517       7.4     B         7.9            B
SB      LTR    0.357   0.383      10.1     B        10.1            B
-------------------------------------------------------------------------
INTERSECTION:      Delay =   8.1 (sec/veh)   V/C = 0.439     LOS = B
```

```
1985 HCM: SIGNALIZED INTERSECTIONS
SUMMARY REPORT
*************************************************************************
INTERSECTION..JERUSALEM AVE./N.JERUSALEM RD.
AREA TYPE.....OTHER
ANALYST.......RME
DATE..........5-31-88
TIME..........PM PEAK (EXISTING)
COMMENT.......5:00-6:00
-------------------------------------------------------------------------
           VOLUMES          :               GEOMETRY
      EB    WB    NB    SB  :      EB          WB          NB          SB
LT     0     0     0    17  : T    10.0   T    12.0        12.0   LT   12.0
TH   573   349     0   223  : R    12.0   TR   12.0        12.0   TR   12.0
RT   666    22     0     0  : R    12.0        12.0        12.0        12.0
RR     0     0     0     0  :      12.0        12.0        12.0        12.0
                            :      12.0        12.0        12.0        12.0
                            :      12.0        12.0        12.0        12.0
-------------------------------------------------------------------------
                            ADJUSTMENT FACTORS
     GRADE    HV    ADJ PKG  BUSES   PHF   PEDS    PED. BUT.   ARR. TYPE
      (%)     (%)   Y/N  Nm    Nb                  Y/N  min T
EB    0.00   2.00    N   0     0    0.90     0    N     11.3      3
WB    0.00   2.00    N   0     0    0.90     0    N     11.3      3
NB    0.00   2.00    N   0     0    0.90     0    N     22.3      3
SB    0.00   2.00    N   0     0    0.90     0    N     22.3      3
-------------------------------------------------------------------------
                          SIGNAL SETTINGS          CYCLE LENGTH =  60.0
           PH-1   PH-2   PH-3   PH-4               PH-1   PH-2   PH-3   PH-4
EB  LT      X                             NB  LT
    TH      X                                 TH
    RT      X                                 RT
    PD                                        PD
WB  LT      X                             SB  LT    X
    TH      X                                 TH    X
    RT      X                                 RT    X
    PD                                        PD
GREEN      30.0   0.0    0.0    0.0      GREEN    22.0   0.0    0.0    0.0
YELLOW      4.0   0.0    0.0    0.0      YELLOW    4.0   0.0    0.0    0.0
-------------------------------------------------------------------------
                           LEVEL OF SERVICE
     LANE GRP.   V/C     G/C     DELAY    LOS    APP. DELAY    APP. LOS
EB       T      0.744   0.517    11.1      B         9.4           B
         R      0.563   0.517     7.9      B
WB       TR     0.237   0.517     6.1      B         6.5           B
SB       LTR    0.207   0.383     9.4      B         9.4           B
-------------------------------------------------------------------------
INTERSECTION:      Delay =   8.8 (sec/veh)   V/C = 0.515     LOS = B
```

```
1985 HCM: SIGNALIZED INTERSECTIONS
SUMMARY REPORT
*************************************************************************
INTERSECTION..JERUSALEM AVE./N.JERUSALEM RD.
AREA TYPE.....OTHER
ANALYST.......RME
DATE..........5-31-88
TIME..........PM PEAK (PROPOSED)
COMMENT.......5:00-6:00
-------------------------------------------------------------------------
           VOLUMES          :                   GEOMETRY
      EB    WB    NB    SB  :     EB          WB          NB          SB
LT     0     0     0    17  : T   10.0   T    12.0        12.0   LT   12.0
TH   671   447     0   321  : R   12.0   TR   12.0        12.0   TR   12.0
RT   764    22     0     0  : R   12.0        12.0        12.0        12.0
RR     0     0     0     0  :     12.0        12.0        12.0        12.0
                            :     12.0        12.0        12.0        12.0
                            :     12.0        12.0        12.0        12.0
-------------------------------------------------------------------------
                            ADJUSTMENT FACTORS
      GRADE    HV    ADJ PKG  BUSES   PHF   PEDS    PED. BUT.   ARR. TYPE
       (%)     (%)   Y/N  Nm    Nb                  Y/N   min T
EB     0.00   2.00    N    0     0    0.90     0     N    11.3       3
WB     0.00   2.00    N    0     0    0.90     0     N    11.3       3
NB     0.00   2.00    N    0     0    0.90     0     N    22.3       3
SB     0.00   2.00    N    0     0    0.90     0     N    22.3       3
-------------------------------------------------------------------------
                           SIGNAL SETTINGS          CYCLE LENGTH =  60.0
           PH-1   PH-2   PH-3   PH-4               PH-1   PH-2   PH-3   PH-4
EB  LT       X                           NB  LT
    TH       X                               TH
    RT       X                               RT
    PD                                       PD
WB  LT       X                           SB  LT     X
    TH       X                               TH     X
    RT       X                               RT     X
    PD                                       PD
GREEN      30.0    0.0    0.0    0.0     GREEN     22.0    0.0    0.0    0.0
YELLOW      4.0    0.0    0.0    0.0     YELLOW     4.0    0.0    0.0    0.0
-------------------------------------------------------------------------
                              LEVEL OF SERVICE
     LANE GRP.   V/C     G/C      DELAY    LOS   APP. DELAY     APP. LOS
EB       T      0.871   0.517     16.5      C       12.3           B
         R      0.645   0.517      8.7      B
WB       TR     0.299   0.517      6.3      B        7.3           B
SB       LTR    0.291   0.383      9.8      B        9.8           B
-------------------------------------------------------------------------
INTERSECTION:     Delay =  10.8 (sec/veh)   V/C = 0.624     LOS = B
```

```
1985 HCM: SIGNALIZED INTERSECTIONS
SUMMARY REPORT
************************************************************************
INTERSECTION..JERUSALEM AVE./N.JERUSALEM RD.
AREA TYPE.....OTHER
ANALYST.......RME
DATE..........5-31-88
TIME..........SAT PEAK (EXISTING)
COMMENT.......12:00-1:00
------------------------------------------------------------------------
           VOLUMES          :                 GEOMETRY
      EB    WB    NB    SB  :      EB          WB          NB          SB
LT     0     0     0    14  : T   10.0   T   12.0        12.0   LT   12.0
TH   144   217     0   145  : R   12.0   TR  12.0        12.0   TR   12.0
RT   195    16     0     0  : R   12.0       12.0        12.0        12.0
RR     0     0     0     0  :     12.0       12.0        12.0        12.0
                            :     12.0       12.0        12.0        12.0
                            :     12.0       12.0        12.0        12.0
------------------------------------------------------------------------
                              ADJUSTMENT FACTORS
      GRADE     HV    ADJ PKG  BUSES   PHF   PEDS    PED. BUT.   ARR. TYPE
       (%)     (%)    Y/N  Nm    Nb                  Y/N  min T
EB     0.00    2.00    N    0     0    0.90     0     N     11.3       3
WB     0.00    2.00    N    0     0    0.90     0     N     11.3       3
NB     0.00    2.00    N    0     0    0.90     0     N     22.3       3
SB     0.00    2.00    N    0     0    0.90     0     N     22.3       3
------------------------------------------------------------------------
                            SIGNAL SETTINGS         CYCLE LENGTH =  60.0
         PH-1   PH-2   PH-3   PH-4               PH-1   PH-2   PH-3   PH-4
EB  LT     X                              NB  LT
    TH     X                                  TH
    RT     X                                  RT
    PD                                        PD
WB  LT     X                              SB  LT    X
    TH     X                                  TH    X
    RT     X                                  RT    X
    PD                                        PD
GREEN    30.0    0.0    0.0    0.0    GREEN     22.0    0.0    0.0    0.0
YELLOW    4.0    0.0    0.0    0.0    YELLOW     4.0    0.0    0.0    0.0
------------------------------------------------------------------------
                             LEVEL OF SERVICE
    LANE GRP.    V/C    G/C     DELAY    LOS    APP. DELAY    APP. LOS
EB       T      0.187  0.517     5.9      B        5.9            B
         R      0.165  0.517     5.8      B
WB      TR      0.149  0.517     5.8      B        6.4            B
SB      LTR     0.138  0.383     9.2      B        9.2            B
------------------------------------------------------------------------
INTERSECTION:      Delay =   7.0 (sec/veh)   V/C = 0.166     LOS = B
```

```
1985 HCM: SIGNALIZED INTERSECTIONS
SUMMARY REPORT
***************************************************************************
INTERSECTION..JERUSALEM AVE./N.JERUSALEM RD.
AREA TYPE.....OTHER
ANALYST.......RME
DATE..........5-31-88
TIME..........SAT PEAK (PROPOSED)
COMMENT.......12:00-1:00
---------------------------------------------------------------------------
            VOLUMES       :                     GEOMETRY
      EB    WB    NB    SB :    EB          WB          NB          SB
LT     0     0     0    14 : T    10.0   T    12.0        12.0   LT   12.0
TH   288   361     0   289 : R    12.0   TR   12.0        12.0   TR   12.0
RT   338    16     0     0 : R    12.0        12.0        12.0        12.0
RR     0     0     0     0 :      12.0        12.0        12.0        12.0
                           :      12.0        12.0        12.0        12.0
                           :      12.0        12.0        12.0        12.0
---------------------------------------------------------------------------
                             ADJUSTMENT FACTORS
      GRADE    HV    ADJ PKG  BUSES    PHF   PEDS    PED. BUT.    ARR. TYPE
       (%)    (%)    Y/N  Nm     Nb                   Y/N   min T
EB     0.00   2.00    N    0      0    0.90      0    N     11.3        3
WB     0.00   2.00    N    0      0    0.90      0    N     11.3        3
NB     0.00   2.00    N    0      0    0.90      0    N     22.3        3
SB     0.00   2.00    N    0      0    0.90      0    N     22.3        3
---------------------------------------------------------------------------
                           SIGNAL SETTINGS          CYCLE LENGTH =  60.0
          PH-1   PH-2   PH-3   PH-4             PH-1   PH-2   PH-3   PH-4
EB  LT      X                           NB  LT
    TH      X                               TH
    RT      X                               RT
    PD                                      PD
WB  LT      X                           SB  LT      X
    TH      X                               TH      X
    RT      X                               RT      X
    PD                                      PD
GREEN     30.0    0.0    0.0    0.0     GREEN     22.0    0.0    0.0    0.0
YELLOW     4.0    0.0    0.0    0.0     YELLOW     4.0    0.0    0.0    0.0
---------------------------------------------------------------------------
                             LEVEL OF SERVICE
     LANE GRP.   V/C     G/C      DELAY    LOS    APP. DELAY     APP. LOS
EB       T      0.374   0.517       6.7     B         6.5            B
         R      0.286   0.517       6.3     B
WB       TR     0.240   0.517       6.1     B         7.3            B
SB       LTR    0.261   0.383       9.7     B         9.7            B
---------------------------------------------------------------------------
INTERSECTION:      Delay =   7.7 (sec/veh)   V/C = 0.326     LOS = B
```

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1985 HCM:  UNSIGNALIZED INTERSECTIONS                              Page-1
***********************************************************************

IDENTIFYING INFORMATION
-----------------------------------------------------------------------

AVERAGE RUNNING SPEED, MAJOR STREET.............. 30

PEAK HOUR FACTOR................................. 1

AREA POPULATION.................................. 150000

NAME OF THE EAST/WEST STREET..................... JERUSALEM AVE.

NAME OF THE NORTH/SOUTH STREET................... NORTHGATE DR. (WEST)

NAME OF THE ANALYST.............................. RME

DATE OF THE ANALYSIS (mm/dd/yy).................. 5-31-88

TIME PERIOD ANALYZED............................. AM PEAK (EXISTING)

OTHER INFORMATION: 8:00-9:00

INTERSECTION TYPE AND CONTROL
-----------------------------------------------------------------------

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN


TRAFFIC VOLUMES
-----------------------------------------------------------------------

           EB     WB     NB     SB
          ----   ----   ----   ----
LEFT        0      2      6     --

THRU      436   1111      0     --

RIGHT       5      0      4     --


NUMBER OF LANES
-----------------------------------------------------------------------

             EB        WB        NB        SB
           -------   -------   -------   -------
LANES         2         2         1        --
```

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	-----	---	---	-

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

CRITICAL GAPS

		TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS					
	NB	5.50	5.50	0.00	5.50
MAJOR LEFTS					
	WB	5.50	5.50	0.00	5.50
MINOR LEFTS					
	NB	7.00	7.00	0.00	7.00

```
CAPACITY AND LEVEL-OF-SERVICE                                  Page-3
---------------------------------------------------------------------

                     POTEN-    ACTUAL
             FLOW-   TIAL      MOVEMENT    SHARED      RESERVE
             RATE    CAPACITY  CAPACITY    CAPACITY    CAPACITY
MOVEMENT     v(pcph) c (pcph)  c (pcph)   c  (pcph)   c = c  - v  LOS
                      p         M          SH          R   SH
             ------- --------- ---------- ----------- ----------- ---

MINOR STREET

  NB LEFT         7       82      82    >        82  >        76 >  E
                                        >  129       >  118      >D
     RIGHT        4      870     870    >       870  >       865 >  A

MAJOR STREET

  WB LEFT         2      670     670            670          668    A
```

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1985 HCM:  UNSIGNALIZED INTERSECTIONS                          Page-1
*********************************************************************

IDENTIFYING INFORMATION
---------------------------------------------------------------------

AVERAGE RUNNING SPEED, MAJOR STREET.............. 30

PEAK HOUR FACTOR................................. 1

AREA POPULATION.................................. 150000

NAME OF THE EAST/WEST STREET..................... JERUSALEM AVE.

NAME OF THE NORTH/SOUTH STREET................... NORTHGATE DR. (WEST)

NAME OF THE ANALYST.............................. RME

DATE OF THE ANALYSIS (mm/dd/yy).................. 5-31-88

TIME PERIOD ANALYZED............................. AM PEAK (PROPOSED)

OTHER INFORMATION: 8:00-9:00

INTERSECTION TYPE AND CONTROL
---------------------------------------------------------------------

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

CONTROL TYPE SOUTHBOUND: STOP SIGN


TRAFFIC VOLUMES
---------------------------------------------------------------------

            EB     WB     NB     SB
           ----   ----   ----   ----
LEFT        40      2      6     25

THRU       446   1119      0      0

RIGHT        5     10      4     33


NUMBER OF LANES AND LANE USAGE
---------------------------------------------------------------------

                EB        WB        NB        SB
              -------   -------   -------   -------
LANES            2         2         1         2

LANE USAGE                          LTR       L+TR
```

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	0	0	0

CRITICAL GAPS

		TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS					
	NB	5.50	5.50	0.00	5.50
	SB	5.50	5.50	0.00	5.50
MAJOR LEFTS					
	WB	5.50	5.50	0.00	5.50
	EB	5.50	5.50	0.00	5.50
MINOR THROUGHS					
	NB	6.50	6.50	0.00	6.50
	SB	6.50	6.50	0.00	6.50
MINOR LEFTS					
	NB	7.00	7.00	0.00	7.00
	SB	7.00	7.00	0.00	7.00

```
CAPACITY AND LEVEL-OF-SERVICE                                  Page-3
---------------------------------------------------------------------

                     POTEN-    ACTUAL
             FLOW-   TIAL      MOVEMENT    SHARED      RESERVE
             RATE    CAPACITY  CAPACITY    CAPACITY    CAPACITY
MOVEMENT     v(pcph) c (pcph)  c (pcph)   c  (pcph)   c = c  - v  LOS
                      p         M          SH          R   SH
             ------- -------- --------- ------------ ------------ ---

MINOR STREET

  NB LEFT         7        75      64    >        64  >        58 >  E
     THROUGH      0        95      85    >  102   85  >   91   85 >E E
     RIGHT        4       865     865    >       865  >       860 >  A

MINOR STREET

  SB LEFT        28        75      67             67           39    E
     THROUGH      0        95      85    >        85  >        85 >  E
     RIGHT       36       581     581    >    0  581  >    0  544 >  A

MAJOR STREET

  EB LEFT        44       282     282            282          238    C
  WB LEFT         2       663     663            663          661    A
```

```
1985 HCM:  UNSIGNALIZED INTERSECTIONS                          Page-1
*********************************************************************

IDENTIFYING INFORMATION
---------------------------------------------------------------------

AVERAGE RUNNING SPEED, MAJOR STREET............. 30

PEAK HOUR FACTOR................................ 1

AREA POPULATION................................. 150000

NAME OF THE EAST/WEST STREET.................... JERUSALEM AVE.

NAME OF THE NORTH/SOUTH STREET.................. NORTHGATE DR. (WEST)

NAME OF THE ANALYST............................. RME

DATE OF THE ANALYSIS (mm/dd/yy)................. 5-31-88

TIME PERIOD ANALYZED............................ PM PEAK (EXISTING)

OTHER INFORMATION: 5:00-6:00

INTERSECTION TYPE AND CONTROL
---------------------------------------------------------------------

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN


TRAFFIC VOLUMES
---------------------------------------------------------------------

           EB     WB     NB     SB
          ----   ----   ----   ----
LEFT         0      8      6    --

THRU      1237    568      0    --

RIGHT       12      0      4    --


NUMBER OF LANES
---------------------------------------------------------------------

               EB         WB         NB         SB
            -------    -------    -------    -------
LANES           2          2          1         --
```

```
ADJUSTMENT FACTORS                                              Page-2
----------------------------------------------------------------------

           PERCENT  RIGHT TURN  CURB RADIUS (ft)  ACCELERATION LANE
            GRADE     ANGLE     FOR RIGHT TURNS    FOR RIGHT TURNS
           -------  ----------  ----------------  -----------------
EASTBOUND    0.00       90             20                 N

WESTBOUND    0.00       90             20                 N

NORTHBOUND   0.00       90             20                 N

SOUTHBOUND  -----      ---            ---                 -


VEHICLE COMPOSITION
----------------------------------------------------------------------

             % SU TRUCKS   % COMBINATION
              AND RV'S       VEHICLES      % MOTORCYCLES
             -----------   -------------   -------------
EASTBOUND         0              0               0

WESTBOUND         0              0               0

NORTHBOUND        0              0               0

SOUTHBOUND       ---            ---             ---



CRITICAL GAPS
----------------------------------------------------------------------

               TABULAR VALUES  ADJUSTED  SIGHT DIST.     FINAL
                (Table 10-2)    VALUE    ADJUSTMENT   CRITICAL GAP
               --------------  --------  -----------  ------------
MINOR RIGHTS
            NB      5.50         5.50       0.00          5.50

MAJOR LEFTS
            WB      5.50         5.50       0.00          5.50

MINOR LEFTS
            NB      7.00         7.00       0.00          7.00
```

```
CAPACITY AND LEVEL-OF-SERVICE                                    Page-3
-----------------------------------------------------------------------

                     POTEN-    ACTUAL
             FLOW-   TIAL      MOVEMENT    SHARED      RESERVE
             RATE    CAPACITY  CAPACITY    CAPACITY    CAPACITY
MOVEMENT     v(pcph) c (pcph)  c (pcph)   c  (pcph)   c = c  - v  LOS
                      p         M          SH          R   SH
             ------- -------- ---------- ----------- ----------- ---

MINOR STREET

  NB LEFT         7      75       73   >        73 >         67 >  E
                                       > 112       >  101       >D
     RIGHT        4     539      539   >       539 >        535 >  A

MAJOR STREET

  WB LEFT         9     239      239            239          230   C
```

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1985 HCM:  UNSIGNALIZED INTERSECTIONS                        Page-1
*********************************************************************

IDENTIFYING INFORMATION
---------------------------------------------------------------------

AVERAGE RUNNING SPEED, MAJOR STREET.............. 30

PEAK HOUR FACTOR................................. 1

AREA POPULATION.................................. 150000

NAME OF THE EAST/WEST STREET..................... JERUSALEM AVE.

NAME OF THE NORTH/SOUTH STREET................... NORTHGATE DR. (WEST)

NAME OF THE ANALYST.............................. RME

DATE OF THE ANALYSIS (mm/dd/yy).................. 5-31-89

TIME PERIOD ANALYZED............................. PM PEAK (PROPOSED)

OTHER INFORMATION: 5:00-6:00

INTERSECTION TYPE AND CONTROL
---------------------------------------------------------------------

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

CONTROL TYPE SOUTHBOUND: STOP SIGN


TRAFFIC VOLUMES
---------------------------------------------------------------------

           EB    WB    NB    SB
          ----  ----  ----  ----
LEFT       157     8     6   118

THRU      1276   607     0     0

RIGHT       12    39     4   157


NUMBER OF LANES AND LANE USAGE
---------------------------------------------------------------------

                EB       WB       NB       SB
             -------  -------  -------  -------
LANES           2        2        1        2

LANE USAGE                       LTR      L+TR
```

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	0	0	0

CRITICAL GAPS

		TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS					
	NB	5.50	5.50	0.00	5.50
	SB	5.50	5.50	0.00	5.50
MAJOR LEFTS					
	WB	5.50	5.50	0.00	5.50
	EB	5.50	5.50	0.00	5.50
MINOR THROUGHS					
	NB	6.50	6.50	0.00	6.50
	SB	6.50	6.50	0.00	6.50
MINOR LEFTS					
	NB	7.00	7.00	0.00	7.00
	SB	7.00	7.00	0.00	7.00

```
CAPACITY AND LEVEL-OF-SERVICE                                  Page-3
---------------------------------------------------------------------

                     POTEN-    ACTUAL
             FLOW-   TIAL      MOVEMENT    SHARED      RESERVE
             RATE    CAPACITY  CAPACITY    CAPACITY    CAPACITY
MOVEMENT     v(pcph) c (pcph)  c (pcph)   c  (pcph)   c = c   - v  LOS
                      p         M          SH          R   SH
             ------- -------- --------- ------------ ------------ ---

MINOR STREET

  NB LEFT          7       75      46   >          46 >        39 > E
     THROUGH       0       95      69   >   72     69 >   61   69 >E E
     RIGHT         4      526     526   >         526 >       522 > A

MINOR STREET

  SB LEFT        130       75      54              54         -76   F
     THROUGH       0       95      69   >          69 >        69 > E
     RIGHT       173      769     769   >    0    769 >    0  597 > A

MAJOR STREET

  EB LEFT        173      525     525             525         352   B
  WB LEFT          9      226     226             226         218   C
```

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1985 HCM:  UNSIGNALIZED INTERSECTIONS                              Page-1
*********************************************************************

IDENTIFYING INFORMATION
---------------------------------------------------------------------

AVERAGE RUNNING SPEED, MAJOR STREET............. 30

PEAK HOUR FACTOR................................ 1

AREA POPULATION................................. 150000

NAME OF THE EAST/WEST STREET.................... JERUSALEM AVE.

NAME OF THE NORTH/SOUTH STREET.................. NORTHGATE DR. (WEST)

NAME OF THE ANALYST............................. RME

DATE OF THE ANALYSIS (mm/dd/yy)................. 5-31-88

TIME PERIOD ANALYZED............................ SAT PEAK (EXISTING)

OTHER INFORMATION: 12:00-1:00

INTERSECTION TYPE AND CONTROL
---------------------------------------------------------------------

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN


TRAFFIC VOLUMES
---------------------------------------------------------------------

          EB    WB    NB    SB
         ----  ----  ----  ----
LEFT        0     7     3   --

THRU      336   355     0   --

RIGHT      16     0     7   --


NUMBER OF LANES
---------------------------------------------------------------------

               EB         WB         NB         SB
            -------    -------    -------    -------
LANES          2          2          1          --
```

```
ADJUSTMENT FACTORS                                                Page-2
------------------------------------------------------------------------

            PERCENT  RIGHT TURN  CURB RADIUS (ft)  ACCELERATION LANE
             GRADE     ANGLE     FOR RIGHT TURNS    FOR RIGHT TURNS
            -------  ----------  ----------------  -----------------
EASTBOUND     0.00       90             20                 N

WESTBOUND     0.00       90             20                 N

NORTHBOUND    0.00       90             20                 N

SOUTHBOUND   -----      ---            ---                 -


VEHICLE COMPOSITION
------------------------------------------------------------------------

              % SU TRUCKS   % COMBINATION
                AND RV'S       VEHICLES      % MOTORCYCLES
              -----------   -------------   -------------
EASTBOUND          0              0               0

WESTBOUND          0              0               0

NORTHBOUND         0              0               0

SOUTHBOUND        ---            ---             ---


CRITICAL GAPS
------------------------------------------------------------------------

                 TABULAR VALUES  ADJUSTED  SIGHT DIST.     FINAL
                  (Table 10-2)    VALUE    ADJUSTMENT   CRITICAL GAP
                 --------------  --------  -----------  ------------
MINOR RIGHTS
            NB        5.50         5.50       0.00          5.50

MAJOR LEFTS
            WB        5.50         5.50       0.00          5.50

MINOR LEFTS
            NB        7.00         7.00       0.00          7.00
```

```
CAPACITY AND LEVEL-OF-SERVICE                                   Page-3
----------------------------------------------------------------------

                     POTEN-    ACTUAL
             FLOW-   TIAL      MOVEMENT    SHARED      RESERVE
             RATE    CAPACITY  CAPACITY    CAPACITY    CAPACITY
MOVEMENT     v(pcph) c (pcph)  c (pcph)   c  (pcph)   c = c  - v  LOS
                      p         M          SH          R   SH
             ------- -------- --------- ------------ ------------ ---

MINOR STREET

  NB LEFT         3      314     312    >       312   >      309 >  B
                                        >  580        > 569      >A
     RIGHT        8      915     915    >       915   >      908 >  A

MAJOR STREET

  WB LEFT         8      743     743            743          736    A
```

```
1985 HCM:  UNSIGNALIZED INTERSECTIONS                          Page-1
*********************************************************************

IDENTIFYING INFORMATION
---------------------------------------------------------------------

AVERAGE RUNNING SPEED, MAJOR STREET.............. 30

PEAK HOUR FACTOR................................. 1

AREA POPULATION.................................. 150000

NAME OF THE EAST/WEST STREET..................... JERUSALEM AVE.

NAME OF THE NORTH/SOUTH STREET................... NORTHGATE DR. (WEST)

NAME OF THE ANALYST.............................. RME

DATE OF THE ANALYSIS (mm/dd/yy).................. 5-31-88

TIME PERIOD ANALYZED............................. SAT PEAK (PROPOSED)

OTHER INFORMATION: 12:00-1:00

INTERSECTION TYPE AND CONTROL
---------------------------------------------------------------------

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

CONTROL TYPE SOUTHBOUND: STOP SIGN


TRAFFIC VOLUMES
---------------------------------------------------------------------

           EB     WB     NB     SB
          ----   ----   ----   ----
LEFT       230      7      3    172

THRU       394    412      0      0

RIGHT       16     58      7    229


NUMBER OF LANES AND LANE USAGE
---------------------------------------------------------------------

              EB         WB         NB         SB
            -------    -------    -------    -------
LANES          2          2          1          2

LANE USAGE                           LTR       L+TR
```

```
ADJUSTMENT FACTORS                                              Page-2
----------------------------------------------------------------------

           PERCENT  RIGHT TURN  CURB RADIUS (ft)  ACCELERATION LANE
            GRADE     ANGLE     FOR RIGHT TURNS    FOR RIGHT TURNS
           -------  ----------  ----------------  -----------------
EASTBOUND    0.00       90             20                 N

WESTBOUND    0.00       90             20                 N

NORTHBOUND   0.00       90             20                 N

SOUTHBOUND   0.00       90             20                 N


VEHICLE COMPOSITION
----------------------------------------------------------------------

             % SU TRUCKS   % COMBINATION
              AND RV'S       VEHICLES      % MOTORCYCLES
             -----------   -------------   -------------
EASTBOUND         0              0               0

WESTBOUND         0              0               0

NORTHBOUND        0              0               0

SOUTHBOUND        0              0               0



CRITICAL GAPS
----------------------------------------------------------------------

               TABULAR VALUES  ADJUSTED  SIGHT DIST.     FINAL
                (Table 10-2)    VALUE    ADJUSTMENT   CRITICAL GAP
               --------------  --------  -----------  ------------
MINOR RIGHTS
           NB       5.50         5.50       0.00          5.50
           SB       5.50         5.50       0.00          5.50

MAJOR LEFTS
           WB       5.50         5.50       0.00          5.50
           EB       5.50         5.50       0.00          5.50

MINOR THROUGHS
           NB       6.50         6.50       0.00          6.50
           SB       6.50         6.50       0.00          6.50

MINOR LEFTS
           NB       7.00         7.00       0.00          7.00
           SB       7.00         7.00       0.00          7.00
```

```
CAPACITY AND LEVEL-OF-SERVICE                                   Page-3
----------------------------------------------------------------------

                     POTEN-    ACTUAL
             FLOW-   TIAL      MOVEMENT     SHARED      RESERVE
             RATE    CAPACITY  CAPACITY     CAPACITY    CAPACITY
MOVEMENT     v(pcph) c (pcph)  c (pcph)    c  (pcph)   c = c  - v  LOS
                      p          M          SH          R   SH
             ------- -------- --------- ------------ ------------ ---

MINOR STREET

  NB LEFT          3      116      61    >        61  >        57 >  E
     THROUGH       0      197     133    >  174  133  >  163  133 >D D
     RIGHT         8      885     885    >       885  >       877 >  A

MINOR STREET

  SB LEFT        189      166     112            112          -77    F
     THROUGH       0      204     139    >       138  >       138 >  D
     RIGHT       252      B55     855    >    0  855  >    0  603 >  A

MAJOR STREET

  EB LEFT        253      649     649            649          396    B
  WB LEFT          8      693     693            693          685    A
```

```
1985 HCM:  UNSIGNALIZED INTERSECTIONS                              Page-1
*********************************************************************

IDENTIFYING INFORMATION
---------------------------------------------------------------------

AVERAGE RUNNING SPEED, MAJOR STREET............. 30

PEAK HOUR FACTOR................................ 1

AREA POPULATION................................. 150000

NAME OF THE EAST/WEST STREET.................... JERUSALEM AVE.

NAME OF THE NORTH/SOUTH STREET.................. NORTHGATE DR. EAST

NAME OF THE ANALYST............................. RME

DATE OF THE ANALYSIS (mm/dd/yy)................. 5-31-88

TIME PERIOD ANALYZED............................ AM PEAK (EXISTING)

OTHER INFORMATION: 8:00-9:00

INTERSECTION TYPE AND CONTROL
---------------------------------------------------------------------

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN


TRAFFIC VOLUMES
---------------------------------------------------------------------

          EB    WB    NB    SB
         ----  ----  ----  ----
LEFT        0     4     3    --

THRU      440  1114     0    --

RIGHT       6     0     4    --


NUMBER OF LANES
---------------------------------------------------------------------

              EB        WB        NB        SB
            -------   -------   -------   -------
LANES          2         2         1        --
```

ADJUSTMENT FACTORS

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	-----	---	---	-

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

CRITICAL GAPS

		TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS					
	NB	5.50	5.50	0.00	5.50
MAJOR LEFTS					
	WB	5.50	5.50	0.00	5.50
MINOR LEFTS					
	NB	7.00	7.00	0.00	7.00

```
CAPACITY AND LEVEL-OF-SERVICE                                  Page-3
----------------------------------------------------------------------

                     POTEN-    ACTUAL
             FLOW-   TIAL      MOVEMENT    SHARED      RESERVE
             RATE    CAPACITY  CAPACITY    CAPACITY    CAPACITY
MOVEMENT     v(pcph) c (pcph)  c (pcph)   c  (pcph)   c = c   - v LOS
                      p         M          SH          R   SH
             ------- -------- --------- ------------ ------------ ---

MINOR STREET

  NB LEFT         3       81      81     >       81   >       77 >  E
                                         > 167        > 159      >D
     RIGHT        4      867     867     >      867   >      863 >  A

MAJOR STREET

  WB LEFT         4      667     667            667          662    A
```

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1985 HCM:  UNSIGNALIZED INTERSECTIONS                         Page-1
*******************************************************************

IDENTIFYING INFORMATION
-------------------------------------------------------------------

AVERAGE RUNNING SPEED, MAJOR STREET............. 30

PEAK HOUR FACTOR................................ 1

AREA POPULATION................................. 150000

NAME OF THE EAST/WEST STREET.................... JERUSALEM AVE.

NAME OF THE NORTH/SOUTH STREET.................. NORTHGATE DR. EAST

NAME OF THE ANALYST............................. RME

DATE OF THE ANALYSIS (mm/dd/yy)................. 5-31-88

TIME PERIOD ANALYZED............................ AM PEAK (PROPOSED)

OTHER INFORMATION: 8:00-9:00

INTERSECTION TYPE AND CONTROL
-------------------------------------------------------------------

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

CONTROL TYPE SOUTHBOUND: STOP SIGN

TRAFFIC VOLUMES
-------------------------------------------------------------------

          EB    WB    NB    SB
         ----  ----  ----  ----
LEFT       10     4     3    17

THRU      465  1124     0     0

RIGHT       6    40     4     8

NUMBER OF LANES AND LANE USAGE
-------------------------------------------------------------------

               EB        WB        NB        SB
            -------   -------   -------   -------
LANES          2         2         1         2

LANE USAGE                        LTR       L+TR
```

```
ADJUSTMENT FACTORS                                               Page-2
-----------------------------------------------------------------------

            PERCENT  RIGHT TURN  CURB RADIUS (ft)  ACCELERATION LANE
             GRADE     ANGLE     FOR RIGHT TURNS    FOR RIGHT TURNS
            -------  ----------  ----------------  -----------------
EASTBOUND     0.00       90            20                  N

WESTBOUND     0.00       90            20                  N

NORTHBOUND    0.00       90            20                  N

SOUTHBOUND    0.00       90            20                  N

VEHICLE COMPOSITION
-----------------------------------------------------------------------

              % SU TRUCKS   % COMBINATION
                AND RV'S       VEHICLES      % MOTORCYCLES
              -----------   -------------    -------------
EASTBOUND          0              0                0

WESTBOUND          0              0                0

NORTHBOUND         0              0                0

SOUTHBOUND         0              0                0


CRITICAL GAPS
-----------------------------------------------------------------------

                TABULAR VALUES  ADJUSTED  SIGHT DIST.     FINAL
                 (Table 10-2)    VALUE    ADJUSTMENT   CRITICAL GAP
                --------------  --------  -----------  ------------
MINOR RIGHTS
            NB       5.50         5.50       0.00          5.50
            SB       5.50         5.50       0.00          5.50

MAJOR LEFTS
            WB       5.50         5.50       0.00          5.50
            EB       5.50         5.50       0.00          5.50

MINOR THROUGHS
            NB       6.50         6.50       0.00          6.50
            SB       6.50         6.50       0.00          6.50

MINOR LEFTS
            NB       7.00         7.00       0.00          7.00
            SB       7.00         7.00       0.00          7.00
```

```
CAPACITY AND LEVEL-OF-SERVICE                                   Page-3
-----------------------------------------------------------------------

                          POTEN-    ACTUAL
                FLOW-     TIAL      MOVEMENT     SHARED       RESERVE
                RATE      CAPACITY  CAPACITY     CAPACITY     CAPACITY
MOVEMENT        v(pcph)  c (pcph)  c (pcph)    c  (pcph)    c = c   - v  LOS
                            p         M          SH           R    SH
                ------- -------- --------- ------------ ------------ ---

MINOR STREET

  NB LEFT           3       75        72    >           72  >         69 >  E
     THROUGH        0       95        92    >  151      92  >  144    92 >D E
     RIGHT          4      855       855    >          855  >        850 >  A

MINOR STREET

  SB LEFT          19       75        73                73            54    E
     THROUGH        0       95        92    >           92  >         92 >  E
     RIGHT          9      568       568    >    0     568  >    0   559 >  A

MAJOR STREET

  EB LEFT          11      269       269               269           258    C
  WB LEFT           4      649       649               649           644    A
```

```
1985 HCM:  UNSIGNALIZED INTERSECTIONS                             Page-1
**********************************************************************

IDENTIFYING INFORMATION
----------------------------------------------------------------------

AVERAGE RUNNING SPEED, MAJOR STREET.............. 30

PEAK HOUR FACTOR................................. 1

AREA POPULATION.................................. 150000

NAME OF THE EAST/WEST STREET..................... JERUSALEM AVE.

NAME OF THE NORTH/SOUTH STREET................... NORTHGATE DR. EAST

NAME OF THE ANALYST.............................. RME

DATE OF THE ANALYSIS (mm/dd/yy).................. 5-31-88

TIME PERIOD ANALYZED............................. PM PEAK (EXISTING)

OTHER INFORMATION: 5:00-6:00

INTERSECTION TYPE AND CONTROL
----------------------------------------------------------------------

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN


TRAFFIC VOLUMES
----------------------------------------------------------------------

           EB     WB     NB     SB
          ----   ----   ----   ----
LEFT         0      4     10    --

THRU      1239    578      0    --

RIGHT        4      0     10    --


NUMBER OF LANES
----------------------------------------------------------------------

                 EB        WB        NB        SB
              -------   -------   -------   -------
LANES            2         2         1         --
```

```
ADJUSTMENT FACTORS                                           Page-2
--------------------------------------------------------------------

           PERCENT  RIGHT TURN  CURB RADIUS (ft)  ACCELERATION LANE
            GRADE     ANGLE     FOR RIGHT TURNS    FOR RIGHT TURNS
           -------  ----------  ----------------  -----------------
EASTBOUND    0.00       90             20                 N

WESTBOUND    0.00       90             20                 N

NORTHBOUND   0.00       90             20                 N

SOUTHBOUND  -----      ---            ---                 -

VEHICLE COMPOSITION
--------------------------------------------------------------------

             % SU TRUCKS   % COMBINATION
               AND RV'S       VEHICLES      % MOTORCYCLES
             -----------   -------------   -------------
EASTBOUND          0              0               0

WESTBOUND          0              0               0

NORTHBOUND         0              0               0

SOUTHBOUND        ---            ---             ---


CRITICAL GAPS
--------------------------------------------------------------------

               TABULAR VALUES  ADJUSTED  SIGHT DIST.     FINAL
                (Table 10-2)    VALUE    ADJUSTMENT   CRITICAL GAP
               --------------  --------  -----------  ------------
MINOR RIGHTS
            NB       5.50         5.50       0.00          5.50

MAJOR LEFTS
            WB       5.50         5.50       0.00          5.50

MINOR LEFTS
            NB       7.00         7.00       0.00          7.00
```

```
CAPACITY AND LEVEL-OF-SERVICE                                  Page-3
---------------------------------------------------------------------

                     POTEN-    ACTUAL
             FLOW-   TIAL      MOVEMENT    SHARED      RESERVE
             RATE    CAPACITY  CAPACITY    CAPACITY    CAPACITY
MOVEMENT     v(pcph) c (pcph)  c (pcph)   c  (pcph)   c = c  - v  LOS
                      p         M          SH          R   SH
             ------- -------- --------- ------------ ------------ ---

MINOR STREET

  NB LEFT        11        75      74   >         74 >         63 > E
                                        >  130       >  108      >D
     RIGHT       11       541     541   >        541 >        530 > A

MAJOR STREET

  WB LEFT         4       241     241            241          237   C
```

```
1985 HCM:  UNSIGNALIZED INTERSECTIONS                        Page-1
*******************************************************************

IDENTIFYING INFORMATION
-------------------------------------------------------------------

AVERAGE RUNNING SPEED, MAJOR STREET.............. 30

PEAK HOUR FACTOR................................. 1

AREA POPULATION.................................. 150000

NAME OF THE EAST/WEST STREET..................... JERUSALEM AVE.

NAME OF THE NORTH/SOUTH STREET................... NORTHGATE DR. EAST

NAME OF THE ANALYST.............................. RME

DATE OF THE ANALYSIS (mm/dd/yy).................. 5-31-88

TIME PERIOD ANALYZED............................. PM PEAK (PROPOSED)

OTHER INFORMATION: 5:00-6:00

INTERSECTION TYPE AND CONTROL
-------------------------------------------------------------------

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

CONTROL TYPE SOUTHBOUND: STOP SIGN

TRAFFIC VOLUMES
-------------------------------------------------------------------

          EB    WB    NB    SB
         ----  ----  ----  ----
LEFT       39     4    10    79

THRU     1357   617     0     0

RIGHT       4   157    10    39

NUMBER OF LANES AND LANE USAGE
-------------------------------------------------------------------

             EB        WB        NB        SB
           -------   -------   -------   -------
LANES         2         2         1         2

LANE USAGE                        LTR      L+TR
```

```
ADJUSTMENT FACTORS                                              Page-2
----------------------------------------------------------------------

           PERCENT  RIGHT TURN  CURB RADIUS (ft)  ACCELERATION LANE
            GRADE     ANGLE     FOR RIGHT TURNS    FOR RIGHT TURNS
           -------  ----------  ----------------  -----------------
EASTBOUND    0.00       90             20                 N

WESTBOUND    0.00       90             20                 N

NORTHBOUND   0.00       90             20                 N

SOUTHBOUND   0.00       90             20                 N


VEHICLE COMPOSITION
----------------------------------------------------------------------

             % SU TRUCKS  % COMBINATION
               AND RV'S      VEHICLES     % MOTORCYCLES
             -----------  -------------   -------------
EASTBOUND         0             0               0

WESTBOUND         0             0               0

NORTHBOUND        0             0               0

SOUTHBOUND        0             0               0


CRITICAL GAPS
----------------------------------------------------------------------

               TABULAR VALUES  ADJUSTED   SIGHT DIST.     FINAL
                (Table 10-2)    VALUE     ADJUSTMENT   CRITICAL GAP
               --------------  --------   -----------  ------------
MINOR RIGHTS
            NB       5.50        5.50         0.00          5.50
            SB       5.50        5.50         0.00          5.50

MAJOR LEFTS
            WB       5.50        5.50         0.00          5.50
            EB       5.50        5.50         0.00          5.50

MINOR THROUGHS
            NB       6.50        6.50         0.00          6.50
            SB       6.50        6.50         0.00          6.50

MINOR LEFTS
            NB       7.00        7.00         0.00          7.00
            SB       7.00        7.00         0.00          7.00
```

```
CAPACITY AND LEVEL-OF-SERVICE                                   Page-3
----------------------------------------------------------------------

                         POTEN-    ACTUAL
                 FLOW-   TIAL      MOVEMENT    SHARED      RESERVE
                 RATE    CAPACITY  CAPACITY    CAPACITY    CAPACITY
MOVEMENT         v(pcph) c (pcph)  c (pcph)   c  (pcph)   c = c   - v  LOS
                          p         M          SH          R   SH
                 ------- -------- --------- ----------- ----------- ---

MINOR STREET

  NB LEFT          11       75       67    >        67  >        56 >  E
     THROUGH        0       95       88    >  119   88  >   97   88 >E E
     RIGHT         11      503      503    >       503  >       492 >  A

MINOR STREET

  SB LEFT          87       75       69             69          -18    F
     THROUGH        0       95       88    >        88  >        88 >  E
     RIGHT         43      712      712    >    0  712  >    0  669 >  A

MAJOR STREET

  EB LEFT          43      442      442            442          399    B
  WB LEFT           4      203      203            203          198    D
```

```
1985 HCM:  UNSIGNALIZED INTERSECTIONS                            Page-1
*******************************************************************

IDENTIFYING INFORMATION
-------------------------------------------------------------------

AVERAGE RUNNING SPEED, MAJOR STREET.............. 30

PEAK HOUR FACTOR................................. 1

AREA POPULATION.................................. 150000

NAME OF THE EAST/WEST STREET..................... JERUSALEM AVE.

NAME OF THE NORTH/SOUTH STREET................... NORTHGATE DR. EAST

NAME OF THE ANALYST.............................. RME

DATE OF THE ANALYSIS (mm/dd/yy).................. 5-31-88

TIME PERIOD ANALYZED............................. SAT PEAK (EXISTING)

OTHER INFORMATION: 12:00-1:00

INTERSECTION TYPE AND CONTROL
-------------------------------------------------------------------

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN


TRAFFIC VOLUMES
-------------------------------------------------------------------

          EB    WB    NB    SB
         ----  ----  ----  ----
LEFT       0     5    11    --

THRU     343   355     0    --

RIGHT      5     0    12    --


NUMBER OF LANES
-------------------------------------------------------------------

             EB        WB        NB        SB
           -------   -------   -------   -------
LANES         2         2         1        --
```

```
ADJUSTMENT FACTORS                                              Page-2
----------------------------------------------------------------------

           PERCENT  RIGHT TURN  CURB RADIUS (ft)  ACCELERATION LANE
            GRADE     ANGLE     FOR RIGHT TURNS    FOR RIGHT TURNS
           -------  ----------  ----------------  -----------------
EASTBOUND    0.00        90              20                N

WESTBOUND    0.00        90              20                N

NORTHBOUND   0.00        90              20                N

SOUTHBOUND  -----       ---             ---                -

VEHICLE COMPOSITION
----------------------------------------------------------------------

             % SU TRUCKS   % COMBINATION
               AND RV'S      VEHICLES      % MOTORCYCLES
             -----------   -------------   -------------
EASTBOUND           0              0              0

WESTBOUND           0              0              0

NORTHBOUND          0              0              0

SOUTHBOUND       ---            ---            ---


CRITICAL GAPS
----------------------------------------------------------------------

               TABULAR VALUES   ADJUSTED    SIGHT DIST.       FINAL
                (Table 10-2)     VALUE      ADJUSTMENT    CRITICAL GAP
               --------------   --------    -----------   ------------
MINOR RIGHTS
            NB        5.50         5.50        0.00            5.50

MAJOR LEFTS
            WB        5.50         5.50        0.00            5.50

MINOR LEFTS
            NB        7.00         7.00        0.00            7.00
```

```
CAPACITY AND LEVEL-OF-SERVICE                                     Page-3
------------------------------------------------------------------------

                       POTEN-   ACTUAL
              FLOW-    TIAL     MOVEMENT    SHARED      RESERVE
              RATE     CAPACITY CAPACITY    CAPACITY    CAPACITY
MOVEMENT      v(pcph) c (pcph)  c (pcph)   c  (pcph)   c = c  - v  LOS
                         p        M          SH           R   SH
              ------- -------- --------- ----------- ----------- ---

MINOR STREET

  NB LEFT        12       315      313    >       313  >       301 >  B
                                          >  477       >  452      >A
     RIGHT       13       917      917    >       917  >       904 >  A

MAJOR STREET

  WB LEFT         6       747      747            747          741    A
```

```
1985 HCM:  UNSIGNALIZED INTERSECTIONS                          Page-1
*********************************************************************

IDENTIFYING INFORMATION
---------------------------------------------------------------------

AVERAGE RUNNING SPEED, MAJOR STREET............. 30

PEAK HOUR FACTOR................................ 1

AREA POPULATION................................. 150000

NAME OF THE EAST/WEST STREET.................... JERUSALEM AVE.

NAME OF THE NORTH/SOUTH STREET.................. NORTHGATE DR. EAST

NAME OF THE ANALYST............................. RME

DATE OF THE ANALYSIS (mm/dd/yy)................. 5-31-88

TIME PERIOD ANALYZED............................ SAT PEAK (PROPOSED)

OTHER INFORMATION: 12:00-1:00

INTERSECTION TYPE AND CONTROL
---------------------------------------------------------------------

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

CONTROL TYPE SOUTHBOUND: STOP SIGN


TRAFFIC VOLUMES
---------------------------------------------------------------------

           EB     WB     NB     SB
          ----   ----   ----   ----
LEFT        59      5     12    115

THRU       515    413      0      0

RIGHT        5    230     11     57


NUMBER OF LANES AND LANE USAGE
---------------------------------------------------------------------

                EB         WB         NB         SB
              -------    -------    -------    -------
LANES            2          2          1          2

LANE USAGE                            LTR       L+TR
```

```
ADJUSTMENT FACTORS                                                Page-2
-------------------------------------------------------------------------

           PERCENT  RIGHT TURN  CURB RADIUS (ft)  ACCELERATION LANE
            GRADE     ANGLE     FOR RIGHT TURNS    FOR RIGHT TURNS
           -------  ----------  ----------------  -----------------
EASTBOUND    0.00       90             20                 N

WESTBOUND    0.00       90             20                 N

NORTHBOUND   0.00       90             20                 N

SOUTHBOUND   0.00       90             20                 N

VEHICLE COMPOSITION
-------------------------------------------------------------------------

             % SU TRUCKS   % COMBINATION
               AND RV'S      VEHICLES      % MOTORCYCLES
             -----------   -------------   -------------
EASTBOUND         0              0               0

WESTBOUND         0              0               0

NORTHBOUND        0              0               0

SOUTHBOUND        0              0               0


CRITICAL GAPS
-------------------------------------------------------------------------

               TABULAR VALUES  ADJUSTED  SIGHT DIST.     FINAL
                (Table 10-2)    VALUE    ADJUSTMENT   CRITICAL GAP
               --------------  --------  -----------  ------------
MINOR RIGHTS
           NB       5.50         5.50        0.00          5.50
           SB       5.50         5.50        0.00          5.50

MAJOR LEFTS
           WB       5.50         5.50        0.00          5.50
           EB       5.50         5.50        0.00          5.50

MINOR THROUGHS
           NB       6.50         6.50        0.00          6.50
           SB       6.50         6.50        0.00          6.50

MINOR LEFTS
           NB       7.00         7.00        0.00          7.00
           SB       7.00         7.00        0.00          7.00
```

```
CAPACITY AND LEVEL-OF-SERVICE                                  Page-3
---------------------------------------------------------------------

                     POTEN-    ACTUAL
             FLOW-   TIAL      MOVEMENT    SHARED      RESERVE
             RATE    CAPACITY  CAPACITY    CAPACITY    CAPACITY
MOVEMENT     v(pcph) c (pcph)  c (pcph)   c  (pcph)   c = c   - v  LOS
                      p         M          SH          R   SH
             ------- -------- --------- ------------ ------------ ---

MINOR STREET

  NB LEFT         13      126     110    >       110  >        97 >  E
     THROUGH       0      165     151    > 188   151  >  163  151 >D D
     RIGHT        12      830     830    >       830  >       818 >  A

MINOR STREET

  SB LEFT        127      160     145            145           19    E
     THROUGH       0      197     181    >       181  >       181 >  D
     RIGHT        63      771     771    >   0   771  >    0  708 >  A

MAJOR STREET

  EB LEFT         64      527     527            527          463    A
  WB LEFT          6      613     613            613          608    A
```

APPENDIX 3
CARBON MONOXIDE HOT SPOT SCREENING ANALYSIS

RTP ENVIRONMENTAL ASSOCIATES INC.

AIR • ~~WATER~~ • SOLID WASTE CONSULTANTS

400 Post Avenue, Westbury, New York 11590

(516)333-4526

J.B.

√ summary

RECEIVED JUL 28 1988

July 27, 1988

Fanning, Phillips & Molnar
909 Marconi Avenue
Ronkonkoma, New York 11779

ATTN: Kevin J. Phillips, P.E., Ph.D.

RE: **Jerusalem Avenue Site - Carbon Monoxide Hot Spot Screening Analysis**

Dear Kevin:

The attached Worksheet No. 5 calculations have been prepared by RTP Environmental Associates, Inc. as per your request. As I have mentioned, the results show that the intersections analyzed, Jerusalem and Winthrop and Jerusalem and Northgate Drive West, will not have a carbon monoxide hot spot problem. The computed values are significantly below the criteria that would suggest the developer complete a more refined IMM analysis.

The primary differences between the initial calculations and those computed by RTP were in two areas. The first is in the interpretation of the traffic volume per lane in line 5 of the worksheet. The second difference is in the calculation of excess emissions in line 17 of the worksheet. This second calculation causes a significant difference in the contribution for excess emissions. There are other differences in the calculations, however, these have only a minor effect on the final value.

Thank you for considering us for this work and we were pleased to be able to be of assistance. The invoice for the above effort will be forwarded to you during the first part of August. Please call if you have any questions on the above or if you have further needs for our services.

Sincerely yours,

RTP ENVIRONMENTAL ASSOCIATES, INC.

Kenneth J. Skipka
Principal

KJS/erl
Attach.
cc: D. F. Elias

ID#FPMHL1

WORKSHEET NO. 5

CALCULATION OF CO CONCENTRATIONS AT INTERSECTIONS

Location: Jerusalem Ave & Wilbrop Dr **Date:** 7/21/88

Analysis by: V. Lee **Checked by:** E. Ken

Assumptions:
- **Analysis Year:** 1989.
- **Location:** (a) ______ California; (b) ✓ 49-State, low altitude; (c) ______ 49-State, high altitude.
- **Ambient temperature:** 20 °F.
- **Percent of vehicles operating in:** (a) cold-start mode 50; (b) hot-start mode 10.
- **Vehicle-type distribution:** LDV 80 %; LDT 12 %; HDV-G 5 %; HDV-D 3 %; MC 0 %.

	Main road		Crossroad	
1. Site identification	Jerusalem		Winthrop	
2. a. i - intersection approach identification	1 W	2 E	3 N	4 S
b. Is approach located in a street canyon?	No	No	No	No
3. n_i - Number of traffic lanes in approach i	2	2	1	1
4. x_i - Roadway/receptor separation (m) + 25'	10	14		
5. V_i - Peak-hour lane volume in each approach (veh/hr) PM peak	709	383	14	33
6. S_i - Cruise speed (mph) on each approach posted ?	35	35	20	20
7. a. Type of intersection (signalized or unsignalized)	Signalized			
b. For signalized intersections:				
i) $(G/Cy)_1$ - Green time/signal cycle ratio for approach 1	0.67			
ii) V_{cross} - Effective crossroad volume (veh/hr)			276	
8. Le - Queue length on approach 1 (m)	55			

		Main road		Crossroad	
9.	Qf_i - Free-flow emission rate (g/m-sec)	0.00226	.00129	.00151	.00059
10.	$\frac{\chi u}{Q}$ f,main - Normalized concentration contribution from free-flow emissions on main roadway (10^{-3} m^{-1})	135			
11.	$\frac{\chi u}{Q}$ f,cross - Normalized concentration contribution from free-flow emission on crossroad (10^{-3} m^{-1})			105	
12.	Cdf_i - Distance correction factor, free-flow emissions	0.98	0.8		
13.	C_{Ef} - Emissions correction factor, free-flow emissions.	2.24*	2.24	2.32	2.32
14. a.	$\chi_{f,main}$ - Concentration contribution from free-flow emissions on main road (mg/m^3)	6.33			
b.	$\chi_{f,cross}$ - Concentration contribution from free-flow emissions on crossroad (mg/m^3)			0.29	
15.	χ_f - Total concentration from free-flow emissions (mg/m^3)	6.62			
16.	C_{Ee} - Emissions correction factor, excess emissions	0.40			
17.	Q_e - Excess emission rate (g/m-sec)	0.0042		0.0038	
18.	$\frac{\chi u}{Q}$ e,i - Normalized concentration contribution from excess emissions on approach i ($10^{-3}m^{-1}$)	740	182	31	17
19.	Cde_i - Distance correction factor, excess emissions	0.75	1.05	1	1
20.	$\chi_{e,i}$ - Concentration contribution from excess emissions on approach i (mg/m^3)	2.95	0.80	0.14	0.06
21.	χ_e - Total contribution from excess emissions (mg/m^3)	3.95			
22.	$\chi_{E,1\text{-}hr}$ - 1-hour average concentration resulting from vehicle emissions (mg/m^3)	10.57			

*using EPA workbook. NYSDOT values are lower (1.36 vs 2.24)

23. $\chi_{E,1\text{-hr}}$ - 1-hour average concentration resulting from vehicle emissions (ppm) 9.20

24 CAL - Calibration factor (for non-street canyon, signalized intersections only, otherwise use 1.0) 1.65 × ( )$^{-0.55}$

25. $\chi_{f,1\text{-hr}}$ - 1-hour final adjusted average concentration, (ppm) 5.59

WORKSHEET NO. 5

CALCULATION OF CO CONCENTRATIONS AT INTERSECTIONS

Location: Jerusalem & Northgate Dr W **Date:** 7/25/88

Analysis by: V. Lee **Checked by:** E. Ken

Assumptions:
- Analysis Year: 1989.
- Location: (a) ____ California; (b) ✓ 49-State, low altitude; (c) ____ 49-State, high altitude.
- Ambient temperature: 20 °F.
- Percent of vehicles operating in: (a) cold-start mode 50; (b) hot-start mode 10.
- Vehicle-type distribution: LDV 80 %; LDT 12 %; HDV-G 5 %; HDV-D 3 %; MC 0 %.

	Main road		Crossroad	
1. Site identification	Jerusalem		Northgate Dr W	
2. a. i - intersection approach identification	1 W	2 E	3 N	4 S
b. Is approach located in a street canyon?	No	No	No	No
3. n_i - Number of traffic lanes in approach i	2	2	1	2
4. x_i - Roadway/receptor separation (m)	4	11	☒	☒
5. V_i - Peak-hour lane volume in each approach (veh/hr) PM	723	327	276	4
6. S_i - Cruise speed (mph) on each approach	35	35	20	20
7. a. Type of intersection (signalized or unsignalized)	Unsignalized			
b. For signalized intersections:				
i) $(G/Cy)_1$ - Green time/signal cycle ratio for approach 1	—	☒	☒	☒
ii) V_{cross} - Effective crossroad volume (veh/hr)	☒			
8. Le - Queue length on approach 1 (m)	40	☒	☒	☒

(25 mph - posted? emission for 20 is higher ∴ more conservative)

(850, 300)

	Main road		Crossroad	
9. Qf_i - Free-flow emission rate (g/m-sec)	0.00258	0.00127	.00135	.00045
10. $\frac{\chi u}{Q}$ f,main - Normalized concentration contribution from free-flow emissions on main roadway (10^{-3} m^{-1})	375			
11. $\frac{\chi u}{Q}$ f,cross - Normalized concentration contribution from free-flow emission on crossroad (10^{-3} m^{-1})			115	
12. Cdf_i - Distance correction factor, free-flow emissions	1.3	0.95		
13. C_{Ef} - Emissions correction factor, free-flow emissions.	* 2.24	2.24	2.32	2.32
14. a. $\chi_{f,main}$ - Concentration contribution from free-flow emissions on main road (mg/m^3)	5.84			
b. $\chi_{f,cross}$ - Concentration contribution from free-flow emissions on crossroad (mg/m^3)			0.6	
15. χ_f - Total concentration from free-flow emissions (mg/m^3)	6.44			
16. C_{Ee} - Emissions correction factor, excess emissions	0.40			
17. Q_e - Excess emission rate (g/m-sec)	0			
18. $\frac{\chi u}{Q}$ e,i - Normalized concentration contribution from excess emissions on approach i ($10^{-3}m^{-1}$)	640	170	38	80
19. Cde_i - Distance correction factor, excess emissions	1.2	1.2	1	1
20. $\chi_{e,i}$ - Concentration contribution from excess emissions on approach i (mg/m^3)	0	0	0	0
21. χ_e - Total contribution from excess emissions (mg/m^3)	0			
22. $\chi_{E,1\text{-}hr}$ - 1-hour average concentration resulting from vehicle emissions (mg/m^3)	6.44			

* Using EPA Workbook
NYSDOT values
are lower
(1.36 vs 2.24)

$Q_{fi} = 0.$

$Q_{fc} = 0.0127$

23. $X_{E,1\text{-}hr}$ - 1-hour average concentration resulting from vehicle emissions (ppm) 5.60

24 CAL - Calibration factor (for non-street canyon, signalized intersections only, otherwise use 1.0) 1.65×( ) 0.55

25. $X_{f,1\text{-}hr}$ - 1-hour final adjusted average concentration, (ppm) 4.26

APPENDIX 4
METHANE SAMPLING, ANALYSIS AND REMEDIATION

ENGINEERING REPORT

METHANE SAMPLING ANALYSIS AND REMEDIATION

UNIONDALE SITE

PREPARED FOR

REALCO MANAGEMENT INC

SEPTEMBER 1988

fanning, phillips & molnar
ENGINEERS
RONKONKOMA NEW YORK

TABLE OF CONTENTS

SECTION 1 INTRODUCTION

In the development of an Environmental Impact Statement for the proposed shopping center, a significant amount of methane was found to cover a large area of the site. Methane is a colorless, odorless, combustible gas that if allowed to accumulate in sufficient concentrations, can explode. Methane's lower explosive limit (L.E.L.) is 5 percent. Below this level it will not explode and poses little risk.

This report will detail the sampling effort at the site, the concentrations encountered, estimate the probable amount of methane being generated, alternatives to insure that concentrations never exceed the L.E.L., and finally, select the most cost effective solution.

SECTION 2 METHANE SAMPLING AND RESULTS

This section of the engineering report will define the extent of the existing methane conditions and lay a foundation for a remedial design. This will be done by reviewing the field sampling phases and their respective results.

Typically, a landfill involves the deposition of significant amounts of biodegradable organic material. As microbes act on this material, methane is generated. This site, although not a municipal solid waste landfill, did receive organic wastes. In order to characterize the extent and severity of the problem, three phases of sampling were conducted to obtain a detailed description of the methane problem (see Appendix A for field reports).

2.1 Methane Sampling - Phase I

At the outset of the methane survey, little was known of the methane concentrations on the site. Previous land use, an Organic Vapor Analysis (OVA) survey, and boring data all suggested, however, that methane was present. Indeed the building department suggested that methane generation may be a significant aspect of the development of this site during the declaration stage of the EIS.

Fanning, Phillips and Molnar devised a sampling plan consisting of one sample per acre or 11 samples using a Gascope Combustible Gas Indicator from Mine Safety Appliances. Methane concentrations were measured as a percent of the Lower Explosive Limit (L.E.L.) for concentrations below the L.E.L. (5 percent methane by volume in air) and as a percent of total gas for higher concentrations.

The L.E.L. for any gas is the concentration of gas in air that makes it explosive should a spark or flame be introduced.

Sampling locations were predetermined to form a grid. Figure 2.1 shows the locations of the samples taken in Phase I. Sample locations in the southern portion of the site (M1-M6) showed no detectable levels of methane, while M-7 and M-8 had 5 percent (the L.E.L.) and 25 percent (5 times the L.E.L.) concentrations of methane gas respectively. These concentrations are at or significantly above the L.E.L.

2.2 Methane Sampling - Phase II

A second methane sampling plan was conducted following the high methane percentages determined in Phase I. Layne Well and Pump Division from Hydrogroup was contracted to drill 20 vapor wells as shown on Figure 2.2. The locations were chosen based on soil borings, Building Department input and Phase I sampling results. Each vapor well was drilled to a depth of 15 feet and a methane reading was taken. The methane concentration for each location is shown on Table 2.1. In summary, every vapor well registered methane gas, the majority of the wells were above 15 percent methane of total gas and only four were below 5 percent (the L.E.L.).

At ten of the 20 locations a permanent vapor well was installed. Each permanent vapor well consists of a ten foot section of 20 slot PVC well screen. The top two feet are solid to prevent gas exchange with the atmosphere, and the bottom eight feet are open to allow soil gases to migrate into the well. Each well was capped with a screw plug. The permanent well locations are also shown on Figure 2.2.

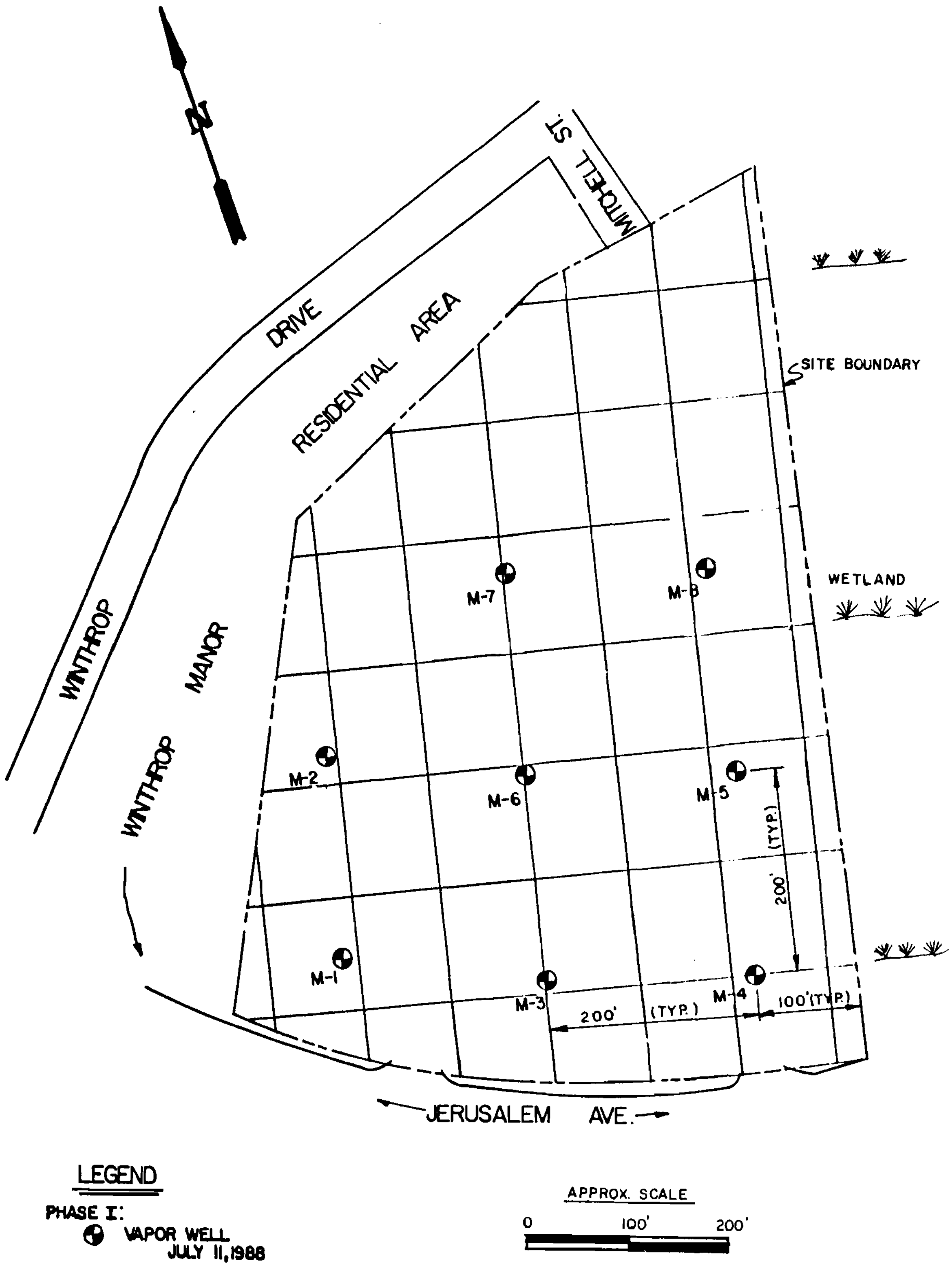


FIGURE 2.1-METHANE SAMPLING: PHASE I

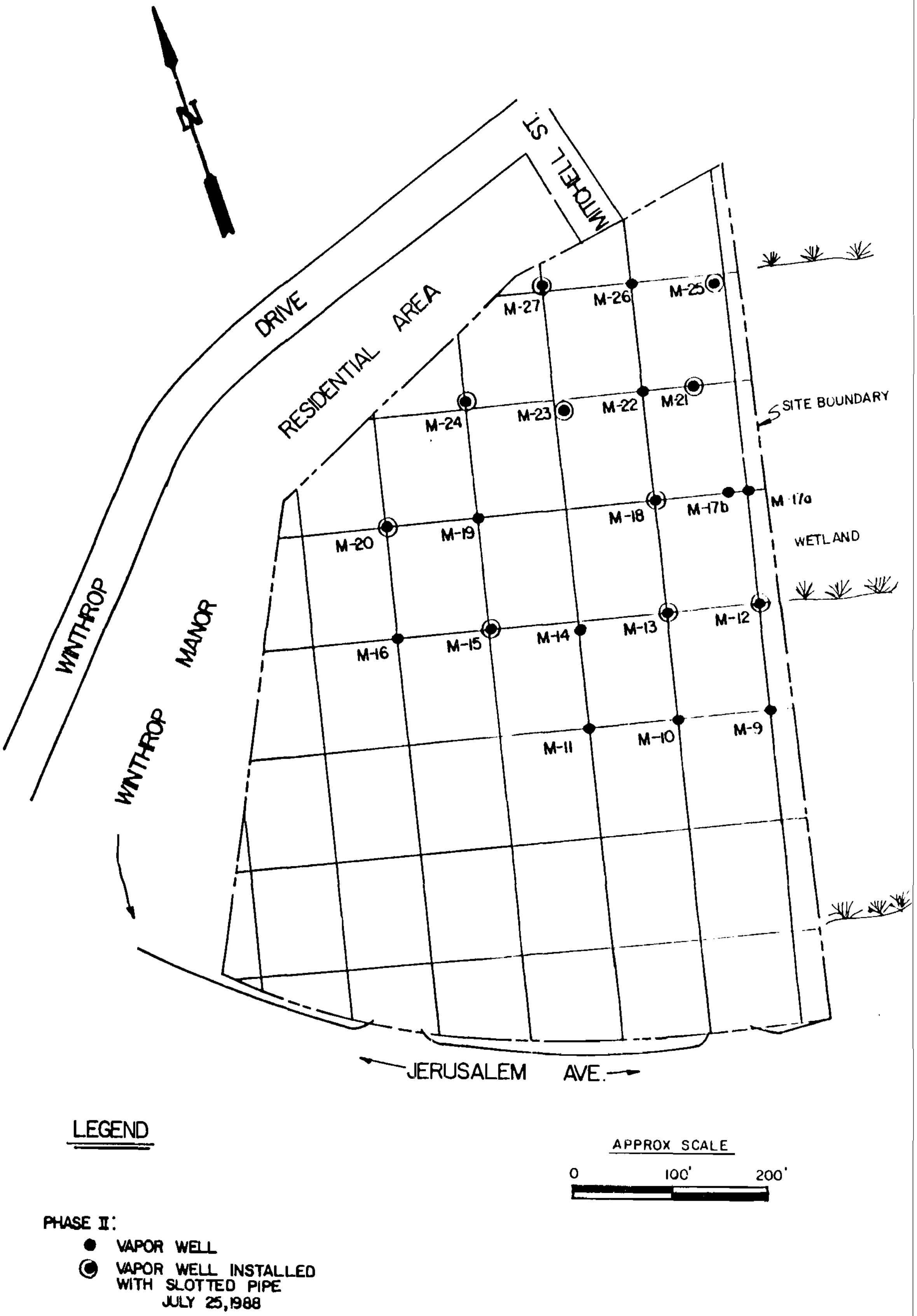


FIGURE 2.2-METHANE SAMPLING: PHASE II

TABLE 2.1

METHANE CONCENTRATIONS FOR VAPOR WELLS INSTALLED 7/25/88

Vapor Well #	Concentrations	Comments
M-9	80% L.E.L.*	black soil
M-10	38% L.E.L.	10 ft. black soil
M-11	80% L.E.L.	black soil almost immediately
M-12	28% Gas	well installed
M-13	25% Gas	asphalt and a lot of organic debris, well installed
M-14	18% Gas	
M-15	26% Gas	well installed
M-16	27% Gas	
M-17	30% Gas	large amount of plastic debris
M-17b	15% Gas	hole collapsed, plastic and debris
M-18	25% Gas	well installed
M-19	60% L.E.L.	
M-20	24% Gas	well installed
M-21	26% Gas	well installed
M-22	10% Gas	
M-23	28% Gas	well installed
M-24	20% Gas	well installed
M-25	15-20% Gas	well installed
M-26	13% Gas	2 in. of surface water in the area of well
M-27	24% Gas	well installed

2.3 Methane Sampling - Phase III

The first two methane samplings led to a third phase of sampling that could be characterized as off-site. The possibility of gas migration off-site was of particular concern because of the contiguous residential areas to the north and west of the site. In addition, there was a need to determine the existance of gas migration to the wetlands to the east of the site. Eleven sample locations were tested as shown on Figure 2.3 and the corresponding results are shown on Table 2.2.

From this sampling we conclude that methane migration off the site to the north and west is not a problem. Although there may be some minimal migration to the wetland on the east side, this is not a hazard.

2.4 Variability of Methane Generation

The sealed vapor wells, installed during Phase II, were tested again to determine the consistancy of gas generation. Examining Table 2.3 yields some interesting points. Samples are consistant from 7/28/88 to 8/9/88 except for wells M-20, 24, 25, and 27 which are perifery wells and all have lower concentration in August. Nine of the ten sealed vapor wells installed have consistent concentrations from the morning sampling to the afternoon sampling. This implies that the daily variability is minimal and that sample concentrations are reliable.

The sealed vapor wells, consistant for the most part, show lower readings for the perifery wells; M-20, 24, 25, and 27. There are several possible factors which may contribute to these inconsis-

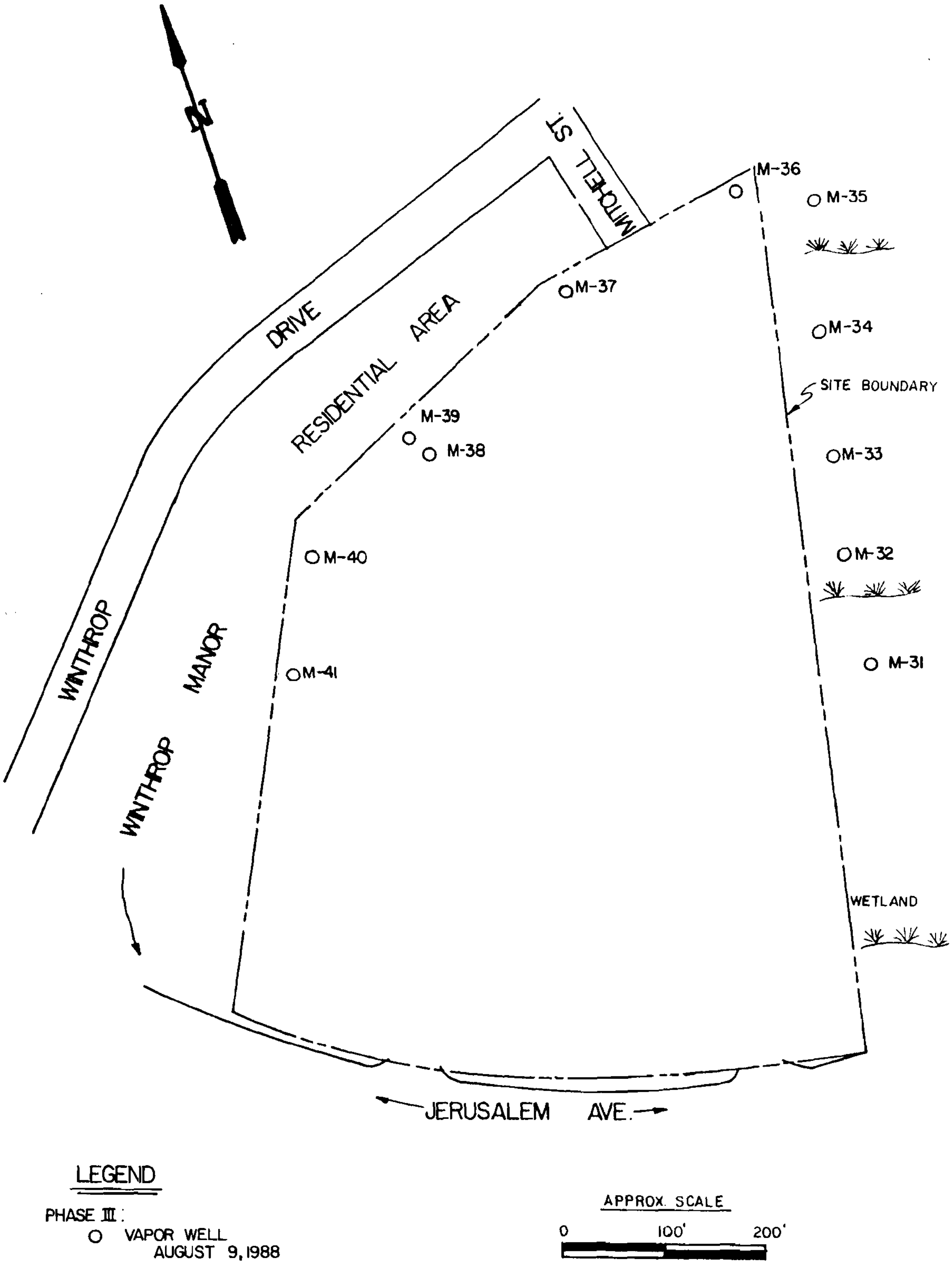


FIGURE 2.3-METHANE SAMPLING: PHASE III

TABLE 2.2

Phase III Methane Sampling Perimeter Locations

New 1/2" vapor wells	Concentration (only 1 sampling)
M-31	0% L.E.L.
M-32	0% L.E.L.
M-33	74% L.E.L.
M-34	0% L.E.L.
M-35	0% L.E.L.
M-36	0% L.E.L.
M-37	0% L.E.L.
M-38	0% L.E.L.
M-39	0% L.E.L.
M-40	0% L.E.L.
M-41	0% L.E.L.

Note: Numbering for Phase III was started at M-31. There is no M-28, M-29 or M-30.

TABLE 2.3

PHASE III METHANE SAMPLING

	Concentrations		
	8/9/88		7/25/88
	9:30 a.m.	2:10 p.m.	
Calibration (2% methane in Air, 40% L.E.L.)	36%	36%	
Vapor Wells (with slotted pipe installed)			
M-12	27% Gas	22% Gas	28% Gas
M-13	10% Gas	22% Gas	25% Gas
M-15	29% Gas	28% Gas	26% Gas
M-18	25% Gas	22% Gas	25% Gas
M-20	0% Gas	2% L.E.L.	24% Gas
M-21	5% Gas	26% Gas	26% Gas
M-23	25% Gas	24% Gas	28% Gas
M-24	0% Gas	0% Gas	20% Gas
M-25	0% Gas	0% Gas	15-20% Gas
M-27	0% Gas	0% Gas	24% Gas

tencies, but the most logical explanation is:

- August 9, the date of Phase III sampling, was at the end of month long period of relatively little percipitation. This was evident by the lack of standing water and dry, cracked soils. In contrast, large pools of water were observed on site during Phase II sampling on July 25. Water is essential for the bacteria which decompose the organic material and produce methane. A lower soil moisture content results in a reduced population and activity of bacteria. In addition, water, as it is migrating through soil pore spaces, acts as a partial cap to escaping gases and will therefore, concentrate gases during wetter periods.

2.5 Summary

Figure 2.4 is a composite of all sampling on site and clearly shows a large area where methane is being produced in significant amounts. The August 9 testing around the perimeter of the site indicates that the neighboring properties appear to be free from methane migration. The proposed development will, however, change conditions by sealing the top of the soils with asphalt or building slabs. This will require mitigation to insure that methane gas does not migrate off the site and become a problem.

The August 9 testing showed that even with variation in moisture content, the interior wells still produced consistantly high methane readings. Some of the perifery wells showed lower concentrations reflecting the stochastic nature of this biological process.

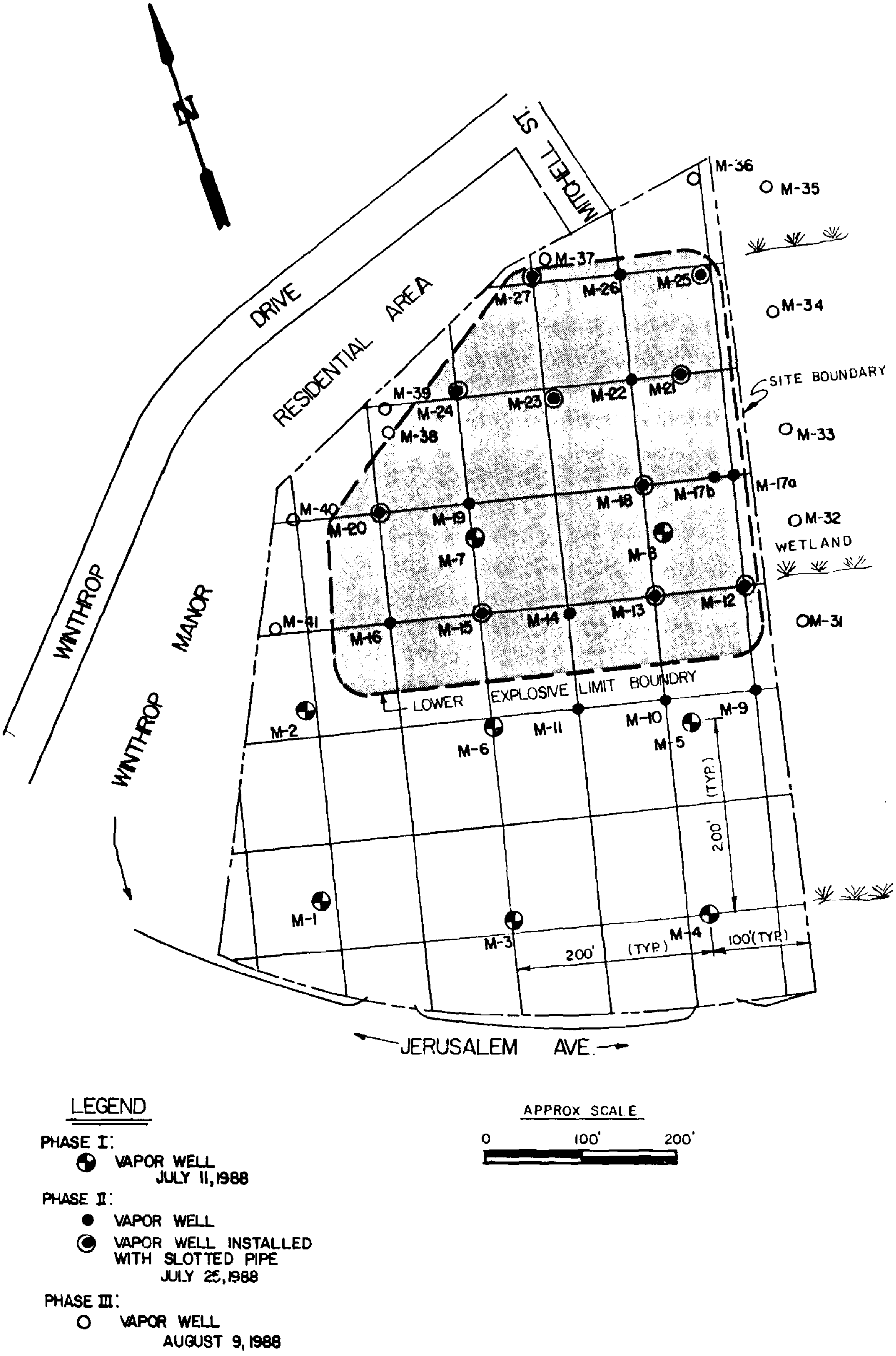


FIGURE 2.4–SUMMARY OF METHANE SAMPLING: PHASE I–III

SECTION 3 ANALYSIS OF METHANE GENERATION

3.1 A Landfill's Potential Ultimate Yield of Methane

Understanding the potential ultimate yield of methane that a landfill can produce is an integral part of designing a remediation scheme. Several methods have been developed based on the estimation of methane producing factors including; size, composition, age, nutrients, moisture content, soil temperature and soil pH.

Although estimating the age, size, and composition can be done relatively accurately, the determination of nutrient characteristics, moisture content, soil temperature, pH and how they vary with other environmental factors is difficult at best. However, it is essential that an analytical look at generation models be performed to give us guidance on not only the present and past but also the future generation values. This will help formulate alternatives that are effective in solving the problem.

The first step towards that goal is the estimation of a landfill's ultimate potential for yielding methane. That is, how much gas will ultimately be generated from one cubic yard of landfill material over the life of the landfill (60 years).

Three ultimate methane generation models are presented in Table 3.1. Examining Table 3.1 reveals that the estimated maximum yield varies from 6.2 to 270 l CH_4/kg wet composite refuge. The large range of gas production is due to the estimated properties of the previously mentioned methane producing factors.

Table 3.1 clearly shows the possible variability of what the maximum production for any landfill could be. A practical range that is supported in the literature is 31-94 liters of methane per kilogram

TABLE 3.1

Ultimate Methane Yield Models

Estimation Method		Estimated Yield Liters of Methane per Kilogram wet composite	Gas Produced %CH	%CO	Assumptions Made	Authors
Balanced Stoichiometric Equations		230-270	54	46	Chemical composition of composite refuse, $C_{99}H_{149}O_{59}N$, and of paper $C_{203}H_{334}O_{138}N$) and food wastes ($C_{16}H_{27}O_{8}N$).	J.O. Leckie
Biodegradability of Materials	A)	6.2-230 47 average[1]	-	-	Assumes 1.5 kg biodegradable COD/kg volatile solids and 351 L/kg biodegradable COD.	J.O. Leckie
	B)	47 average[1]	50	50	Wet, composite refuse is 50% decomposable organics; 50% of decomposable organics is volatile; 375 L gas/kg volatile matter; 50% of gas is CH_4.	Ronald Schwegler
	C)	120	50	50	Wet composite refuse is 70% decomposable organics; 70% decomposable organics converted to gas; 690 L gas/kg dry decomposable organics, 25% moisture content; 50% of gas is CH_4.	J.T. Pfeffer
Total Organic Content		190-270	50	50	1 mol organic carbon yields 1 mol gas; CH is 50 % of gas produced, 100% of organic carbon is converted to gas.	M.J. Blanchet F.R. Bowerman N.K. Rohatgi K.Y. Chen R.A. Lockwood

[1] Analysts using "average" characteristics for each refuse category gave a potential ultimate yield of 47 l CH_4/kg wet composite refuse.

Source:

METHANE GENERATION AND RECOVERY FROM LANDFILLS
Emcon Associates

(Emcon, 1982).

The landfill at the Uniondale site appears to contain a large amount of asphalt and concrete (demolition debris) judging from soil borings and methane samples taken. A large amount of concrete and asphalt intuitively places our site as a lower methane producing landfill when compared to a typical landfill. Therefore, we feel that choosing a value of 90 liters of methane/kg of refuse is a conservative ultimate maximum methane production value.

3.2 Methane Generation With Time

In order to achieve an idea on what can be expected in the future, three models were examined. Each model has different approaches and assumptions. All three models are considered useful as qualitative tools only because of the extreme varibility of generation rates. The assumptions and corresponding calculations from each model are given in Appendix B.

3.2.1 Palos Verdes Kinetic Model

The Palos Verdes Kinetic Model divides the composite refuse into three categories; Readily Decomposable Organics, (RDO), Moderately Decomposable Organics, (MDO) and Refactory Organics (RO). Each category has a corresponding half life, which is given within the contents of the model. By estimating the amount of refuse in each category, a graph of gas production versus time can be plotted (Figure 3.1). Figure 3.1 shows the majority of methane has already been produced and left the fill by 1988. Figure 3.2 increases the sensitivity of the same graph to show that high methane still can still be expected from this fill for at least 12 more years.

FIGURE 3.1 PALOS VERDES KINETIC MODEL

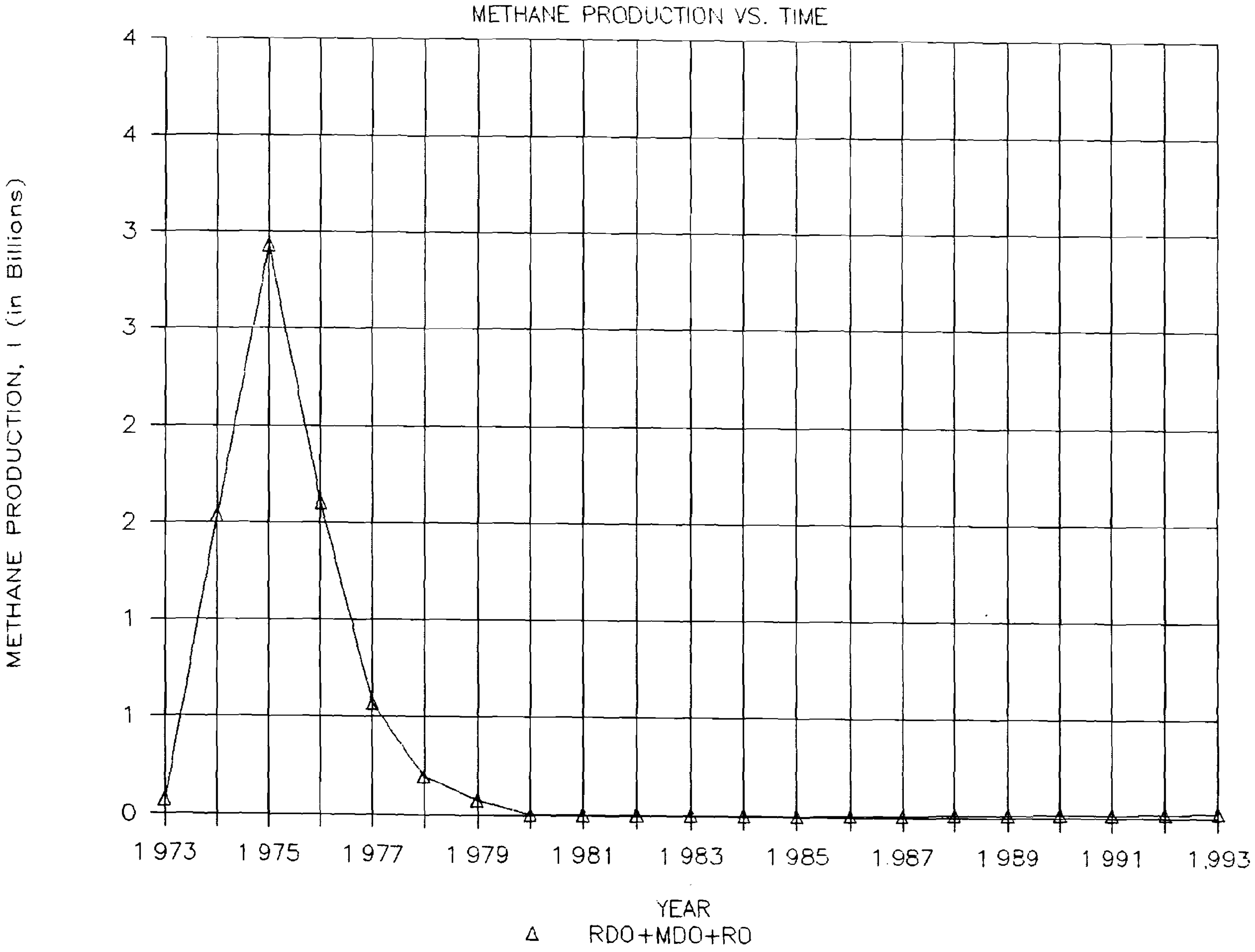
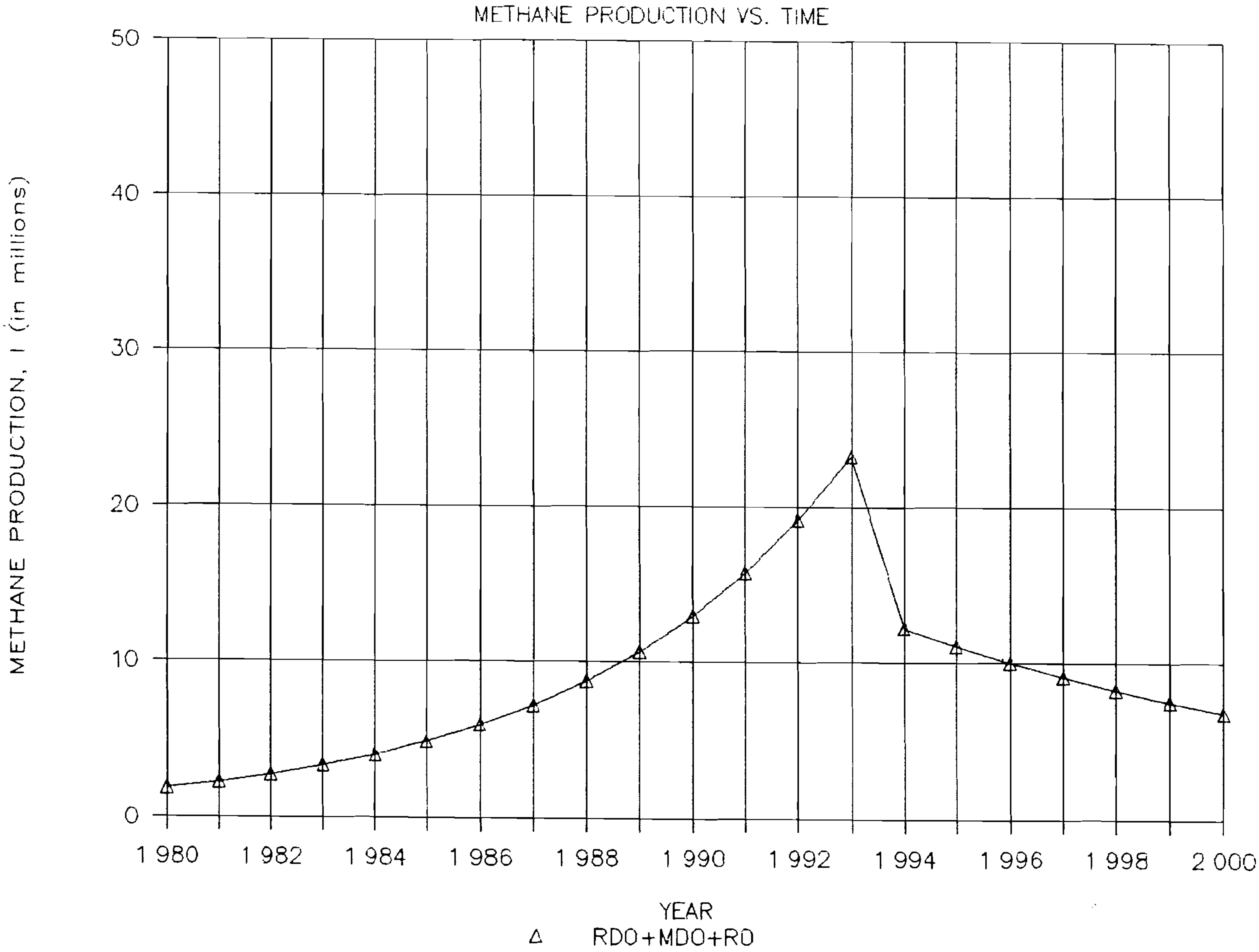


FIGURE 3.2 PALOS VERDES KINETIC MODEL



There are a few limitations to the Palos Verdes Kinetic Model worth noting. First, the model assumes that the point of inflection occurs when time equals the category's half life. Typically a landfill reaches its maximum generation rate prior to the half life. This is because nutrients are in an optimum condition initially, and then decrease with time. High degregation rates early followed by low rates with time tend to stretch out the curves.

The second criticism of this model relates to the value associated with each half life. The model shows that 95 percent of the ultimate methane gas yield will be obtained by the 17th year. According to the authors, Escom, the economical gas production life of a typical landfill is probably significantly greater than six years mentioned in the Palos Verdes report.

3.2.2 Sheldon Arleta Kinetic Model

In the Sheldon Arleta Kinetic Model the following is given: (1) the ultimate maximum methane production rate , (2) the percentage of refuse in two categories and (3) their respective half life. The only information needed to execute the model is the volume and density of the refuse.

There are two main differences between this model and the Palos Verdes Kinetic Model; (1) the refuse is divided into two categories readily decomposable, (RD) and more slowly decomposable, (MSD), and (2) the corresponding half lifes are appropriately different.

Applying this model to the Uniondale site produces the graph shown on Figure 3.3. According to this model, the maximum gas production rate was obtained in 1982 and a future peak of 250 million liters of methane will occur in 2009. The two distinct peaks are due

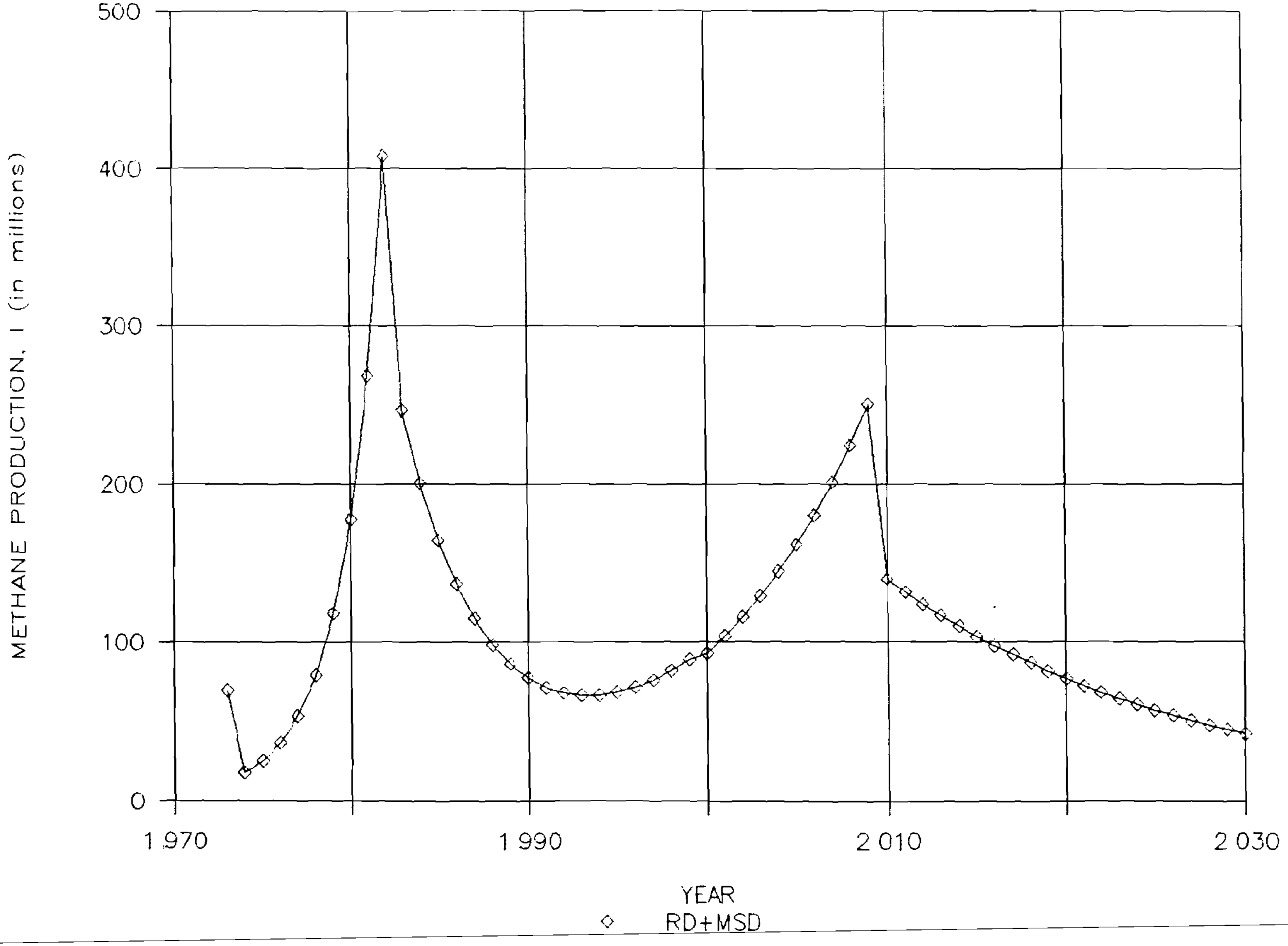


FIGURE 3.3 SHELDON ARLETA KINETIC MODEL

METHANE PRODUCTION VS. TIME

to the assumed half time for each refuse category. Comparing the Palos Verdes and the Shelden Arleta Model shows that the assumed half life of the waste is a very sensitive parameter. In reality, the half life of fill is a combination of many different kinds of waste with many different half lifes. This would support a more uniform curve.

3.2.3 Scholl Canyon Kinetic Model

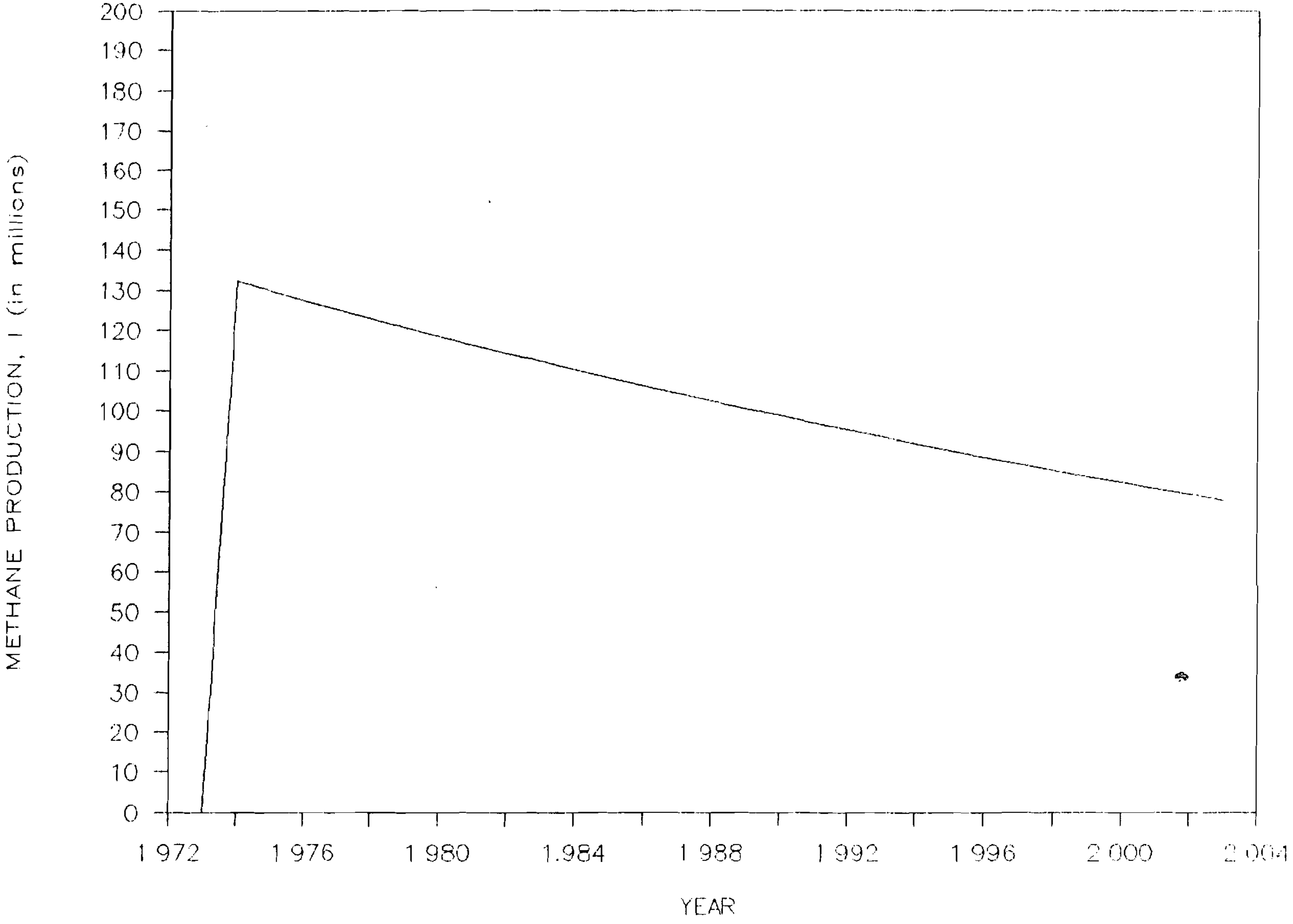
The Scholl Canyon Kinetic Model is considerably different in theory than the first two models presented. This model assumes that initially the methane producing factors are in optimum condition so that the microbial mass is built up and stabilized resulting in peak methane production at the outset. The time frame for this stage is considered a lag time and is negligable. After maximum production has been obtained, the gas production rate (and microorganisms) are assumed to decrease as the methane producing factors diminish.

Applying this model to the Uniondale site produces Figure 3.4. As can be seen, the 1988 production rate is 100 million liters of methane. Future production decrease in time but not very rapidly.

This model appears to be the most reliable in theory. However, it should be noted that the model is assuming normal conditions. In other words, the microorganisms are very sensitive species and if any of the methane producing factors were to become life threatening, they would die rapidly. When the factors are replenished, the model would start again. This is a practical concern since environmental factors can fluctuate often. If we were to graph this fluctuation, it would show considerable fluctuations around the smooth curve we have drawn.

FIGURE 3.4 SCHOLL CANYON KINETIC MODEL

METHANE PRODUCTION VS. TIME



3.3 Summary

The first section of this report described the extent of the methane problem at the Uniondale site. There is no doubt that the levels of methane found create a potential hazard for any future occupancy at the site. However, what do these levels mean? This section of the report tries to determine how significant the problem is now and what its outlook for the future would be so that the appropriate remediation scheme could be conceptually designed.

Fanning, Phillips and Molnar believe that the ultimate yield of 90 l CH_4/kg is conservative because it is the upper end of what others have responded as practical. Using this number we have looked at three models. The most appropriate for this fill is the Scholl Canyon Kinetic Model. The production rate in 1988 was 100 million liters. To be conservative, we have chosed a design production rate of 400 million liters (factor of safety = 4).

SECTION 4 ALTERNATIVES AND THEIR COMPARISON

Section 4 will review the possible remedial alternatives to the proposed shopping center site and review their advantages and disadvantages. In order to develop design alternatives, the following pages will include: (1) the presentation of the generic types of venting designs, (2) the possible additional concepts available to develop design alternatives, and (3) the development of alternatives pertaining to this site. Section 5 will then perform a detailed comparison of the alternatives. This will lead to screening the best alternative available to remediate and allow the proposed project to be safely developed and occupied.

4.1 Generic Types of Venting

In general, there are two types of gas extraction vents: trench design and vertical wells. Although there are several variations of the trench and vertical well design, the three most common design types, in their simplest form, will be discussed. This includes two trench and one vertical design. The objective of each method of gas extraction is to control vertical and/or lateral gas migration.

The first type of trench design consists of a gravel trench extending from the surface down to the groundwater table or to an unfractured, impervious stratum. The gravel trench provides a path of least resistance (gravel) allowing gas molecules to escape upward to the atmosphere or to a collection pipe manifold. This design, in the simplest form, is an effective means of controlling lateral gas migration. If the design is upgraded by introducing a negative pressure system, such as a wind induced fan or blower, vertical gas migration can also be controlled.

The second type of trench design consists of a gravel-filled trench to a depth of only a few feet. This design includes a perforated PVC pipe which collects gas under negative pressure. This usually requires impermeable surfaces so that only methane and not atmospheric gases are recovered. However, only vertical gas migration is controlled with a shallow trench design.

The vertical well design consists of slotted PVC pipe wells installed in a gravel pack. These wells can vary in depth and extend close to the groundwater table or below the landfill limits. Typically, gases are drawn to a manifold pipe which in turn routes the gas to the appropriate endpoint (i.e. atmosphere). This design controls vertical and lateral gas migration.

Selecting the best generic gas extraction approach must consider two important parameters:

- o The greatest concern is gas buildup and concentration directly under the parking lot and proposed structures. Therefore, the greatest areas of concern are in the top feet, not at 20 feet below the surface.
- o Lateral gas migration doesn't appear to be a problem if the top few feet are allowed to vent without buildup. This is based on the field sampling program previously discussed.

Therefore, it appears that controlling vertical gas migration close to the surface is the most important concern with our site. As previously explained, both the shallow trench and vertical well design will sufficiently remediate this problem. Therefore, the design alternatives will stem from these two generic venting techniques.

4.2 Additional Concepts

When developing remediation alternatives, several other concepts can be utilized. This chapter will review a number of concepts that are felt to be useful in a design alternative for the Uniondale site.

Impermeable Barrier

Sloped Liner	A gas resistant liner is placed on a sloping angle of gravel to allow gas to migrate naturally to a collection area. A single gas extraction trench under negative pressure can then collect the gases. The installation of a liner will generally be economical if the required depth is ten feet or less.
Sloped Slabs	A sloped foundation technique has the same theoretical approach as the sloped liner method. This technique slopes the slab of the structure in lieu of the gas resistant liner. The slab slopes to the foundation where all of the gases are collected by a perferated pipe with negative pressure laid in a porous medium. The porous media also rests underneath the sloped slab to allow the gases to naturally flow to the collection area.
Bentonite Liner	A small trench is excavated to a predetermined depth to contain lateral gas migration from moving off-site. The liner may be a vertical wall or sloped but usually is keyed into the soil. To reduce gas buildup a venting system may be incorporated in the containment area (USEPA, 1985) .
Gas Impermeable Liner	gas impermeable liner can be placed between the porous media and the building slabs to line the building slabs. This reduces the possibility of gas migration through unavoidable cracks in the slab. In addition, it will significantly reduce a possibility of "leaking" other gases into the negative pressure system.

Induced Movement of Gas Through Vacuums

Atmospheric Pressure	Methane can be vented to the atmosphere when the absolute pressure adjacent to the gas vent is higher than the barometric pressure. The maximum pressure differential is expected only to be a fraction of an inch.
Wind Induced Vacuum	Methane will be drawn from the ground by a vacuum created in the manifold pipe. The vacuum is generated in the pipe from a wind driven fan at the top of the pipe spinning proportionally with wind conditons.
Forced Ventillation	Forced ventillation is a more effective means of controlling the migration and buildup of methane gases. A vacuum flow rate is created by a blower pulling methane methane from the subsurface. Several inches of vacuum can be created under this condition.

Sensors

MSA Sensor	A methane gas monitoring sensor package. Package consists of sample point locations which are continually monitored and analyzed. The analyzer has an alarm system which is preset at any level and will activate if the alarm levels are attained. This can be designed to activate a pump system or a visual and audible warning device to all occupants of the buildings.

Indroduction of Atmospheric Air Through Inlet Pipes

Inlet Pipes	Atmospheric air can be introduced in the subsurface to serve as a "buffer" by diluting high gas concentrations prior to their removal from the subsurface. Butterfly valves placed on the pipes allow the amount of air introduced into the subsurface to be adjusted. This allows the optimum "mix" of atmospheric air to be introduced in the system.

4.3 Alternatives

In this chapter the information presented in the past sections and chapters will be integrated with engineering judgments to develop four remedial alternatives. With the presentation of each alternative, there will be a brief description and discussion of the techniques, advantages and disadvantages, and approximate cost.

To simplify the discussion, the proposed site has been divided into two areas; a non critical area, approximately 1.5 acres (parking field) and a critical area, approximately 3.5 acres as seen in Figure 4.1.

The parking fields are considered non critical for the following reasons: (1) the layout of the proposed development places the parking field over lower concentration areas, (2) natural cracking of the asphalt give a means of venting of the methane to the atmosphere, (3) since there are no confined spaces (with the exception of drywells) on the parking field, the possibility of gas build up to the point of a potential explosion is remote and (4) their is little exposure to the people.

The critical areas are critical because they are enclosed structures occupying people. The possability of gas build up in a confined area and ignited (i.e. by a cigarette or match) is much greater.

4.3.1 Alternative 1 "Sloped Slab"

The first alternative incorporates the generic trench design concept. This alternative places perforated collection pipes under the concrete slabs in the critical area and under the pavement in the noncritical area. Figure 4.2 shows the plan view of the piping network and Figure 4.3 illustrates a section view for this alternative.

When collection trenches are located under the slab of a building, a major concern is that gases will accumulate and

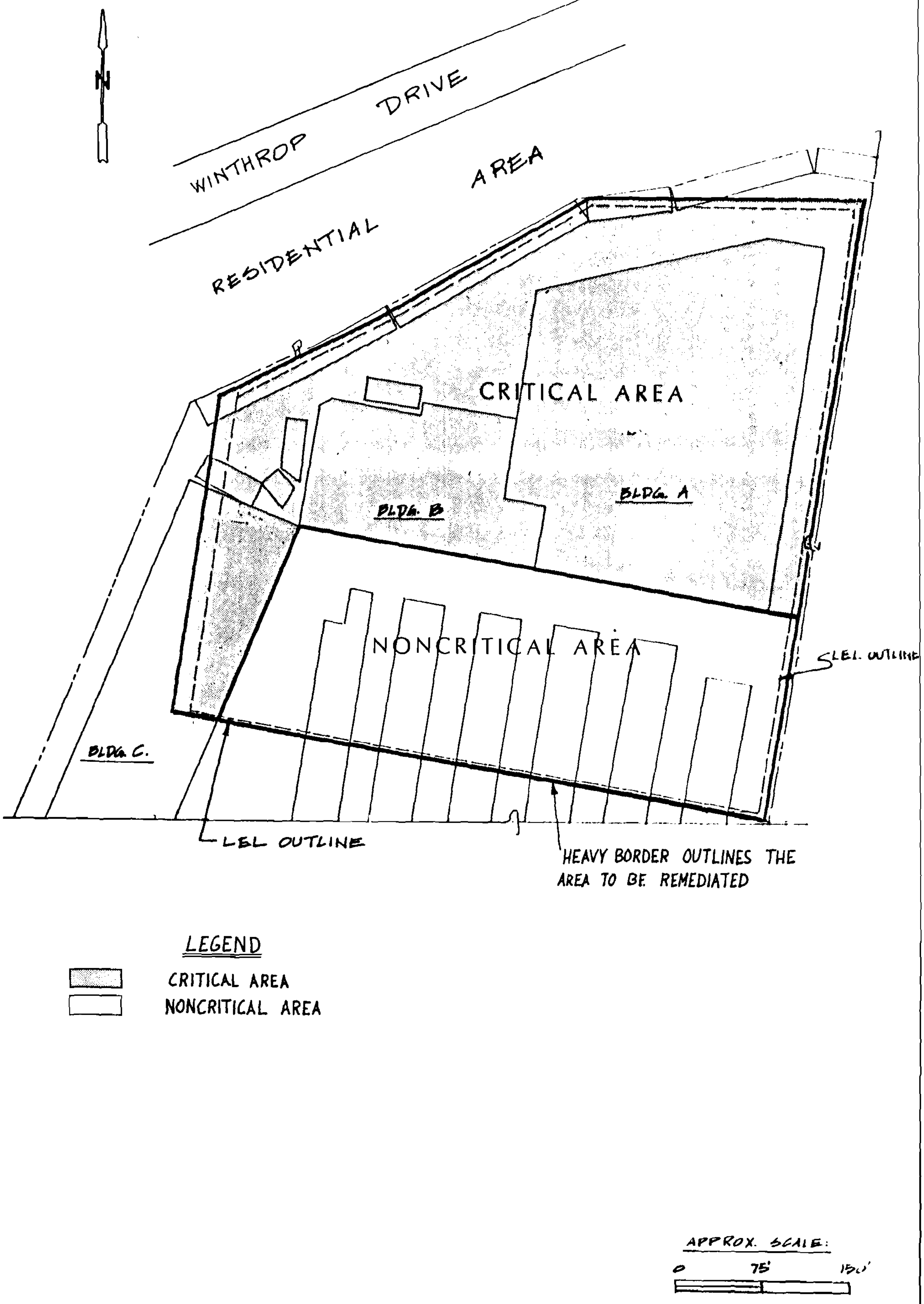
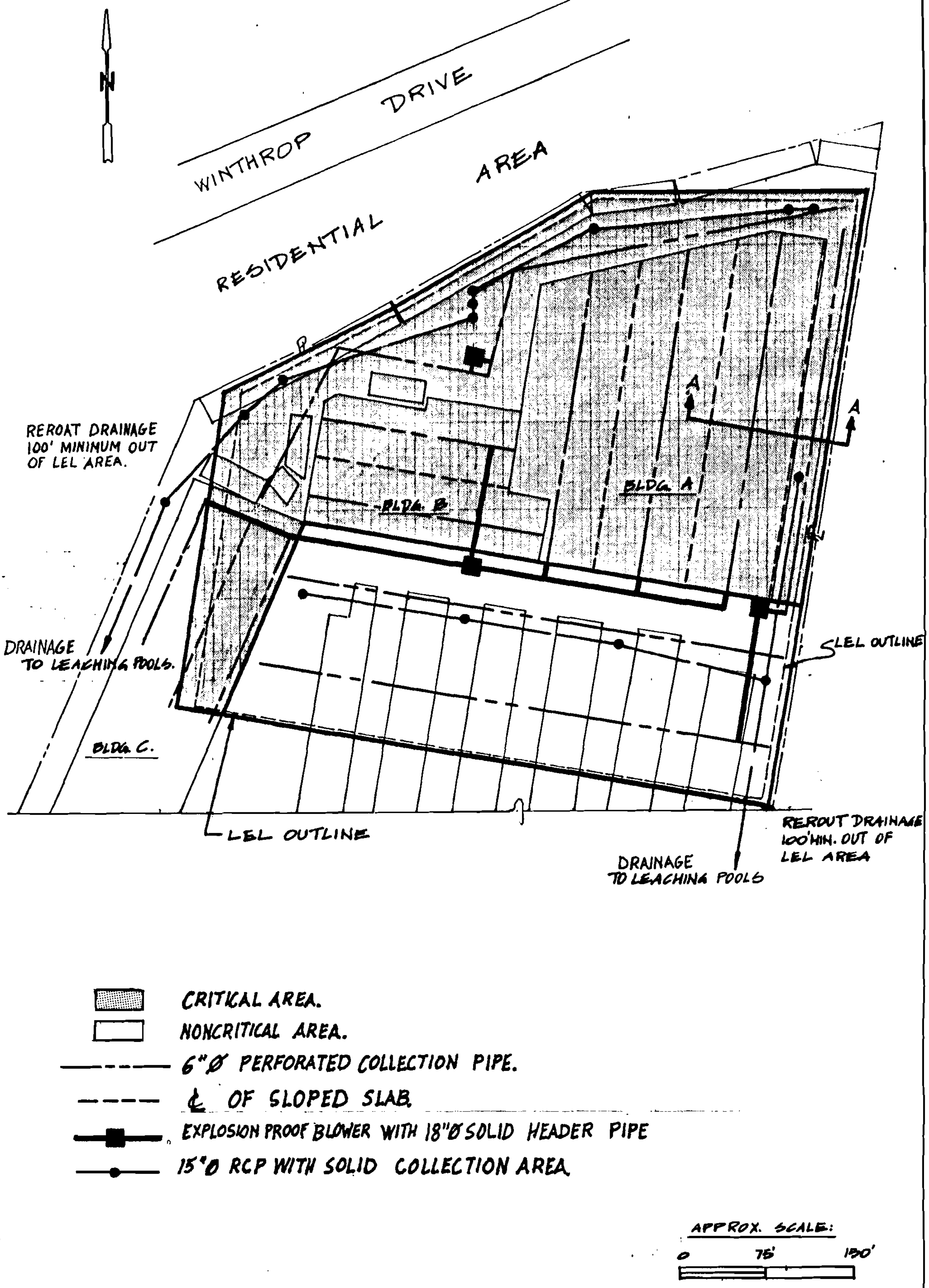


FIGURE 4.1-OUTLINE OF CRITICAL AND NONCRITICAL AREAS



F,P&M FIGURE 4.2 SLOPED SLAB ALTERNATIVE–PLAN VIEW

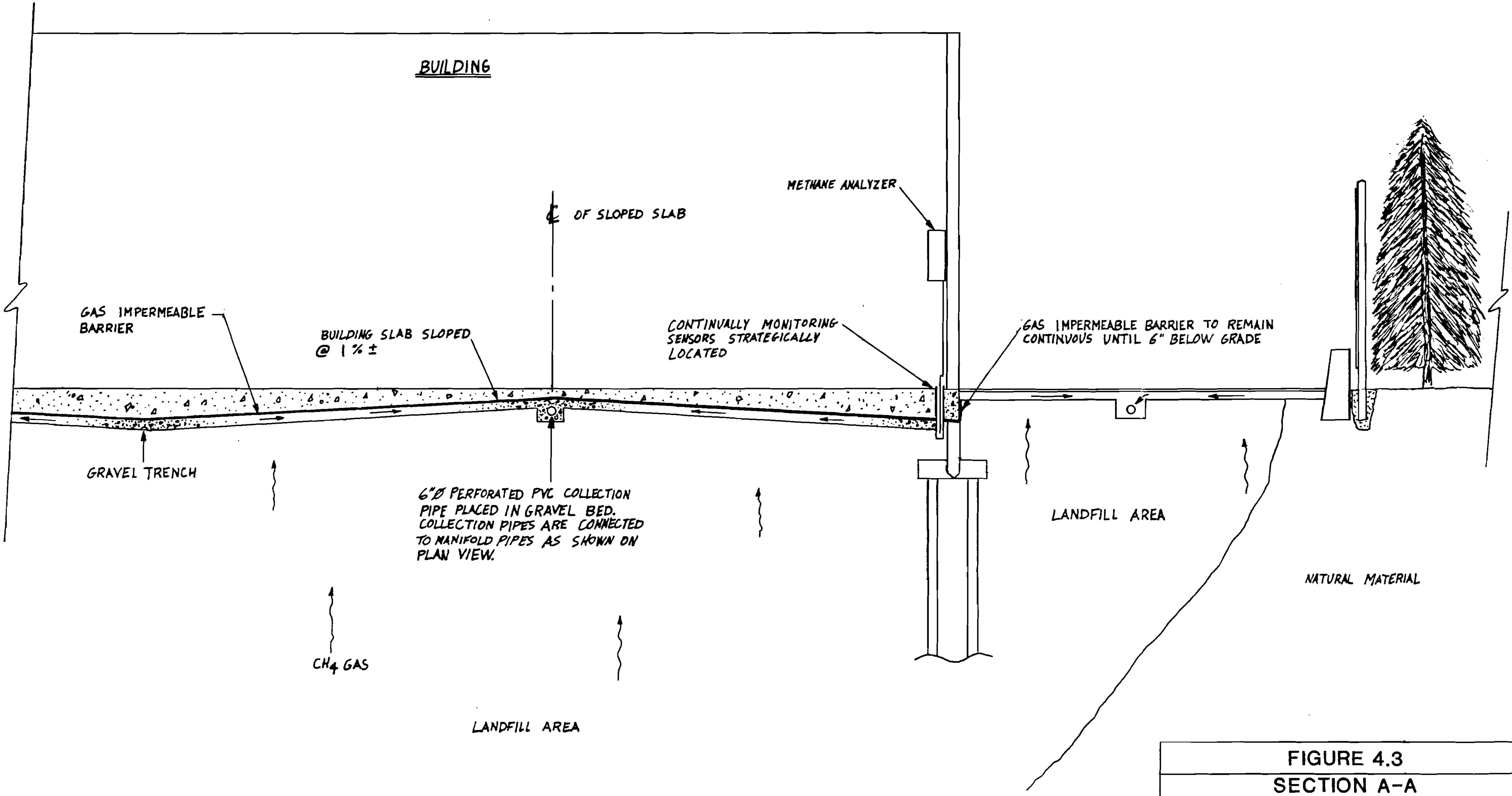


FIGURE 4.3

SECTION A–A
SLOPED SLAB ALTERNATIVE

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eventually migrate through unavoidable cracks in the slab. This may cause an enclosed area to become highly concentrated with methane gas. As mentioned earlier, this is extremely critical because methane has a lower explosive limit (LEL) of only 5 percent methane in gas. In order to remediate this potentially hazardous situation, several tools will be implemented in this design including: a blower, continually monitoring sensor system, sloped building slabs, Gas Impermeable Barrier, and a special drainage design. The following pages will review these tools and how they can be most effectively implemented in this alternative.

The first tool is an explosion proof activated blower ventilation system creating a vacuum in the collection pipes. As gas molecules are being extracted from the subsurface, other gas molecules must take the place of the extracted molecule. Therefore, determining the feasability of exhausting the entire landfill of the methane gas is important.

Equation 4.1 determines the timeframe to exhaust the landfill.

$$Q \times t = n \times V \qquad \text{(Equation 4.1)}$$

which when rearranged becomes,

$$t = \frac{n \times V}{Q} \qquad \text{(Equation 4.2)}$$

Where t = time required to remove the gas
n = porosity of the landfill
V = volume of the landfill
Q = extraction flowrate of the blowers

In order to determine an extraction flowrate, several factors are considered. The methane generation rate was determined to be 400 million liters per year (Section 3). This relates to a methane generation rate of 27 cfm. This is a very small rate. In considering the engineering aspects of the remediation system, we should have: (1) sufficiently sized collection pipes (6-8 inches in diameter); (2) enough vacuum introduced into the subsurface to discourage "null velocity points"; (3) enough extraction flowrate to quickly relieve a void area below slabs; and (4) an extraction flowrate capable of handling a displacement ratio of 100, if desired. Therefore, for conceptual design purposes, the total extraction rate is 2700 cfm.

If we assume that the porosity is 30 percent, the extraction flowrate of the blowers is 2,700 cfm, and the volume of the landfill is 7.623 E06 cubic feet(1) (Appendix B), equation 4.2 can be solved.

$$t = \frac{0.3 \times 7.63 \text{ E06 cu. ft.}}{2{,}700 \text{ cfm}} = 847 \text{ minutes}$$

$$t = 14.1 \text{ hours}$$

Therefore, under our assumptions, it will take approximately fourteen hours to exhaust the landfill.

The question that rises is: Once the landfill has been exhausted of the methane gas, how much time will pass before the system must be reactivated, starting the exhausting proceedure again?

As explained in Section 3, there are a number of unknown parameters in a landfill to accurately determine the production

(1) Air intrusion from the perifery is expected. The additional gas is accounted for by assuming an average depth of 35 feet when realistically gas will only be collected from the region above the groundwater (20-30 feet below the site).

rate. In addition, the relationship of methane production vs. time isn't accurately known (as demonstrated in Section 3). On the other hand, it can be assumed that our site will produce less methane as time passes, primarily because of the current age of the landfill (15 years old).

In light of these facts, it is difficult to determine the idle time of the exhaust system. However, assuming that the worst case scenerio of continuous operation (no idle time) at the outset, the monthly operation costs can be calculated. Assuming that the system requires three, 1/4 horsepower blowers, the required kilowatts hours (KW-hr) per year would be,

KW-hr/yr = 3 pump x 0.25 HP/pump x 1KW/1HP x 24 hr/day x 365 days/yr
= 6,570 KW-hr/yr

Further assuming that 1KW-HR costs 17 cents, the annual operation costs can be calculated.

Operation Costs = 6,570 KW-hr/yr x $0.17/KW-hr
Operation Costs = $1,120/yr

Thus, the worst case scenerio has operation costs of approximately $100 per month. Indeed, the activated ventilation system proves to be more cost effective when compared with wind induced turbines. However, although the operation costs are low, continuous operation will tend to raise maintenance costs.

The second tool utilized in this design is a continually monitoring sensor system. Sensors stratigically located under, around, and in the buildings, will continuously monitor gas by running samples through a methane analyzer (Public Works, 1988).

The system can be set up in a number of ways. An example of one set-up sceme would be as follows: (1) if the analyzer reaches a predetermined level, such as 60 percent LEL, the blowers activate creating a vacuum in the trench system, (2) the blowers continue to extract the gas from the subsurface until the theoretical time to exhaust the landfill (14 hours) has elapsed and the methane concentration is below 20 percent LEL in all sensors, (3) if the concentration is ever as high as 100 percent LEL, a visual and audible alarm activates notifying the building occupants and the fire marshall.

The third tool utilized, eliminates gas migration through unavoidable cracks in the slabs. A gas impermeable liner will be placed in the buildings concrete slab. As previously shown in Figure 4.3, the liner remains continuous from under the building to outside the foundation walls, creating an impermeable surface.

The fourth tool implemented in this design is the concept of sloping the bottom of the building slabs. The building slab will be pitched at an ascending 1 percent slope towards the collection trenches, from a point equidistant from the trenches. This tool serves two significant purposes: (1) increases the gases ability to migrate toward the collection trenches because methane naturally travels towards the atmosphere and (2) once a gas molecule enters the porous material, the low point of the slab serves as a barrier separating the two trenches; the gas molecule will be more likely to be influenced by only one collection trench (this reduces any null velocity points). The sloped slabs make this design unique and thus, it's named the "Sloped Slab

Alternative."

As explained earlier, the landfill has and will continue to decompose. As this process continues, settlement will occur. Although the amount of settlement is unknown, it is assumed that the site has settled in the past and that the potential for future settlement is a concern. Intuitively, it is expected that as the ground around the buildings settle, so will the collection pipes and gravel beds (the buildings will remain their original elevation since they are constructed on piles). If the collection pipes settle, problems may arise. For instance, the collection pipes may become sheared, causing a failure in the system or cause the system to operate less effectively.

To alleviate this problem, the collection trenches should be anchored into the building slab. After settlement occurs, the collection trenches will be supported in an open void below the slab. This in fact will allow the system to operate more efficiently since the once porous media (gravel) now has no resistance (air). After settlement, the purpose of the sloped slab becomes less useful.

The final remediation tool addresses the potential methane build up in the proposed drainage system. A concern for high methane gas concentration in the drywells located in the paved areas around the buildings still exist. This is a particular concern for two reasons: (1) gases may accumulate in pockets which reach concentrations above the LEL. The methane may be ignited by a cigarette tossed in the drywell and (2) a maintenance man may enter the drywell unsuspecting the presence of methane and become unconcious due to the methane

TABLE 4.1

Alternative 1 "Sloped Slab" Benefits/Concerns

Area	Tools	Benefits	Concerns
Critical	1. Shallow Trench design	- Effective means of eliminating vertical gas migration. - Collection pipes are easily anchored in the building slab. Therefore, the settlement of the landfill won't greatly affect this design.	- High concentrations of methane gas are collected directly below the building slab.
	2. Explosion Proof Activated Ventilation System	- System can be activated at any time or ran continuously. - Best method available for exhausting gases. - Operation costs are minimal. - 14 hours to exhaust all landfill gases.	- Maintenance may be required periodically. - Cracks in the building slab will cause the air in the buildings to be pulled into the subsurface This may cause a leakage in the design.
	3. Sensor System	- Effective means of monitoring methane concentrations in critical zones (i.e. directly below building, inside building). - Can activate the ventilation system.	- Maintenance may be required periodically.
	4. Sloped Slab	- Helps gases travel in their natural direction. - Low point (center of slab) acts as a barrier to the collection trenches.	- Although the center of the slab will help, some negative pressure influence in the opposite direction may occur, restricting the molecules' movement.
	5. Gas Impermeable Barrier	- Safely protects the slab from gas migration through unavoidable cracks. - Helps reduce any leakage from cracks in the slab.	- Perfect seals must be achieved.
	6. Rout Drainage 100' out of LEL area	- Best means of eliminating fatalities or explosions.	- None
Noncritical	1. Shallow Trench design	- Effective means of eliminating vertical gas migration.	- None
	2. Explosion Proof Activated Ventilation System	SAME AS ABOVE	- Maintenance may be required periodically - Cracks in the asphalt may cause leakage.
	3. Sensor System	- Continually monitors gas concentrations in parking area. - Can activate ventilation system when high levels occur.	- Maintenance may be required periodically.
	4. Rout Drainage 100' out of LEL area	SAME AS ABOVE	- None

abundant/oxygen deficient environment.

In light of these vital concerns, our recommendation is that the drainage be collected in solid basins and routed with 15 inch RCP pipe 100 feet out of the LEL area (Figure 4.4). This drainage plan was also shown in Figure 4.3; the plan view of the Sloped Slab Alternative.

Noncritical Area

The noncritical area has the same design concepts as in the critical area, including: same trench design, activated ventilation system, sensors and drainage plan, as previously shown in Figure 4.3. However, impermeable gas barrier and sloped slab will not be utilized. This is primarily because the areas are considered less critical. In addition, anchoring the collection pipes becomes useless since the parking areas will settle with the subsurface.

The natural cracks in the asphalt will allow the methane to escape the subsurface and will actually benefit the area when the ventilation system is off.

Summary

Table 4.1 summarizes the tools and their associated benefits and unavoidable concerns. As can be seen, the greatest concerns with this design are (1) the system collects all gases near the slabs, and (2) the collection trenches will still tend to oppose one another, possibly causing null velocity points; although a gas molecule will have a resultant force to one trench, the opposing trench will have an affect on the molecule in the

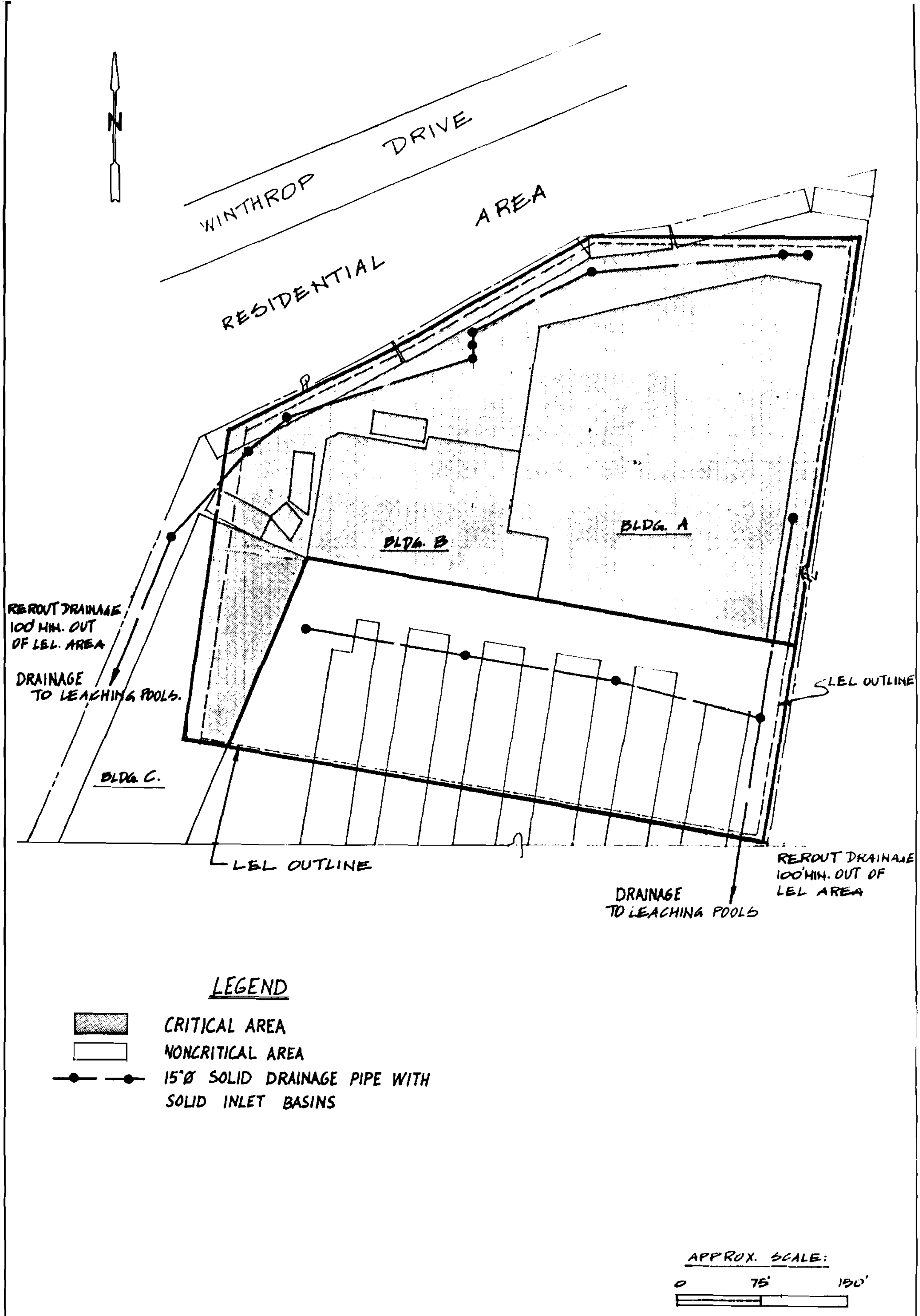

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FIGURE 4.4 DRAINAGE PLAN FOR THE CRITICAL AND NONCRITICAL AREAS opposite direction, and (3) the "leaking" possibility in the parking areas exists.

Table 4.2 summarizes the costs associated with this design. The estimated total cost is approximately $350,000.

4.3.2 Alternative 2 "Air Buffer"

The second alternative is similar in many respects to the Sloped Slab Alternative. Some of the same tools are utilized in the same manner, such as: an activated explosion proof blower system, the sensor system, gas impermeable barrier, the anchoring of the collection pipes and the drainage plan. In general, the significant changes are the pipe layout and the inclusion of ambient air into the space between the ground and the slab adjusted with butterfly valves. For this reason we have called this alternative "air buffer". Figure 4.5 shows the plan view and Figure 4.6 is a section view of this alternative.

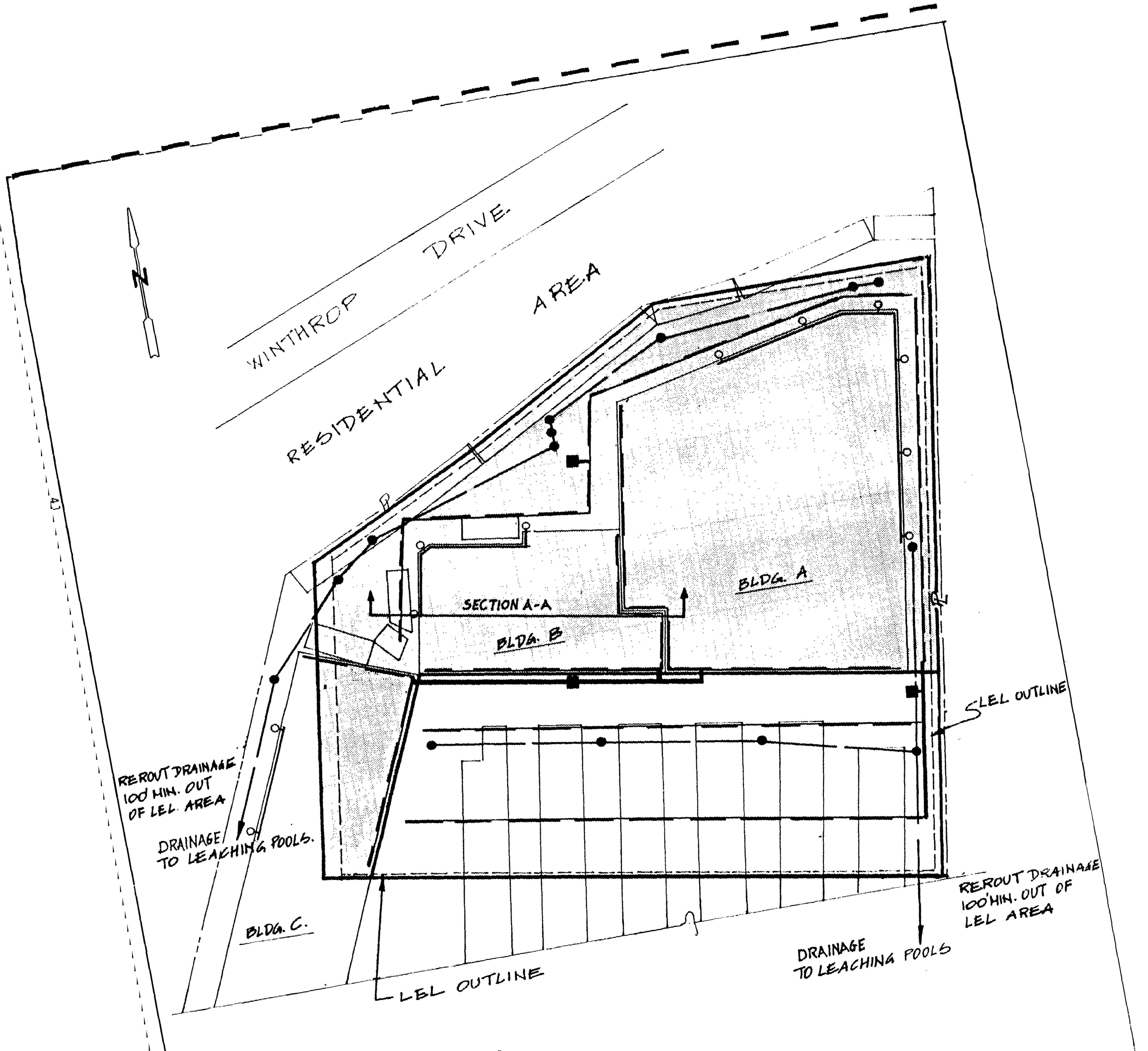
The discussion in this section will concentrate on the changed piping layout, the additional tools and their associated benefits and concerns. For an explanation of the other aforementioned tools implemented in this design, see the discussion in Alternative 1.

Alternative 2 differs from the Sloped Slab Aleternative by using a different pipelayout and atmospheric inlet vents. The implementation of these two tools have a preponderance affect on the difference of each alternative's respective theory.

As previously mentioned, a concern with the Sloped Slab Alternative is that the vacuum established in the collection trenches will tend to conflict each other rather than support one another. As can be seen in Figure 4.6, the pipe networks

Table 4.2
Alternative 1 - "Sloped Slab" Cost Estimate

	Item	Unit	Quantity	Unit Cost	Total Cost
1.	Crushed Bank Gravel	cu. yd.	4,333	$ 15	$ 65,000
2.	6"0 Perforated PVC Collection Pipe	L.F.	3,416	12	41,000
3.	6"0 Perforated PVC Inlet Pipe	L.F.	800	30	24,000
4.	Explosion Proof Blower System (1/4 HP)	Ea.	3	2,000	6,000
5.	Solid Inlet Catch Basin	Ea.	10	1,000	10,000
6.	15" 0 RCP	L.F.	1,600	35	56,000
7.	Sensor Package	Ea.	1	35,000	35,000
8.	Gas Impermeable Barrier	sq. ft.	100,000	0.75	75,000
9.	Additional Concrete	cu. yd.	800	50	40,000
	Total (w/o Engineering and Contingencies)				$352,000



LEGEND

▨ CRITICAL AREA
☐ NONCRITICAL AREA
ATMOSPHERIC VENT WITH 6"Ø PERFORATED INLET PIPE
6"Ø PERFORATED COLLECTION PIPE
18"Ø SOLID MANIFOLD PIPE WITH EXPLOSION PROOF BLOWER
15"Ø SOLID DRAINAGE PIPE WITH SOLID INLET BASINS

APPROX. SCALE:

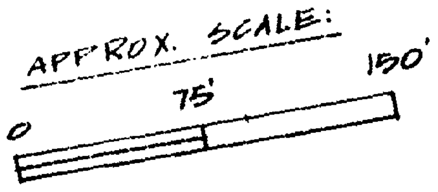


FIGURE 4.5
THE BUFFER ALTERNATIVE

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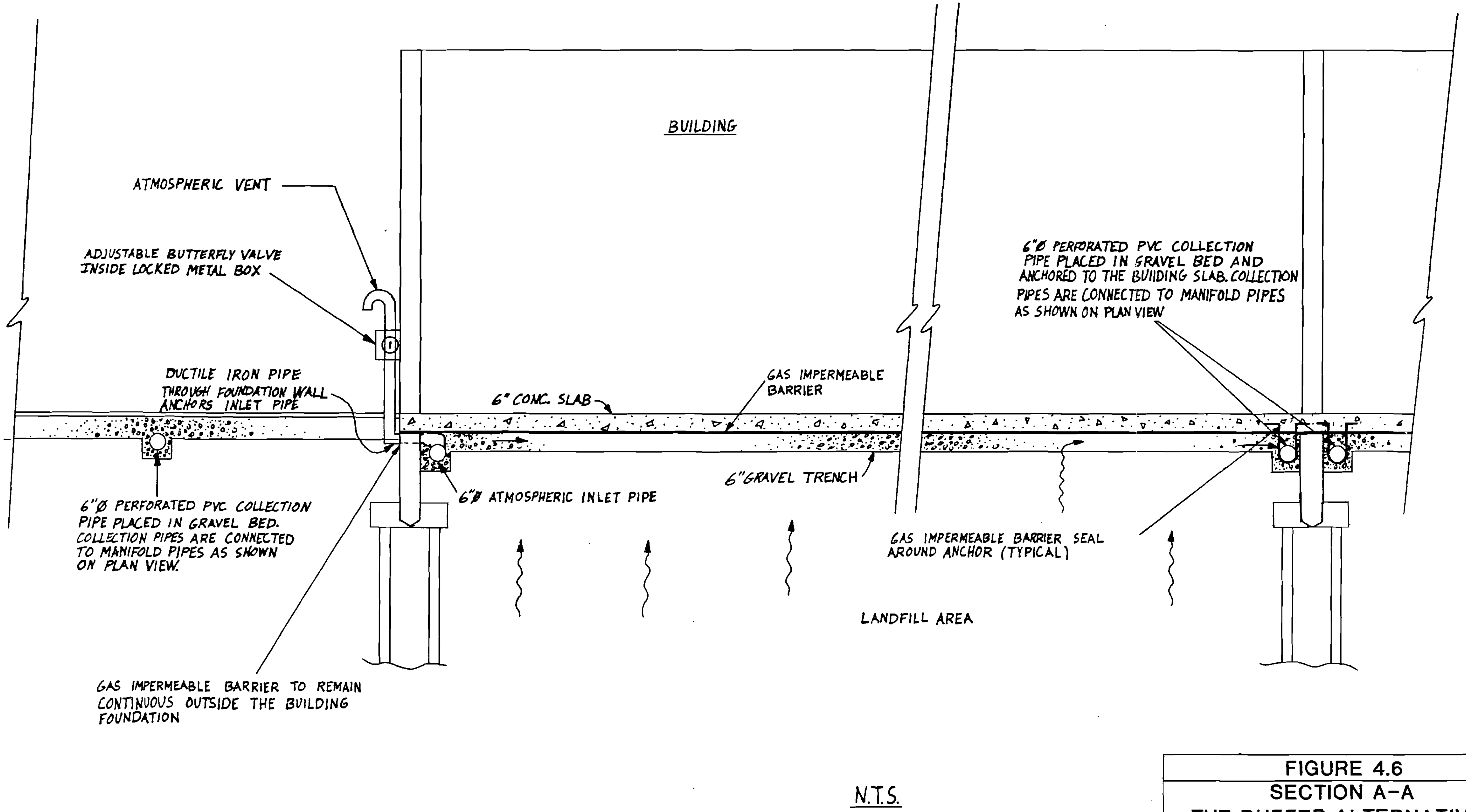

FIGURE 4.6
SECTION A-A
THE BUFFER ALTERNATIVE

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designed not to conflict one another. Separated by a foundation wall, the collection trenches pull the gases from under the building slabs towards the trenches. This allows the gases to be drawn to a centralized area. Therefore, the negative pressure pulling the gas molecules below the building slab act in one direction; to the collection trenches. The collection trenches are anchored to the building slabs relieving the possibility of any problems asociated with settlement.

The second tool in this design are the atmospheric vents. As shown in Figure 4.6, atmospheric vents are routed through the foundation wall to a perforated pipe under the building slab, directly opposite from the collection trenches. These vents inject atmospheric air into the porous region. This immediately drops the concentration of methane. Thus, posing less of a danger to the occumpant inside. A concern of the atmospheric vents is that the air will flush into the porous media and will be the only gas molecules extracted by the blowers. This will inaffect "short circuit" the system. It solves the immediate problem of too high of a concentration of methane at the slab but ignores the long-term problem of methane generation below the gravel layer.

This problem can be balanced by implementing butterfly valves on the atmospheric vents. The butterfly valve will be adjusted to allow air into the critical zone while not substantially affecting the negative pressure in the subsurface. Shallow probes can be installed in the subsurface for monitoring gas pressure and vacuum (Sherman, 1987). Therefore, the probes will show how the adjustments on the butterfly valves affect the gas pressure and vacuum in the subsurface. The butterfly valves can be protected from tampering by a locked metal box.

One will note that the collection trenches outside of the "building footprints" do not have atmospheric vents. This is because the area is naturally vented from the surrounding properties. The gas flow from offsite to the collection trenches is useful because it discourages any gas migration that might occur to the wetlands and residential area.

It should be noted that the explosion proof activated ventilation system in this alternative will require much more than 14 hours to exhaust the landfill. This is simply explained by the additional gas (atmospheric air) which is introduced to the subsurface. The time frame to exhaust the landfill in this alternative changes with the flow through the atmopsheric vents (displacement ratio).

Noncritical Area

The noncritical area has the same design concepts as the critical area with a few exceptions. The Gas Impermeable Liner is not needed in the noncritical area. The natural cracking of the asphalt may cause leakage in the system but this is desirable. Other than the Gas Impermeable Liner and atmospheric vents, the noncriticl area mirrors the critical area.

Summary

Table 4.3 summarizes the tools and their associated benefits and unavoidable concerns. The biggest concern with this design is that the system can be short circuited by the introduction of

TABLE 4.3

Alternative 2 "Air Buffer" Benefits/Concerns

Area	Tools	Benefits	Concerns
Critical	1. Shallow Trench Design	- Effective means of eliminating vertical gas migration - Collection pipes are easily anchored into the building slab. Therefore, the settlement of the landfill won't greatly affect this design.	- High concentrations of methane gas are collected directly below the building slab.
	2. Explosion Proof Activated Ventilation System	- System can be activated at any time or run continuously. - Best method available for exhausting gases. - Operation costs are minimal. - Time to exhaust all landfill gases is greater than 14 hours. Exact time varies proportionally with the amount of air entering the atmospheric vents.	- Maintenance may be required periodically. - Cracks in the building slab will cause the air in the buildings to be pulled into the subsurface This may cause a leaking in the design.
	3. Sensor System	- Effective means of monitoring methane concentrations in critical zones (i.e. directly below building, inside building). - Can activate the ventilation system.	- Maintenance may be required periodically.
	4. Atmospheric Vents	- Lowers the methane concentration below the slab resulting in a safer environment for the building occupants. - Can be adjusted to allow atmospheric air to enter the system at the desired extraction condition. - Vents can be adjusted (turned down) with time.	- Potential for leakage exists. - Extraction time for the entire landfill is >14 hours (will vary with flowrate through the vents). - Maintenance may be required. - Increases maintenance costs.
	5. Gas Impermeable Barrier	- Safely protects the slab from gas migration through unavoidable cracks. - Helps reduce any leakage from cracks in the slab.	- Perfect seals must be achieved.
	6. Route Drainage 100' out of LEL area	- Best means of eliminating fatalities or explosions.	- None
Noncritical	1. Shallow Trench Design	- Effective means of eliminating vertical gas migration.	- None
	2. Explosion Proof Activated Ventilation System	SAME AS ABOVE	- Maintenance may be required periodically - Cracks in the asphalt may cause leakage.
	3. Sensor System	- Continually monitors gas concentrations in parking area - Can activate ventilation system when high levels occur.	- Maintenance may be required periodically.
	4. Route Drainage 100' out of LEL area	SAME AS ABOVE	- None

atmospheric air. Therefore, an active and efficient maintenance program to check the system and adjust the butterfly valves will be necessary.

Table 4.4 summarizes the costs associated with this design. The estimated total cost is approximately $310,000.

4.3.3 Alternative 3 "Sloped Liner"

The third alternative presented will use two different designs for the critical and noncritical areas. In this design, a much greater slope is placed on aliner to allow for effective gas migration. Hence, this alternative is called "Sloped Liner". Some of the tools presented in the sloped slab alternative, will be utilized in the same context, including: explosion proof activated ventilation system and sensors in both the critical and noncritical areas; and the drainage plan in the noncritical area.

Critical Area

The third alternative design incorporates a constant slope liner over six inches of coarse material to a collection point where gases are drawn to the atmosphere and released. Figure 4.7 is a plan view of the piping layout. Figure 4.8 is a section view of the critical and noncritical area as shown in Figure 4.7. An impervious liner is sloped on a half inch per foot slope to collection points approximately 150 feet apart on center. At the lowest point, the liner is approximately 10 feet below the building slab. Therefore, this alternative is called the "Sloped Liner Alternative."

Table 4.4
Alternative 2 - "Air Buffer" Cost Estimate

	Item	Unit	Quantity	Unit Cost	Total Cost
1.	Crushed Bank Gravel	cu. yd.	4,333	$ 15	$ 65,000
2.	6"0 Perforated PVC Collection Pipe	L.F.	3,000	12	36,000
3.	6"0 Perforated PVC Inlet Pipe	L.F.	500	12	6,000
4.	2"0 Solid Atmospheric Vent with Butterfly Valve	Ea.	11	1,000	11,000
5.	18"0 Solid Header Pipe	L.F.	400	30	12,000
6.	Explosion Proof Blower System (1/4 HP)	Ea.	3	2,000	6,000
7.	Solid Inlet Catch Basin	Ea.	10	1,000	10,000
8.	15" 0 RCP	L.F.	1,600	35	56,000
9.	Sensor Package	Ea.	1	35,000	35,000
10.	Gas Impermeable Liner	sq. ft.	100,000	0.75	75,000
	Total (w/o Engineering and Contingencies)				$312,000

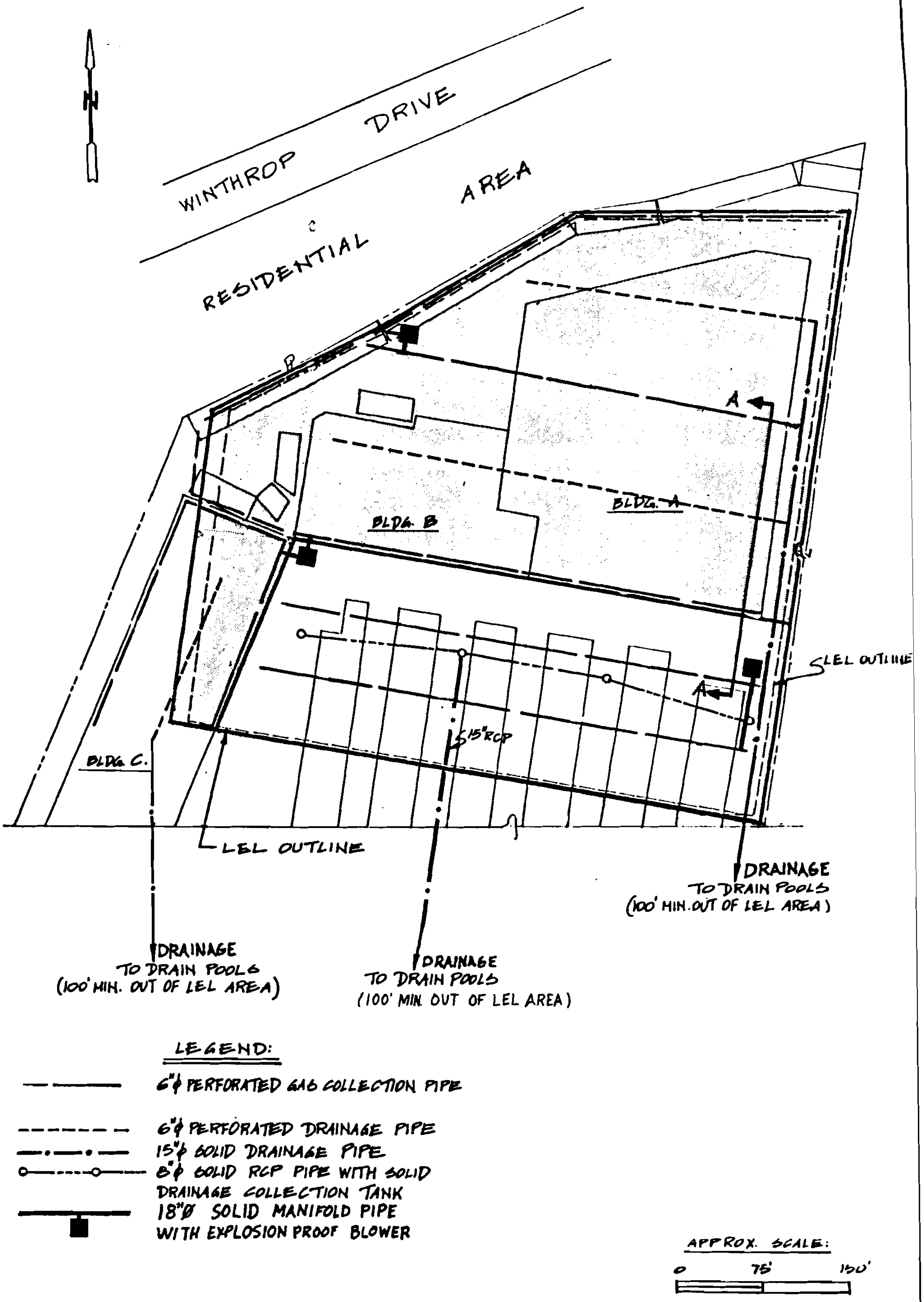

FIGURE 4.7 PLAN VIEW OF SLOPE LINER ALTERNATIVE

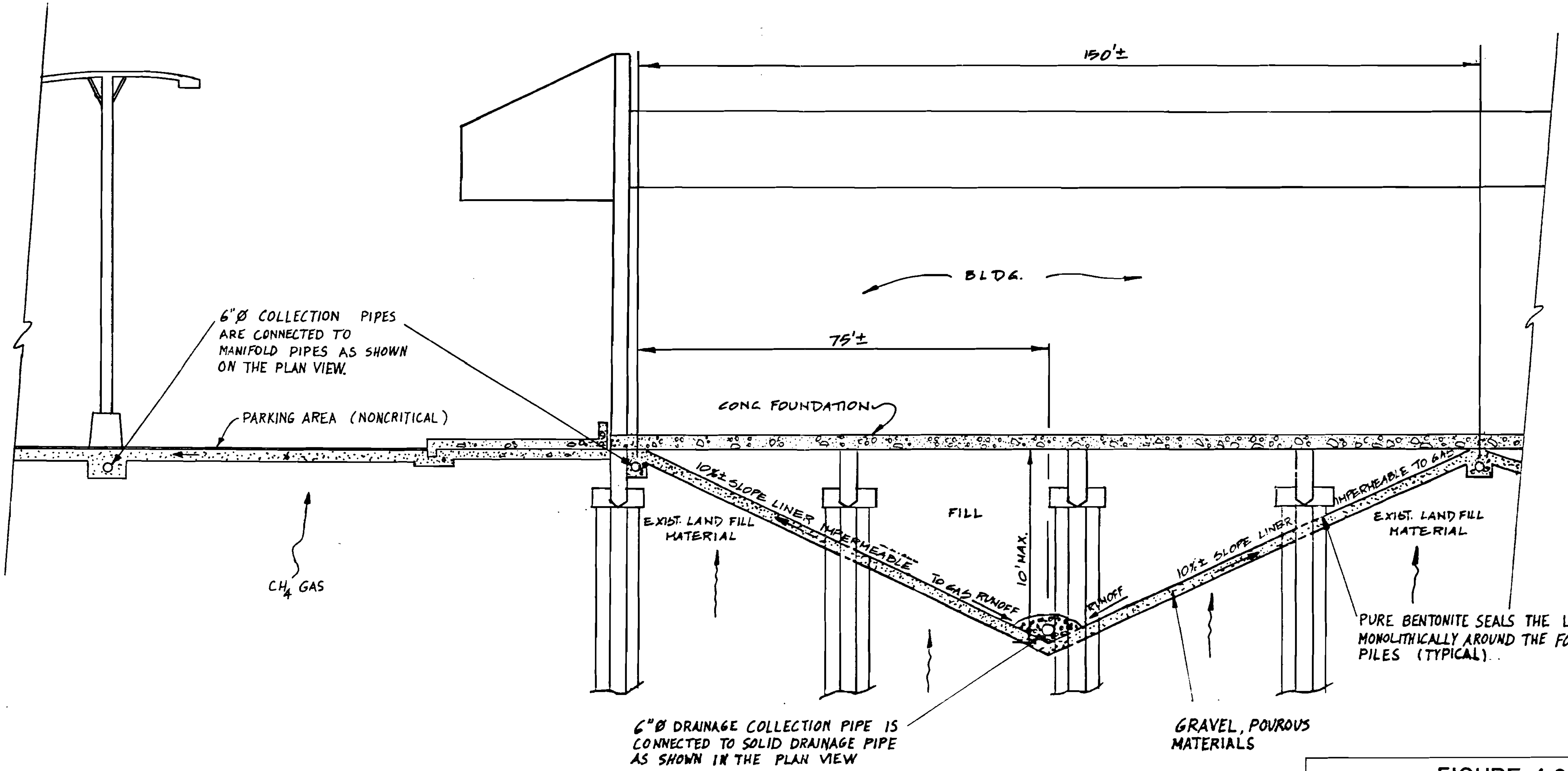

FIGURE 4.8

SECTION A-A
SLOPED LINER ALTERNATIVE

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RONKONKOMA NEW YORK

There are some concerns with this design in this project: (1) liners must be able to remain monolithic; no tears can occur allowing gas to enter an unvented cell, (2) when the liner must be punctured (for the structure's foundation piles), a perfect seal must be performed, (3) a new drainage design must be incorporated to release any accumulated water on top of the liner, and (4) the liner must have the ability to resist settlement from the additional weight on top of the liner combined with the settlement of the landfill.

In light of the aforementioned concerns, a geocomposite liner is the only feasible solution. One geocomposite liner, CLAYMAX, sandwiches sodium bentonite (montmorillonige) between two durable woven polyproplyene fabrics. The sodium bentonite is a high swelling clay, which when hydrated by water, typically can swell 15 times its dry volume and have an equivalent permeability of 30 feet of compacted clay. The bentonite allows the liner to have a self-healing ability if riped or punctured. It should be noted that this liner exceeds the EPA regulations for waste containment (James Clem Corporation, 1988).

In the areas where the Claymax must be penetrated by the foundation pile, an impermeable seal must be constructed. The proposed foundation design at the Uniondale Shopping Center enables the Claymax to be nailed to the foundation piles and a thick layer of pure bentonite surrounding the pile placed below the liner. When moistened, the Claymax liner and pure bentonite will swell and become a monolithic barrier.

The Claymax material actually benefits in a moist environment. This will allow drainage collection pipes laid in gravel beds in the valleys of the lining system (as shown in Figure 4.8). The runoff can then be collected with the perferated PVC pipe and routed to a manifold collection pipe, which will direct flow to the southern portion of the site for recharge.

As mentioned earlier, the geocomposite liner is placed over a porus layer of gravel. This allows the gas to travel along the path of least resistance to the collection area, and the ventilation system will exhaust the gases. As explained in the Sloped Slab Alternative, the landfill will take approximately 14 hours to exhaust under the assumptions stated in Alternative 1.

One of the concerns of placing a liner over the landfill is that the landfill may settle causing dips in the liner. Since runoff will be guided on the liner system, the flexibility or stretchability of the liner material is important. The Claymax material holds a property of 15 - 18 percent stretch until failure. This is equal or better quality than conventional liners. However, because of the possibility of large amounts of settlement, the 15-18 percent stretchability of this liner may be in question. If the liner were to fail, methane would enter an unvented cell and have access to migrate through natural cracks in the slab. Even if the liner doesn't fail, the bentonite seal around the footings will crack and provide access for the gas. In general, the problems associated with the landfill's potential to settle, raise serious questions for this alternative.

Noncritical Area

Fanning, Phillips and Molnar believe that there is a simple solution to the methane danger in the noncritical area. The remediation sceme consists of the typical trench design previously discussed in Alternative 1. Figure 4.7 includes the plan view of the noncritical area in which the methane gas is extracted from collection trenches by the same procedure as in the critical area; an explosion proof activated ventilation system. Figure 4.8 shows that the gases are able to reach the collection trench with the help of two parameters: (1) the vacuum in the subsurface created by ventilation system and (2) a six inch layer of porous gravel below the parking lot. As explained earlier, leakage may occur due to natural cracking of the asphalt. However, leakage into the atmosphere is to be encouraged since it relieves the methane buildup.

Summary

Table 4.6 summarizes the tools and their associated benefits and concerns as implemented in this design. The biggest concerns with this design include: (1) Since the gases are collected below the liner, it is imperative that no cracks or failures in the liner occur (the liner may crack when it becomes aged and/or the bentonite dries out; and (2) If gas enters the unvented cell, the system fails. The corresponding buildup in a confined space may occur (migration of gas through natural cracks in the slabs).

Table 4.7 summarizes the costs associated with this design. The estimated cost is approximately $350,000.

4.3.4 Alternative 4 "Vertical Well"

The fourth and final alternative presented is considerably different from the first three alternatives. Alternatives 1 through 3 branch from a generic trench design concept; this

TABLE 4.6

Alternative 3 "Sloped Liner" Benefits/Concerns

Area	Tools	Benefits	Concerns
Critical	1. Shallow Trench design	- Effective means of eliminating vertical gas migration.	- High concentrations of methane are directed to collection trenches. In some cases, these collection trenches are located directly below the building slabs.
	2. Explosion Proof Activated Ventilation System	- System can be activated at any time or run continuously. - Best method available for exhausting gases. - Operation costs are minimal. - 14 hours to exhaust all landfill gases	- Maintenance may be required periodically.
	3. Sensor System	- Effective means of monitoring methane concentrations in critical zones (i.e. directly below building, inside building). - Can activate the ventilation system.	- Maintenance may be required periodically.
	4. Sloped Liner	- Helps gases travel in their natural direction. - Low point acts as a barrier to to the collection trenches. In this respect, the sloped liner is more effective than the sloped slab. - A zone of clean natural material is located from 0-10 ft. below the buildings. - Reduces "short circuiting" from cracks in the slab.	- Natural cracking in the geocomposite liner may allow gases to enter the unvented cell above the liner. - Gas migration may enter through the unique seal around the foundation piles. - As the landfill decomposes and settles, the liner may fail. If the liner doesn't fail, pockets of gas may accumulate. - Bentonite seals will be destroyed as settlement occurs.
	5. Route Drainage 100' out of LEL area	- Best means of eleminating fatalities or explosions in drainage rings.	- None
Noncritical	1. Shallow Trench design	- Effective means of eliminating vertical gas migration.	- None
	2. Explosion Proof Activated Ventilation System	SAME AS ABOVE	- Maintenance may be required periodically - Cracks in the asphalt may cause "short circuiting".
	3. Sensor System	- Continually monitors gas concentrations in parking area - Can activate ventilation system when high levels occur.	- Maintenance may be required periodically.
	4. Route Drainage 100' out of LEL area	SAME AS ABOVE	- None

Table 4.7
Alternative 3 - "Sloped Liner" Cost Estimate

	Item	Unit	Quantity	Unit Cost	Total Cost
1.	Crushed Bank Gravel	cu. yd.	4,533	$ 15	$ 68,000
2.	6"0 Perforated PVC Gas Collecton Pipe	L.F.	2,920	12	35,000
3.	18"0 Solid Header Pipe	L.F.	150	30	4,500
4.	1/4 Hp Explosion Proof Blower	Ea.	3	2,000	6,000
5.	6"0 Perforataed PVC Drainage Collection Pipe	L.F.	920	12	11,000
6.	Solid Inlet Basin	Ea.	4	1,000	4,000
7.	8"0 Solid RCP Pipe	L.F.	400	20	8,000
8.	15"0 Solid RCP Pipe	L.F.	800	35	28,000
9.	Geocomposite Liner	Sq. Ft.	152,000	1	152,000
10.	Sensor System	Ea.	1	35,000	35,000
	Total (w/o Engineering and Contingencies)				$352,000

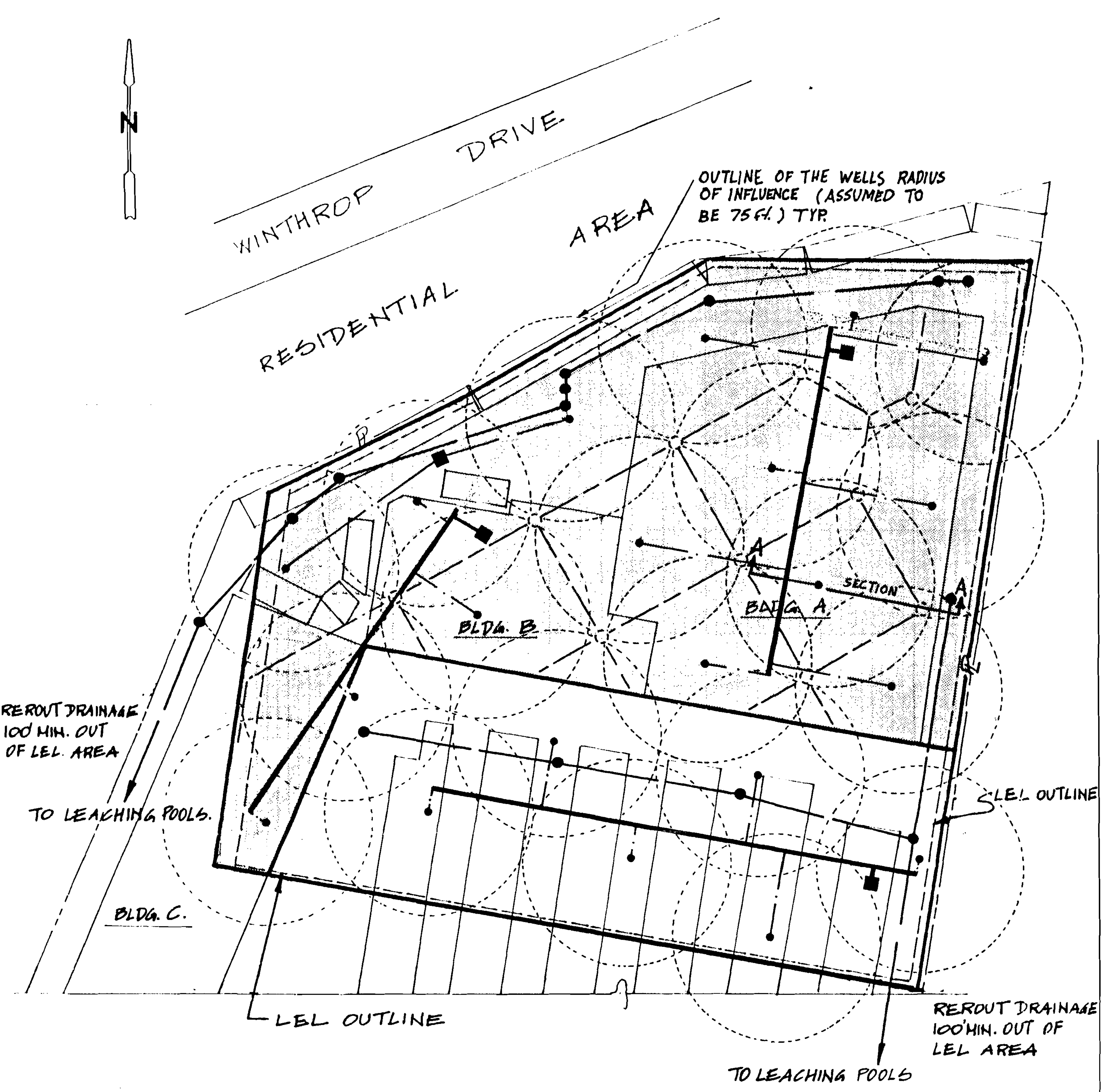
alternative is derived from the vertical well design concept. Thus, it will be called the "Vertical Well" alternative"

Once again there will be some tools implemented in this design which are duplicated from others. Therefore, the reader is refered to the Sloped Slab Alternative (Alternative 1) to review the following tools: the gas impermeable barrier in the building slab; continually monitoring sensors, stratigically located; and the drainage plan.

The following discussion will concentrate on the unique characteristics of this design. First, the critical area will be discussed followed by the toned down non-critical area. The plan view and corresponding section view are shown in Figures 4.9 and 4.10 respectively.

As shown in Figure 4.9, vertical wells are scattered throughout the critical and non-critical areas. Well spacings on the order of 100 feet are commonly used, however the appropiate spacing will vary with landfill characteristics (USEPA, 1985). Dividing by a factor of safety of 1.33 yields a conservative radius of influence of 75 feet. Overlapping the radii of influence of two wells results in the well spacing within 125 feet of each other, yielding a factor of safety greater than 5.0. As can be seen in Figure 4.10, the vertical well is located approximately 5 feet below grade. Each well is 6 inch diameter PVC slotted pipe and is placed in a 2 foot diameter gravel bed. The vertical well terminates approximately 20 feet below grade (near the water table).

Since directly below the building slabs have been referred



LEGEND

●	6"Ø SLOTTED PVC PIPE VERTICAL WELLS
———	6"Ø SOLID PVC LATERAL PIPE
━┳━	18"Ø SOLID MANIFOLD PIPE WITH EXPLOSION PROOF BLOWER
—— — —	6"Ø PVC PERFORATED INLET PIPES
○	6"Ø SOLID PVC RISERS WITH BUTTERFLY VALVE
—●—	15"Ø SOLID DRAINAGE PIPE

APPROX. SCALE:

0 75' 150'

FIGURE 4.9
VERTICAL WELL ALTERNATIVE

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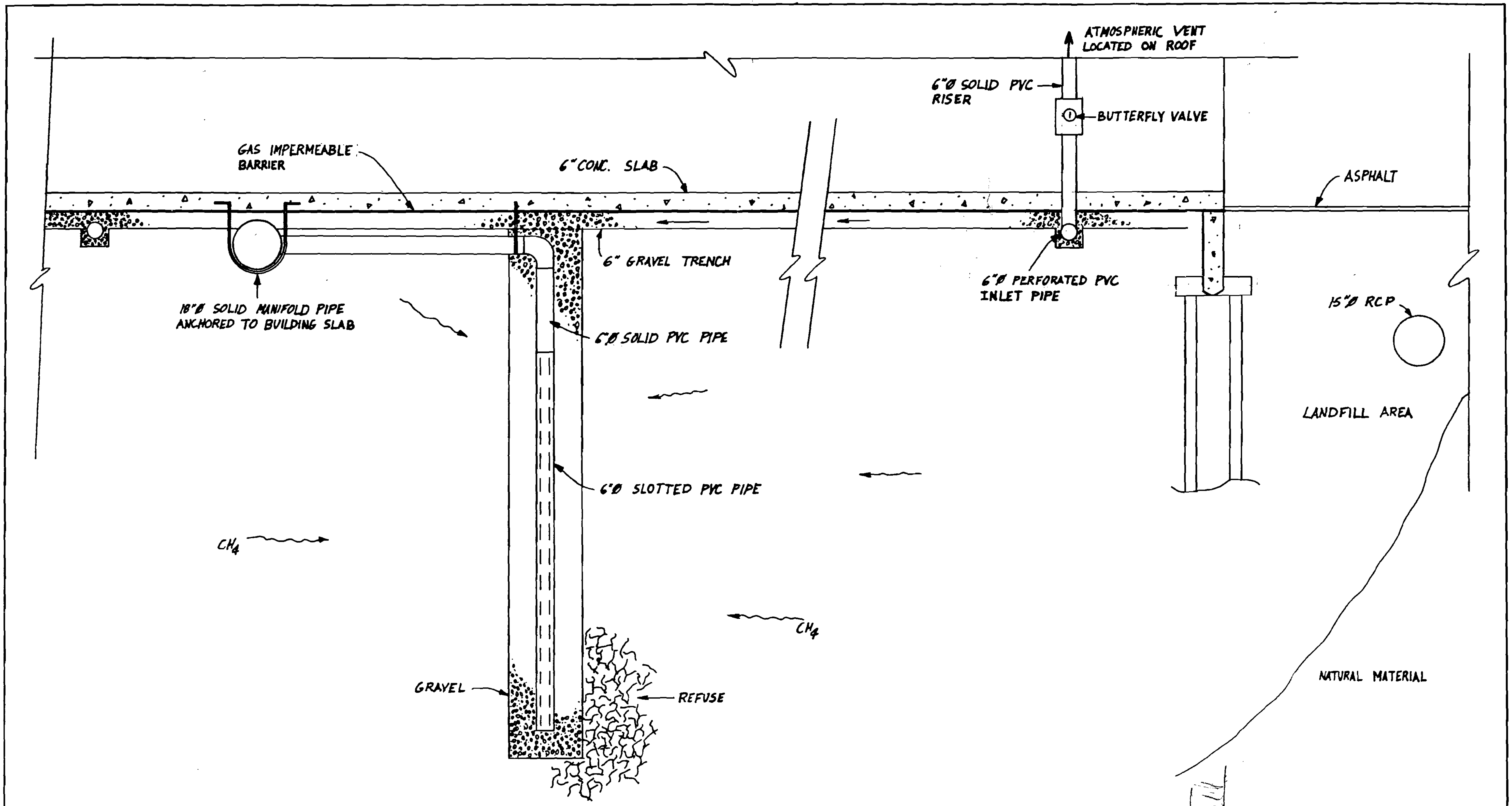

N.T.S.

FIGURE 4.10

SECTION A-A
VERTICAL WELL ALTERNATIVE

fanning, phillips & molnar
ENGINEERS

to as the most critical area, atmospheric inlet pipes have been placed in the subsurface, to serve as a buffer; similar to the design concept in Alternative 2. The inlet pipes bisect the resulting overlapping area of two adjacent radii of influence. This helps clearly divide the overlapping area so that the gases will travel in one direction depending on its location. This is a more desirable condition than having the overlapping areas consist of a neutral zone. The wells along the perifery do not require inlet pipes because the atmospheric air beyond the property boundary serves as an inlet pipe.

Once again, the settlement characteristics of the landfill will have some affect on this design. As in the other alternatives, the manifold pipes and all lateral pipes will require anchoring to the building slab. FP&M has illustrated the conceptual design by placing the collection well in a two foot diameter bed of gravel. The gravel serves as a porous media around the pipe, but more importantly, helps the well withstand the potential adverse affects of settlement.

When settlement of the landfill occurs, the primary movement of the subsurface will be in the vertical direction. The well will be supported in its original position as the neighboring gravel and surrounding subsurface drops in elevation. If the landfill drops far enough (a few feet) part of the slotted pipe will be exposed in the void area below the slab. As in the case with the trench designs, this scenerio would benefit the design. In some instances, lateral settlement may occur in conjunction with vertical settlement. With this scenerio, the gravel surrounding the pipe would shift and fill the void. A rapid lateral shift may have adverse affects on the well; shearing of the well could conceivably occur. Although FP&M feel this is not likely, it still should be considered as a concern.

The activated ventilation system in this alternative is similar to the system in Alternative 2, the Air Buffer Alternative. Due to the influence of additional air entering the system, the exhausting of the landfill will be greater than 14 hours. Exact time will depend on the amount of air entering through the adjustable butterfly valve on the inlet pipe (refer to Figure 4.10).

Non Critical Area

The non-critical area is similar to the critical area with a few changes. The gas impermeable barrier will be omitted from the non-critical area. The sensor system will be included in the non-critical area, but in a limited context when compared to the critical area. The exact location of the sensors will be determined in the design stage.

Finally, the use of inlet pipes will not be included in this area. This is done for two reasons: 1) as explained in the beginning of Section 4.3, this area is not considered critical. Therefore, the buffer of the atmospheric air is not needed, and 2) in the absence of inlet vents, the gases from the perifery and under the building slabs will migrate towards the non-critical area. This will help flush out the more dangerous, critical area.

Summary

Table 4.8 summarizes the tools and their associated benefits and concerns. The biggest concerns with this design include: (1) the introduction of atmospheric air into the subsurface. As mentioned earlier, this increases the time to vent the methane in the fill itself. However, the time is less of a concern in this alternative when compared to the other alternatives, since the wells are placed right in the generation zone. This may be the most effective alternative for removing methane in the fill zone. The vertical wells are extracting the gases at a farther distance (and the media has more resistance) than the other alternatives. Table 4.9 summarizes the costs associated with this design. The estimated total cost is approximately $300,000.

4.3.5 Reviewing The Four Alternatives

The previous chaper reviews four different remedial alternatives for the Uniondale site. Table 4.10 lists the four alternatives and describes their method of remediation for the critical and non critical areas. As explained earlier, the non critical area is beneath the paving and poses no threat to the public. The following section will compare the four alternatives with the following parameters: regulatory approval, effectiveness, methane buildup potential, and finally, capital and yearly operation and maintenance costs. This will lead to the selection of the best suited conceptual design for the proposed Uniondale shopping center site.

TABLE 4.8

Alternative 4 "Vertical Well" Benefits/Concerns

Area	Tools	Benefits	Concerns
Critical	1. Vertical Wells	- As the exhausting procedures begin, the area below the slabs will be the first gas exhausted. - Gases are collected close to their original source; the gases at greater depths will not have to travel to the trenches below slabs--as in other designs. - Affectively controls lateral and vertical gas migration. This reduces the possibility of off-site migration.	- Leakage may result from the introduction of atmospheric air. - With the occurance of settlement, the vertical wells may be affected.
	2. Explosion Proof Activated Ventilation System	- System can be activated at any time or ran continuously. - Best method available for exhausting gases. - Operation costs are minimal. - Time to exhaust all landfill gases is greater than 14 hours. Exact time varies proportionally with the amount of air entering the atmospheric vents.	- Maintenance may be required periodically. - Cracks in the building slab will cause the air in the buildings to be pulled into the subsurface This may cause a leakage in the design.
	3. Sensor System	- Effective means of monitoring methane concentrations in critical zones (i.e. directly below building, inside building). - Can activate the ventilation system.	- Maintenance may be required periodically.
	4. Atmospheric Vents	- Lowers the methane concentration below the slab resulting in a safer environment for the building occupants. - Can be adjusted to allow atmospheric air to enter the system at the desired extraction condition. - Vents can be adjusted (turned down) with time.	- Potential leakage exists. - Extraction time for the entire landfill is >14 hours (will vary with flowrate through the vents). - Maintenance may be required. - Increases maintenance costs.
	5. Gas Impermeable Barrier	- Safely protects the slab from gas migration through uanavoidable cracks. - Helps reduce any "short circuiting" from cracks in the slab.	- Perfect seals must be achieved.
	6. Rout Drainage 100' out of LEL area	- Best means of eleminating fatalities or explosions.	- None
Noncritical	1. Shallow Trench Design	- Effective means of eliminating vertical gas migration.	- None
	2. Explosion Proof Activated Ventilation System	SAME AS ABOVE	- Maintenance may be required periodically. - Cracks in the asphalt may cause "short circuiting".
	3. Sensor System	- Continually monitors gas concentrations in parking area. - Can activate ventilation system when high levles occur.	- Maintenance may be required periodically.
	4. Rout Drainage 100' out of LEL area	SAME AS ABOVE	- None

Table 4.9
Alternative 4 - "Vertical Well" Cost Estimate

	Item	Unit	Quantity	Unit Cost	Total Cost
1.	Crushed Bank Gravel	cu. yd.	2,067	$ 15	$ 31,000
2.	6"0 PVC Screened Well	L.F.	400	15	6,000
3.	18"0 Solid Header Pipe	L.F.	1,000	30	30,000
4.	6"0 Solid Laterals from the header pipe	L.F.	1,200	12	14,400
5.	6" Perforated Inlet Pipe	L.F.	2,000	12	24,000
6.	6" Solid Inlet Pipe	L.F.	333	12	4,000
7.	Butterfly Valves	Ea.	11	600	6,600
8.	1/4 Hp Explosion Proof Blower	Ea.	4	2,000	8,000
9.	Solid Inlet Catch Basin	Ea.	10	1,000	10,000
10.	15"0 RCP	L.F.	1,600	35	56,000
11.	Gas Impermeable Liner	Sq. ft.	100,000	0.75	75,000
12.	Sensor System	Ea.	1	35,000	35,000
	Total (w/o Engineering and Contingencies)				$300,000

TABLE 4.10
REVIEW OF THE ALTERNATIVES

Alternative	Tools Implemented	Greatest Benefit	Greatest Unavoidable Concerns	Estimated Cost
1. Sloped Slab	- Shallow Trench Design - Activated Ventilation System - Sensor System - Sloped Slab - Gas Impermeable Barrier - Route Drainage 100' out of LEL area	- Approximately 14 hours to exhaust the entire landfill - Sloped slabs assist natural gas migration - Gas Impermeable Barrier reduces leakage through the slab	- Collection trenches will tend to oppose each other - High concentrations of methane are collected below the slabs - Leakage possability exists in parking areas	$352,000
2. Buffer	- Shallow Trench Design - Activated Ventilation System - Sensor System - Atmospheric Vents with Butterfly Valves - Gas Impermeable Barrier - Route Drainage 100' out of LEL area	- Air buffer allows low concentrations of methane to be collected below the slab - Gas Impermeable Barrier reduces leakage through the slab	- Gases are collected directly below the slabs - Leakage possibility exists in parking areas	$312,000
3. Sloped Liner	- Shallow Trench Design - Activated Ventilation System - Sensor System - Sloped Geocomposite Liner - Route Drainage 100' out of LEL area	- Gases travel in their natural direction - Methane gases have a 0-10 foot buffer of clean soil	- Collection trenches may be located below building slabs - Natural cracking, poor seals and failure will cause methane to enter an unvented cell	$352,000
4. Vertical Well	- Vertical Wells - Activated Ventilation System - Sensor System - Atmospheric Vents with Butterfly Valves - Gas Impermeable Barrier - Rout Drainage 100' out of LEL area	- Air Buffer occurs below the building slabs - Gases at lower depths collected near their source	- Short circuit possibility exists	$300,000

effectiveness, methane buildup potential, and finally, capital and yearly operation and maintenance costs. This will lead to the selection of the best suited conceptual design for the proposed Uniondale shopping center site.

SECTION 5 COMPARISON OF THE ALTERNATIVES

The following sections will compare the four alternatives with the following parameters: regulatory approval, effectiveness, methane build up potential, and finally, capital and yearly operation and maintenance costs.

5.1 Comparison of the Alternatives

In order to compare the four alternatives with one another, the subsequent pages will discuss these alternatives and how they may be affected by the aforementioned parameters. The objective of this chapter is to decisively remove the alternatives which aren't best suited for this site.

5.5 Regulatory Approval

In general, both trench and vertical well designs are acceptable means for extracting the landfill gas. The regulatory agencies are primarily concerned with a design which will safely exhaust the methane problem, so the occupants of the buildings will not be in any danger.

It is FP&M's subjective opinion that the regulatory agencies response to the four alternatives will be the following:

Sloped Slab	A safe and effective design in both the pre and post settlement stage. However, high methane concentrations are drawn from the entire landfill to the collection trenches directly below the building slabs. This may be a deterring factor for this alternative.
Air Buffer	Another safe and effective design in both the pre and post settlement stage. Once again, high concentrations of methane are drawn from the lower depths of the landfill to the critical zone directly below the building slabs. However, in this design, atomospheric air is introduced in this region to serve as a buffer protection by decreasing the methane concentrations. In addition, the collection pipes work together by

drawing gases to a centralized collection area in this design.

Sloped Liner	This is a safe and effective design in the pre settlement stage, but there are serious dangers associated with the post stage. Settlement may cause the liner or bentonite seals around the piles to fail allowing gas to enter the unvented cell below the building. Since there is no liner protecting the building slabs, gas will have access to the natural cracks. This may cause buildup in confined spaces resulting in an explosion. It is anticipated that this design will be unacceptable due to potential settlement conditions.
Vertical Well	This design has one favorable advantage over the other three; it collects the gases at or close to their source, rather than below the building slabs. This design also introduces atmospheric air into the system. Indeed, the atmospheric air serves an invaluable service. When the system activates, clean air is flushed through the gravel area, directly below the building slabs by means of the well's natural drawdown capabilities. This provides true "cushion" of methane free gas directly below the slab. There is one drawback of this alternative. If large amounts of settlement occur, there is a potential for damage to the wells. The amount of settlement which can be expected is difficult to determine because (1) the amount of settlement which has already occured is not known, (2) the types of materials in the landfill is not known, and (3) the life of the landfill is unknown. However, it is felt that this alternative will effectively operate with small amounts of settlement.

Therefore, FP&M feel that the regulatory agencies will interpret the pros and cons of the Air Buffer and Vertical Well Alternatives in order to choose which is best suited for the Uniondale site.

5.3 Effectiveness

The second parameter to be discussed is each system's effectiveness to reduce the possibility of gas migration into the building. Gas infiltration would occur through natural cracks and joints in the building slabs.

The Sloped Liner alternative is the least effective design of the four alternatives. As mentioned earlier, settlement will give the methane gas access to the unvented cell below the building slab. In this design, the building slab is not sealed with a gas impermeable barrier. This provides a possibility of gas infiltration into the building.

The other three alternatives have a gas impermeable barrier, sealing the building slabs. This eliminates the potential hazard thus protects the building occupants. Therefore, the Sloped Slab, Air Buffer and Vertical Well Alternative are equally effective.

5.4 Methane Buildup Potential (MBP)

The third parameter relates to the degree of methane concentration below the building slab, during the system's normal operations. This parameter helps identify which alternative may be at a higher risk.

The Sloped Slab Alternative has a high degree of MBP. This was implied earlier when it was explained that all landfill gases in their pure form, are drawn from the subsurface to collection pipes below the slab.

The Air Buffer Alternative has a moderate degree of MBP. As in the Sloped Slab Alternative, all landfill gases are directed to the collection trenches below the building slab. However, the methane concentration is displaced because it will be mixed by means of negative pressure, with atmospheric air supplied by the inlet pipes.

The Sloped Liner and Vertical Well Alternatives both have low degrees of MBP. The sloped liner collects the gases near the building slab, but the majority of the gases travel below a 0-10 foot clean fill barrier. The vertical well has a low degree since it collects gases near their source (5-20 feet). In addition, the first few feet below the slab are flushed with clean air when the system activates.

5.5 Costs

In the explanation of each alternative, capital costs estimates were presented. These estimates ranged from approximately $300,000 to $350,000 for all four alternatives. Since the focus of this report was of conceptual design only, these costs will vary in the final design by 20%. Therefore, the costs of each alternative are relatively the same. In other words, the capital costs should not have an influence on the selection of the best suited alternative.

Maintenance costs are slightly more differentiable. The Sloped Slab Alternative and should have the lowest operation and maintenance costs. This is due to the alternative's (1) ability to withstand any affects of settling (no maintenance costs) and (2) lack of atmospheric inlet pipes (no additional blower operation cost and no maintenance required to check/adjust the atmospheric vents).

The Air Buffer and Vertical Well Alternatives will require additional operation and maintenance costs (O&M). Both alternatives will utilize the blowers more than the Sloped Slab Alternative because of the introduction of atmospheric air into the system. This will increase O&M costs. The adjustments and periodical inspections of the butterfly valves will also increase maintenance costs. The Vertical Well Alternative may also require repair costs associated with settling.

The sloped liner will have low O&M costs but may require extensive repair costs due to settling.

The report discussess the low costs associated with the operation of this system. It is expected that any additional operation costs will be very small. FP&M believe that the maintenance costs will also be de minimus in comparison to the capital costs and other more important parameters. Therefore, it is felt that operation and maintenance are not a significant determinant in the final section. However, repair costs, incurred from large settlement, can be significant and should be considered where appilcable.

SECTION 6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The following pages have explored many parameters in an attempt to identify the best suited alternative for relieving methane buildup at the Uniondale site. Some of the more important parameters which surfaced included: the possibilities of settlement and how each alternative would be affected; each alternatives ability to effectively reduce the potential of gas migration into the building; the concentration and location of the gas when it is collected; and the presence of null velocity points. Furthermore, it was suggested that the capital and operation and maintenance costs should not have a large influence in the decision making process. This was primarily because of each alternative's costs were within a tolerance range for conceptual designs.

Fanning, Phillips and Molnar have come to the following conclusions regarding each alternative.

Sloped Slab:	This alternative is acceptable in every parameter discussed, except methane buildup potential and regulatory acceptance. The collection of high gases directly below the building slab and the existence of conflicting velocity points does not utilize the best engineering design. This alternative is not recommended.
Air Buffer:	Capturing the faults of the sloped slab alternative, the Air Buffer Design was created. The concentrations of methane are reduced, by introducing atmospheric air, below the building slab. In addition, the system draws gases to a central area, affectively having the collection pipes work together rather than conflict. This alternative is recommended.
Sloped Liner:	This alternative had worthy design factors associated with it. However, the settlement potential which exists, is critical with this alternative. There are a number of ways in which

the seals or liner may fail causing methane gas to enter the unvented cell and have access to the unlined slabs. The potential problems are too great with this design.

Vertical Wells: The Vertical Well design has a different theoretical approach of collecting gas; remove the gas below the slab first and then remove the additional gas near the source at greater depths. The additional tool, atmospheric vents, reduces null points and causes almost instantaneous flushing of the gravel layer below the slabs (creating its own buffer). The Vertical Wells also reduce gas migration offsite. It seems that this alternative could also be recommended. However, Fanning, Phillips and Molnar feel that since the possibilities of settlement are unknown. Large settlement could damage the wells and therefore, this alternative is our second choice.

6.2 Recommendations

Fanning, Phillips and Molnar recommends that the Air Buffer Alternative be implemented at the Uniondale site to provide safe and secure environment for the shopping center. It is felt that this design, properly put into effect, will address and relieve the dangers of methane gas buildup and migration.

It is also recommended that three maintenance programs be incorporated following the completion of the shopping center. First, a biannual program to inspect and/or adjust (1) the butterfly valves supplying atmospheric air and (2) the methane analyzers which monitor the methane in critical and noncritical areas. This program should be performed by qualified and knowledgable technicians. Secondly, a consistent program to repair and maintain the shopping centers paved areas is critical. Finally, a 5 year inspection program should be initiated to inspect the settlement below the buildings. This program will not only insure that the venting process is not in danger, but will also determine other hazards such as excessive loads on weakly supported platforms.

It is strongly believed that the recommended design with the help of the maintenance programs, will provide an innocuous and secure environment for the daily shoppers as well as the employees of the markets.

SECTION 7 REFERENCES

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APPENDIX A

METHANE SAMPLING FIELD REPORTS

FIELD REPORT

UNIONDALE SHOPPING CENTER -- REALCO

OBJECTIVE: To follow up previous OVA survey done by Martin Klein of Fanning, Phillips and Molnar, using the Gascope Combustible Gas Indicator to determine the extent of high methane content in the soil.

DATE: July 11, 1988

WEATHER CONDITIONS: Hot, Humid, Hazy 90° - 95° F

PRESENT Fanning, Phillips and Molnar

Andrew Ritchie	Engineer
Jay Best	Chemist

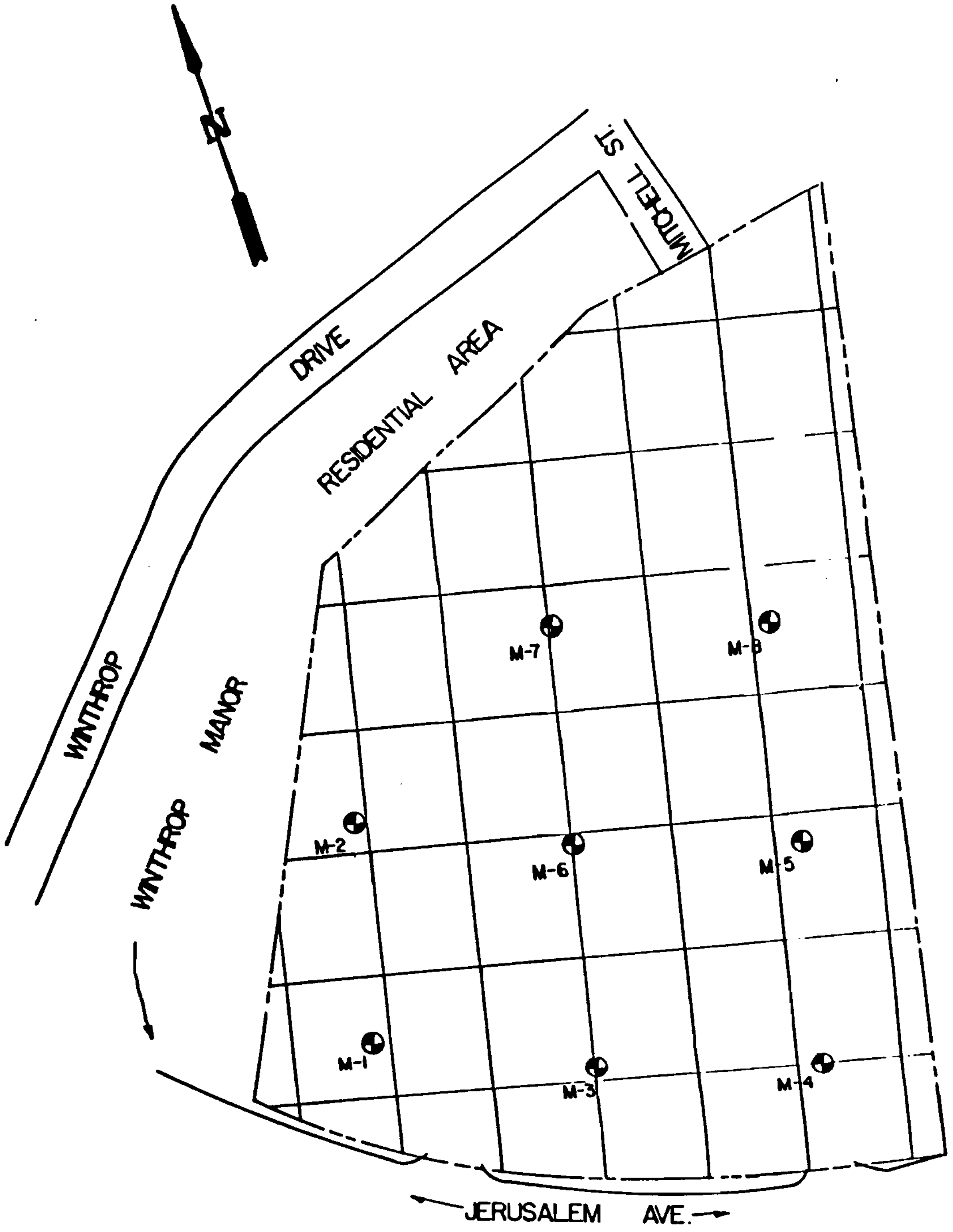
DETAILS:

- Arrived on site at 10:00 a.m.
- The calibration was checked using a 2% methane standard. The reading was 37% LEL, the actual concentration is 40% LEL, this is within 5% error.
- Located the sampling points for M1 - M4. Located as shown on the accompanying site map.
- A pneumatic drill was used to go through the top 6' of asphalt and a plunge bar was used to make a 4' deep hole by 1/2" diameter. The drill was only needed for Vapor Well M1 - M3.
- The end of the sampling tube was inserted into each vapor well made and the gas was drawn through the machine by squeezing the bulb 10 - 15 times. The gas concentration was measured using the LEL (Lower Explosive Limit) setting.
- Sampling Wells M5 - M8 were made and sampled immediately after they were located.
- There were no readings at M1 - M6.

- M7 had a fluxuating reading that peaked above 100% LEL and went as low as 50% LEL. A second reading was taken using the GAS setting. A steady state reading of 5% was obtained.
- M8 was above 100% LEL. Again a second reading was taken on the GAS setting indicating 25% gas.
- It was judged that because the gas reading was 5 times the lower explosive limit, it was unsafe to continue sampling without necessary safety precautions.
- A partially buried tank was discovered. Liquid was visable through a 3" opening about 2' below the surface. The liquid had a smell like that of gasoline. There was a 5% LEL reading on the Combustible Gas Indicator. Its approximate location is shown on the accompanying site map.
- Left site at 1:00 p.m.

CONCLUSION:

Although the area of high methane concentration was located, it was not detailed and further sampling points will be needed to determine the boundaries of this area. Sampling was discontinued due to lack of safety preparation for explosive concentration of methane, but will be continued with suitable safety precautions at a future date.



LEGEND

PHASE I:

◐ VAPOR WELL
JULY 11,1988

APPROXIMATE SCALE

1"=100'

PHASE II METHANE SAMPLING
FIELD REPORT
Uniondale Shopping Center - Realco

DATE:	July 25, 1988	
WEATHER CONDITIONS:	90 - 95 F, moderate humidity	
PRESENT:	Fanning, Phillips & Molnar	Andrew Ritchie, Engineer Jay Best, Chemist
	Layne Drillers	Lou Brian

OBJECTIVE: To complete the previous methane survey using the Gascope Combustible Gas indicator to determine the extent of high methane concentration in the soil. Phase II utilized drillers to install vapor wells rather than using a plunger bar, due to the above explosive limit gas concentrations in the soil.

DETAILS:

- Arrived on site at 9:00 a.m.
- The calibration of the explosive meter was not checked because the tank of 2 percent methane calibrating gas was empty.
- Began drilling vapor wells
  - o 15 ft. segment of 4 in. hollow-stem-auger was used
  - o A grid pattern as indicated on the accompanying figure was used. The only exceptions to this pattern occured when the drilling rig was unable to access the proposed sampling point or when the auger hit impervious material at a shallow depth.
  - o See the included figure for the sampling plan and the table for a detailed drilling log.

    - Four tries were made to install a well between wells 18 and 19, but underground obsticles made this impossible.
- In order to take future methane measurements:
    - Ten of the wells had a 10 ft. section of 2 inch diameter, 20 slot pipe installed.
    - These were filled around with dirt from the drilling.
    - The top 2 ft. of the pipe was wrapped in duct tape to prevent surface water runoff from entering and methane gas from escaping.
    - A cap was screwed onto the top to seal the well.
    - Methane sampling will be performed at approximately two week intervals over the next month to better assertain what the steady state concentrations of methane.

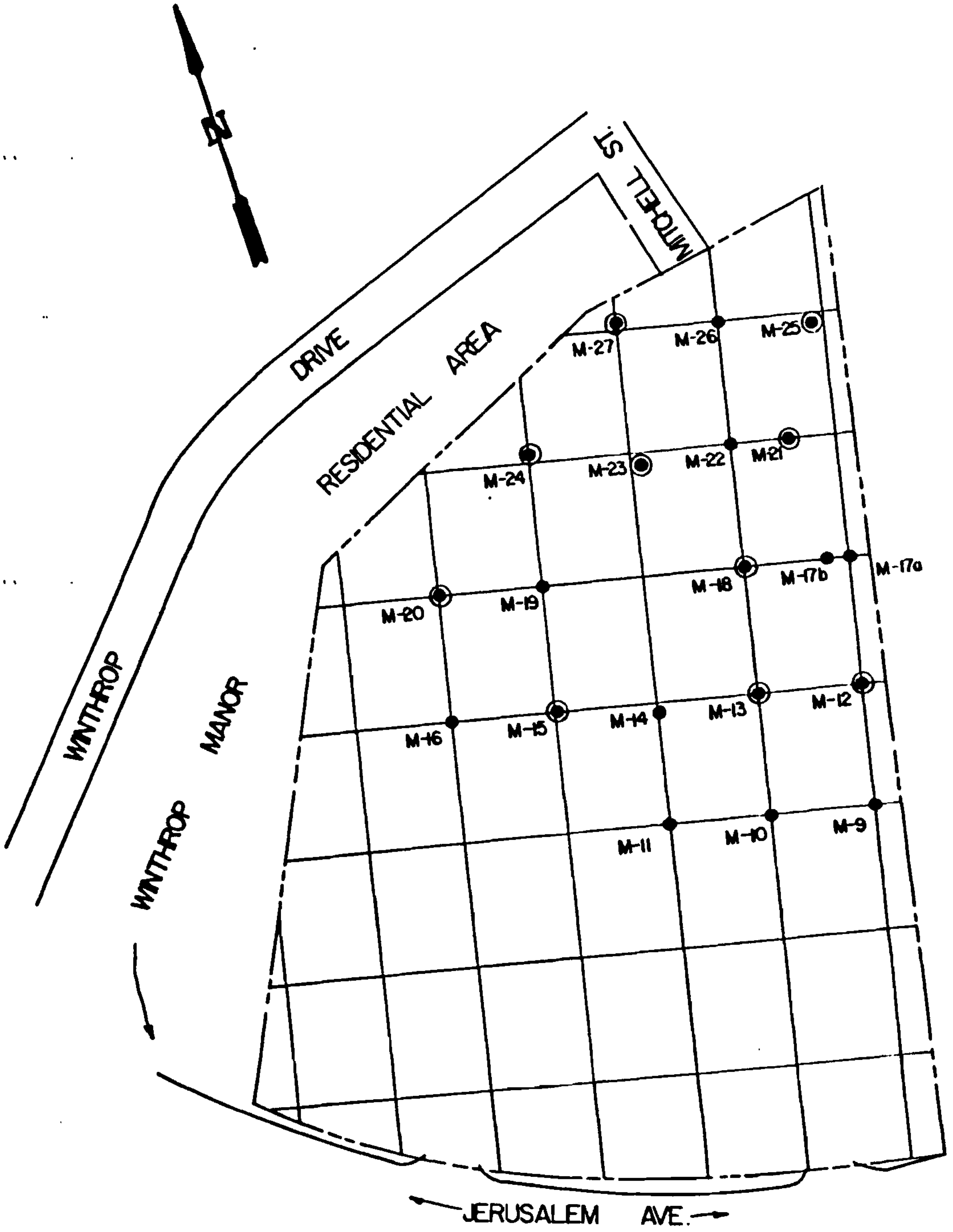
CONCLUSIONS:

- The area of methane concentration is larger than originally anticipated and seems to include the entire northern part of the site.
- Future testing of the 10 permanent vapor wells should be performed to determine steady state of methane.

TABLE OF METHANE CONCENTRATIONS FOR VAPOR WELLS INSTALLED 7/25/88

Vapor Well #	Concentrations	Comments
M-9	80% L.E.L.*	black soil, suspect garbage
M-10	38% L.E.L.	10 ft. black soil
M-11	80% L.E.L.	black soil almost immediately
M-12	28% Gas	well installed
M-13	25% Gas	asphalt and alot of organic debris, well installed
M-14	18% Gas	
M-15	26% Gas	well installed
M-16	27% Gas	
M-17	30% Gas	large amount of plastic debris
M-17b	15% Gas	hole collapsed, plastic and debris
M-18	25% Gas	well installed
M-19	60% L.E.L.	
M-20	24% Gas	well installed
M-21	26% Gas	well installed
M-22	10% Gas	
M-23	28% Gas	well installed
M-24	20% Gas	well installed
M-25	15-20% Gas	well installed
M-26	13% Gas	2 in. of surface water in the area of well
M-27	24% Gas	well installed

* Lower Explosive Level



LEGEND

APPROXIMATE SCALE
1"=100'

PHASE II:

● VAPOR WELL

◉ VAPOR WELL INSTALLED WITH SLOTTED PIPE JULY 25,1988

PHASE III METHANE SAMPLING
FIELD REPORT
UNIONDALE SHOPPING CENTER--REALCO

DATE:	August 8, 1988
WEATHER CONDITIONS:	90-95 F, hot, humid and hazy
PRESENT:	Fanning, Phillips and Molnar:

Andrew Ritchie	Engineer
Jay Best	Chemist

OBJECTIVE:

- To sample the vapor wells and the open bore holes that were made July 25, 1988 using the Gascope Combustible Gas indicator. In addition to try to establish the methane concentrations at the edge of the property using a plunge bar to make vapor wells and the Gas indicator to establish concentrations.

DETAILS:

- Arrived on site at 8:15 a.m.
- Checked calibration of Gascope Combustible Gas indicator with 2 percent gas or 40 percent LEL calibration gas. The reading was 36 percent LEL. This is within the 5 percent error allowed by the manufacturer.
- Began sampling of open bore holes and vapor wells at 9:30 a.m.
  - o Both the vapor wells with installed slotted pipe and the open vapor wells were checked.
  - o The gas consentrations appear in a table at the end of this report.
  - o The locations and numberings are the same as on the Phase II field report from July 25, 1988.
- Sampling procedure for the installed vapor wells:

1. The combustible gas indicator was turned on and the "ready" light is allowed to come on.
2. While pumping the aspirator bulb the machine is adjusted to zero.
3. The cap is removed.
4. The sampling tube is inserted as far as possible into the vapor well.
5. A reading is made after pumping the aspirator bulb 10-15 times.

- Sampling procedure for open vapor wells--same as above excluding step 3.
- A second sampling was done at 2:10 p.m.
- Sampling around the perimeter of the site.

o Seven vapor wells were done around the northern perimeter of the site.

o See attached figure for locations.

o Vapor wells M-32 and M-33 were taken at the same location as borings B-6 and B-7 (see Site Contamination Study - Uniondale prepared for Realco by Fanning, Phillips and Molnar on October 14, 1986).

o These wells are 4' deep and 1/2" in diameter.

o In each case a plunge bar was used to make the well. The sampling tube was inserted as far as it could be into the hole and the aspirator was pumped 10-15 times before taking a reading.

o Each of the seven holes indicated 0 percent LEL.

CONCLUSIONS:

- The area of high methane concentration appears to be smaller on August 9 than on July 25.
- The cause of this is uncertian, but several explainations can be offered.
    1. The soil has been vented from the existing holes lowering the methane concentration.
    2. On July 25, there were several standing pools of water, particularly near M-25, M-26, M-27 and near M-18, M-22, M-23. On August 9 these did not exist. The Microorganisms that make methane need nutrients these include water. Less water could mean less methane.
    3. Barrametric pressure. The atmospheric pressure on August 9 was relatively high.
- Ground methane near the northern property boundary does not appear to be a problem.

TABLE

PHASE III METHANE SAMPLING

	Concentrations	
	9:30 a.m.	2:10 p.m.
Calibration (2% methane in Air, 40% LEL)	36%	36%
Vapor Wells (with slotted pipe installed)		
M-12	27% Gas	22% Gas
M-13	10% Gas	22% Gas
M-15	29% Gas	28% Gas
M-18	25% Gas	22% Gas
M-20	0% L.E.L.	2% L.E.L.
M-21	100% L.E.L.	26% Gas
M-23	25% Gas	24% Gas
M-24	0% L.E.L.	0% L.E.L.
M-25	0% L.E.L.	0% L.E.L.
M-27	0% L.E.L.	0% L.E.L.
Open Bore Holes		
M-14	13% Gas	28% Gas
M-16	16% Gas	70-80% L.E.L.
M-19	15% L.E.L.	16% L.E.L.
M-22	9% Gas	20-40% L.E.L.
M-26	0% L.E.L.	0% L.E.L.
New 1/2 vapor wells	Concentration (only 1 sampling)	
M-30	0% L.E.L.	
M-31	0% L.E.L.	
M-32	0% L.E.L.	
M-33	0% L.E.L.	
M-34	0% L.E.L.	
M-35	0% L.E.L.	
M-36	0% L.E.L.	
M-37	0% L.E.L.	
M-38	0% L.E.L.	

APPENDIX B

KINETIC MODEL WORKSHEETS

PALOS VERDES KINETIC MODEL

RDO = READILY DECOMPOSABLE ORGANICS
MDO = MODERATELY DECOMPOSABLE ORGANICS
RO = REFACTORY ORGANICS
K1 = FIRST STAGE GAS PRODUCTION RATE CONSTANT (1/YR), FOR T<T1/2
K2 = FIRST STAGE GAS PRODUCTION RATE CONSTANT (1/YR), FOR T>T1/2
Lo = MAXIMUM YIELD OF GAS TO BE PRODUCED, L OF METHANE
G = VOLUME OF GAS PRODUCED, L OF METHANE

Lo = (90 L METHANE/KG)(500 KG/CU M)(16,000 SQ M)(10M) = 7.29E9 L METHANE

ASSUMPTIONS: LANDFILL SURFACE AREA = 16,000 SQ M
AVERAGE DEPTH = 10 M
REFUSE DENSITY =500 KG/CU M

GIVEN: RDO: Tmax=3.5 YR, T1/2=1 YR
MDO: Tmax=6 YR, T1/2=2 YR
RO: Tmax=60 YR, T1/2=20 YR
RDO = 35.4% OF THE REFUSE
MDO = 61.0% OF THE REFUSE
RO = 3.6% OF THE REFUSE

EQUATIONS:
K1 = ln(50)/T1/2
K2 = ln(50)/(0.99Tmax-T1/2)
G = 0.5Lo(EXP(-K1(T1/2-T))), FOR T<T1/2
G = Lo(1-0.5(EXP(-K2(T-T1/2)))), FOR T>T1/2

TIME (YEAR)	Lo1 (E06)	Lo2 (E6)	Lo3 (E06)	K1 RDO	K1 MDO	K1 RO	K2 RDO	K2 MDO	K2 RO	G RDO (E06)	G MDO (E06)	G RO (E06)	DEL G RDO (E06)	DEL G MDO (E06)	DEL G RO (E06)	TTL G (E06)
1973	2581	4447	262	3.91	1.96	0.20				26	44	3	26	44	3	73
1974	2581	4447	262	3.91	1.96	0.20				1291	313	3	1265	269	1	1534
1975	2581	4447	262		1.96	0.20	1.56			2310	2224	4	1019	1910	1	2930
1976	2581	4447	262			0.20	1.56	0.98		2524	3611	5	214	1387	1	1602
1977	2581	4447	262			0.20	1.56	0.98		2569	4133	6	45	522	1	568
1978		4447	262			0.20		0.98			4329	7		196	1	197
1979		4447	262			0.20		0.98			4403	8		74	1	75
1980			262			0.20						10			2	2
1981			262			0.20						12			2	2
1982			262			0.20						15			3	3
1983			262			0.20						18			3	3
1984			262			0.20						22			4	4
1985			262			0.20						27			5	5
1986			262			0.20						33			6	6
1987			262			0.20						40			7	7
1988			262			0.20						49			9	9
1989			262			0.20						60			11	11
1990			262			0.20						73			13	13
1991			262			0.20						89			16	16
1992			262			0.20						108			19	19
1993			262			0.20						131			23	23
1994			262						0.10			143			12	12
1995			262						0.10			154			11	11
1996			262						0.10			164			10	10
1997			262						0.10			173			9	9
1998			262						0.10			182			8	8
1999			262						0.10			189			7	7
2000			262						0.10			196			7	7
2001			262						0.10			202			6	6
2002			262						0.10			208			6	6
2003			262						0.10			213			5	5
2004			262						0.10			217			5	5
2005			262						0.10			221			4	4
2006			262						0.10			225			4	4
2007			262						0.10			229			3	3
2008			262						0.10			232			3	3
2009			262						0.10			235			3	3
2010			262						0.10			237			3	3
2011			262						0.10			239			2	2
2012			262						0.10			242			2	2
2013			262						0.10			243			2	2
2014			262						0.10			245			2	2
2015			262						0.10			247			2	2
2016			262						0.10			248			1	1
2017			262						0.10			249			1	1
2018			262						0.10			251			1	1
2019			262						0.10			252			1	1
2020			262						0.10			253			1	1
2021			262						0.10			254			1	1
2022			262						0.10			254			1	1
2023			262						0.10			255			1	1
2024			262						0.10			256			1	1
2025			262						0.10			256			1	1
2026			262						0.10			257			1	1
2027			262						0.10			257			0	0
2028			262						0.10			258			0	0
2029			262						0.10			258			0	0
2030			262						0.10			258			0	0
2031			262						0.10			259			0	0
2032			262						0.10			259			0	0
2033			262						0.10			259			0	0

SHELDON ARLETA KINETIC MODEL

RD = READILY DECOMPOSABLE MATERIAL
MSD = MORE SLOWLY DECOMPOSABLE MATERIAL
T1/2 = TIME, HALF LIFE (YR)
Tmax = TOTAL LIFE EXPECTED, (YR)
Lo = MAXIMUM YIELD OF METHANE, (L)
G = VOLUME OF GAS PRODUCED, (L)
K1 = FIRST STAGE GAS PRODUCTION CONSTANT, (1/YR) FOR T<T1/2
K2 = SECOND STAGE GAS PRODUCTION CONSTANT, (1/YR) FOR T>T1/2

ASSUMPTIONS:
LANDFILL SURFACE AREA = 16,000 SQ M
AVERAGE DEPTH = 10 M
RECOVERY POTENTIAL = 90 L METHANE/KG
REFUSE DENSITY = 500 KG/CU M

GIVEN:
T1/2(RD) = 9 YR
T1/2 (MSD) = 36 YR
Tmax = (T1/2)/0.35
31% OF REFUSE IS RD
66% OF REFUSE IS MSD

NOTE: THE SHELDON ARLETA KINETIC MODEL GIVES A VALUE OF 2.01 E03 LITERS OF METHANE PER KILOGRAM OF REFUSE. THIS WOULD RELATE TO A MAXIMUM YIELD OF 4.23 E10 LITERS OF METHANE, BASED ON THE OTHER PARAMETERS GIVEN. FPM ARE USING 7.29 E09 LITERS OF METHANE (THE VALUE DETERMINED IN THE OTHER MODELS) FOR COMPARISON PURPOSES.

Lo = (90 l METHANE/KG)(500 KG/CU M)(16,000 SQ M)(10 M) =7.29E9 L METHANE

K1 = (ln(50))/T1/2
K2 = (ln(50))/(0.99(Tmax)-T1/2)

G = 0.5(Lo)EXP(-K1(T1/2-T)), FOR T<T1/2
G = Lo(1-0.5(EXP(-K2(T-T1/2)))), FOR T>T1/2

TIME (YEARS)	Lo RD (E06)	Lo MSD (E06)	K1-RD	K1-RD	K2-MSD	K2-MSD	G RD (E06)	G MSD (E06)	DEL RD (E06)	DEL MSD (E06)	RD+MSD (E06)	DEL RD+MSD (E06)
1973	2260	4811	0.43		0.11		24	46	24	46	69	69
1974	2260	4811	0.43		0.11		36	51	13	5	87	18
1975	2260	4811	0.43		0.11		56	57	19	6	113	25
1976	2260	4811	0.43		0.11		86	64	30	7	149	37
1977	2260	4811	0.43		0.11		132	71	46	7	203	53
1978	2260	4811	0.43		0.11		202	79	71	8	282	79
1979	2260	4811	0.43		0.11		311	89	109	9	400	118
1980	2260	4811	0.43		0.11		478	99	167	10	577	177
1981	2260	4811	0.43		0.11		735	111	257	12	846	268
1982	2260	4811	0.43		0.11		1130	123	395	13	1253	408
1983	2260	4811		0.23	0.11		1362	138	232	14	1500	247
1984	2260	4811		0.23	0.11		1547	154	184	16	1700	200
1985	2260	4811		0.23	0.11		1693	172	147	18	1865	164
1986	2260	4811		0.23	0.11		1810	192	116	20	2001	136
1987	2260	4811		0.23	0.11		1902	214	93	22	2116	115
1988	2260	4811		0.23	0.11		1976	239	74	25	2214	98
1989	2260	4811		0.23	0.11		2034	267	58	28	2301	86
1990	2260	4811		0.23	0.11		2080	298	46	31	2378	77
1991	2260	4811		0.23	0.11		2117	332	37	35	2449	71
1992	2260	4811		0.23	0.11		2147	371	29	39	2517	68
1993	2260	4811		0.23	0.11		2170	414	23	43	2584	66
1994	2260	4811		0.23	0.11		2188	462	18	48	2650	67
1995	2260	4811		0.23	0.11		2203	516	15	54	2719	68
1996	2260	4811		0.23	0.11		2215	576	12	60	2790	72
1997	2260	4811		0.23	0.11		2224	643	9	67	2867	76
1998	2260	4811		0.23	0.11		2231	717	7	75	2949	82
1999	2260	4811		0.23	0.11		2237	801	6	83	3038	89
2000		4811			0.11			894		93	894	93
2001		4811			0.11			998		104	998	104
2002		4811			0.11			1114		116	1114	116
2003		4811			0.11			1243		130	1243	130
2004		4811			0.11			1388		145	1388	145
2005		4811			0.11			1549		161	1549	161
2006		4811			0.11			1730		180	1730	180
2007		4811			0.11			1931		201	1931	201
2008		4811			0.11			2155		224	2155	224
2009		4811			0.11			2406		251	2406	251
2010		4811				0.06		2546		140	2546	140
2011		4811				0.06		2678		132	2678	132
2012		4811				0.06		2802		124	2802	124
2013		4811				0.06		2919		117	2919	117
2014		4811				0.06		3029		110	3029	110
2015		4811				0.06		3133		104	3133	104
2016		4811				0.06		3231		98	3231	98
2017		4811				0.06		3323		92	3323	92
2018		4811				0.06		3409		87	3409	87
2019		4811				0.06		3491		82	3491	82
2020		4811				0.06		3568		77	3568	77
2021		4811				0.06		3640		72	3640	72
2022		4811				0.06		3709		68	3709	68
2023		4811				0.06		3773		64	3773	64

SHELDON ARLETA KINETIC MODEL

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T1/2 = TIME, HALF LIFE (YR)
Tmax = TOTAL LIFE EXPECTED, (YR)
Lo = MAXIMUM YIELD OF METHANE, (L)

ASSUMPTIONS:
LANDFILL SURFACE AREA = 16,000 SQ M
AVERAGE DEPTH = 10 M
RECOVERY POTENTIAL = 90 L METHANE/KG
REFUSE DENSITY = 500 KG/CU M

G = VOLUME OF GAS PRODUCED, (L)
K1 = FIRST STAGE GAS PRODUCTION CONSTANT, (1/YR) FOR T<T1/2
K2 = SECOND STAGE GAS PRODUCTION CONSTANT, (1/YR) FOR T>T1/2

GIVEN:
T1/2(RD) = 9 YR
T1/2 (MSD) = 36 YR
Tmax = (T1/2)/0.35
31% OF REFUSE IS RD
66% OF REFUSE IS MSD

NOTE: THE SHELDON ARLETA KINETIC MODEL GIVES A VALUE OF 2.01 E03 LITERS OF METHANE PER KILOGRAM OF REFUSE. THIS WOULD RELATE TO A MAXIMUM YIELD OF 4.23 E10 LITERS OF METHANE, BASED ON THE OTHER PARAMETERS GIVEN. FPM ARE USING 7.29 E09 LITERS OF METHANE (THE VALUE DETERMINED IN THE OTHER MODELS) FOR COMPARISON PURPOSES.

Lo = (90 1 METHANE/KG)(500 KG/CU M)(16,000 SQ M)(10 M) =7.29E9 L METHANE

K1 = (ln(50))/T1/2
K2 = [ln(50)]/(0.99(Tmax)-T1/2)

G = 0.5(Lo)EXP(-K1(T1/2-T)), FOR T<T1/2
G = Lo(1-0.5(EXP(-K2(T-T1/2)))), FOR T>T1/2

TIME (YEARS)	Lo RD (E06)	Lo MSD (E06)	K1-RD	K1-RD	K2-MSD	K2-MSD	G RD (E06)	G MSD (E06)	DEL RD (E06)	DEL MSD (E06)	RD+MSD (E06)	DEL RD+MSD (E06)
2024		4811				0.06		3833		60	3833	60
2025		4811				0.06		3890		57	3890	57
2026		4811				0.06		3944		54	3944	54
2027		4811				0.06		3994		51	3994	51
2028		4811				0.06		4042		48	4042	48
2029		4811				0.06		4087		45	4087	45
2030		4811				0.06		4129		42	4129	42
2031		4811				0.06		4169		40	4169	40
2032		4811				0.06		4206		37	4206	37
2033		4811				0.06		4241		35	4241	35
2034		4811				0.06		4275		33	4275	33
2035		4811				0.06		4306		31	4306	31
2036		4811				0.06		4335		29	4335	29
2037		4811				0.06		4363		28	4363	28
2038		4811				0.06		4389		26	4389	26
2039		4811				0.06		4414		25	4414	25
2040		4811				0.06		4437		23	4437	23
2041		4811				0.06		4459		22	4459	22
2042		4811				0.06		4479		21	4479	21
2043		4811				0.06		4499		19	4499	19
2044		4811				0.06		4517		18	4517	18
2045		4811				0.06		4534		17	4534	17
2046		4811				0.06		4550		16	4550	16
2047		4811				0.06		4565		15	4565	15
2048		4811				0.06		4580		14	4580	14
2049		4811				0.06		4593		13	4593	13
2050		4811				0.06		4606		13	4606	13
2051		4811				0.06		4618		12	4618	12
2052		4811				0.06		4629		11	4629	11
2053		4811				0.06		4640		11	4640	11
2054		4811				0.06		4650		10	4650	10
2055		4811				0.06		4659		9	4659	9
2056		4811				0.06		4668		9	4668	9
2057		4811				0.06		4676		8	4676	8
2058		4811				0.06		4684		8	4684	8
2059		4811				0.06		4692		7	4692	7
2060		4811				0.06		4699		7	4699	7
2061		4811				0.06		4705		7	4705	7
2062		4811				0.06		4711		6	4711	6
2063		4811				0.06		4717		6	4717	6
2064		4811				0.06		4723		5	4723	5
2065		4811				0.06		4728		5	4728	5
2066		4811				0.06		4733		5	4733	5
2067		4811				0.06		4737		5	4737	5
2068		4811				0.06		4742		4	4742	4
2069		4811				0.06		4746		4	4746	4
2070		4811				0.06		4749		4	4749	4
2071		4811				0.06		4753		4	4753	4
2072		4811				0.06		4756		3	4756	3
2073		4811				0.06		4760		3	4760	3
2074		4811				0.06		4763		3	4763	3
2075		4811				0.06		4766		3	4766	3
2076		4811				0.06		4768		3	4768	3

SCHOLL CANYON KINETIC MODEL

KL = METHANE PRODUCTION RATE
K = GAS PRODUCTION CONSTANT
T = TIME, YEAR
L = VOLUME OF METHANE REMAINING TO BE PRODUCED
Lo = MAXIMUM YIELD OF METHANE, (Liters, L)
G = VOLUME OF GAS PRODUCED, (Liters, L)

ASSUME: LANDFILL SURFACE AREA = 16000 SQ M
AVERAGE LANDFILL DEPTH = 10 M
REFUSE DENSITY = 500 KG
KL = 1.25 L/KG @ T=15 YR (1988)
Lo = 90 L METHANE/KG REFUSE

Lo = (90 l METHANE/KG)(500 KG/CU M)(16,000 SQ M)(10 M) =7.29E9 L ME

KL = KLoEXP(-KT)
L = LoEXP(-KT)
G = Lo(1-(EXP(-KT)))

TIME (YEARS)	Lo (E06)	K	G (E06)	DELTA G (E06)
1973	7290	0.0183	0	0
1974	7290	0.0183	132	132
1975	7290	0.0183	262	130
1976	7290	0.0183	389	127
1977	7290	0.0183	515	125
1978	7290	0.0183	637	123
1979	7290	0.0183	758	121
1980	7290	0.0183	877	118
1981	7290	0.0183	993	116
1982	7290	0.0183	1107	114
1983	7290	0.0183	1219	112
1984	7290	0.0183	1329	110
1985	7290	0.0183	1437	108
1986	7290	0.0183	1543	106
1987	7290	0.0183	1648	104
1988	7290	0.0183	1750	102
1989	7290	0.0183	1850	100
1990	7290	0.0183	1949	99
1991	7290	0.0183	2046	97
1992	7290	0.0183	2141	95
1993	7290	0.0183	2234	93
1994	7290	0.0183	2326	92
1995	7290	0.0183	2416	90
1996	7290	0.0183	2504	88
1997	7290	0.0183	2591	87
1998	7290	0.0183	2676	85
1999	7290	0.0183	2760	84
2000	7290	0.0183	2842	82
2001	7290	0.0183	2923	81
2002	7290	0.0183	3002	79
2003	7290	0.0183	3080	78