GEOTECH CONSULTANTS, INC.
13256 NE 20th Street, Suite 16
Bellevue, WA 98005
(425) 747-5618
FAX (425) 747-8561

RECEIVED
AUG 24 1998
DEPT. OF ECOLOGY

August 17, 1998

RECEIVED
AUG 19 1998
CITY OF EVERETT
Permit Services

JN-98313

Steffen Jacobson
3035 Fairweather Place
Hunts Point, Washington 98004-1002

Subject: **Geotechnical Engineering Study**
Proposed North Point Apartments
East Marine View Drive
Everett, Washington

Dear Mr. Jacobson:

We are pleased to present this geotechnical engineering report for the proposed North Point Apartments to be constructed on East Marine View Drive in Everett, Washington. The scope of our work consisted of exploring site surface and subsurface conditions, and then developing this report to provide recommendations for general earthwork and design criteria for foundations, and retaining walls. You authorized our work by accepting our proposal, P-4616, dated July 14, 1998.

The subsurface conditions of the proposed apartment complex were explored with ten test pits that generally encountered a thin topsoil layer and 3 to 5 feet of loose to medium dense weathered soils overlying dense to very dense glacial till. However, in the western third of the property, 6 to 10 feet of unengineered fill overlies the native soils. Based on the proposed basement levels for the buildings, we anticipate that the fill soils will be removed during site excavation. Conventional footings bearing on the dense, native soils beneath the topsoil and loose weathered soils should be used to support the proposed apartment buildings the weathered soils and structural fill can be used to support the basement slabs. In general, much of the on-site soils are moisture sensitive and will make wet weather grading and earthwork more difficult.

The attached report contains a discussion of the study and our recommendations. Please contact us if there are any questions regarding this report, or if we can be of further assistance during the design and construction phases of this project.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

Robert Ward, P.E.
Associate

DRW: alt

GEOTECHNICAL ENGINEERING STUDY
Proposed North Point Apartments
East Marine View Drive
Everett, Washington

This report presents the findings and recommendations of our geotechnical engineering study for the site of a proposed residential subdivision in Everett, Washington. The Vicinity Map, Plate 1, illustrates the general location of the site.

Development of the property is in the planning stage, and detailed plans were not made available to us. The site plans provided to us prior to our explorations depicted the proposed apartment building locations and floor elevations, along with topographic information. Based on this information, we understand that the project development includes three buildings, all with lower level parking mostly surrounded with surface parking. Two L-shaped buildings will be at the northwestern and southwestern portions of the site, while a T-shaped building will be located near the middle. Finish floor elevations for the buildings will range from 51 feet to 70 feet. Excavation depths of as much as 20 feet in the western portion of the site are anticipated. Several feet of fill will be required in the eastern part of the project to achieve the desired floor grade.

SITE CONDITIONS

Surface

The nearly rectangular site covers approximately 4.5 acres and is currently vacant. It has about 600 feet of frontage along the eastern side of East Marine View Drive and an average depth of about 335 feet. The 11th Street right-of-way, partially improved to provide access to neighboring residences, borders the southern property line.

The property is relatively flat from East Marine View Drive eastward for about 30 to 40 feet then drops moderately to steeply 10 to 15 feet in elevation. A second flat area that has the appearance of a former haul road extends nearly across the property from north to south. Continuing eastward, the ground slopes gently downward to the eastern property line and beyond. Topographic relief across the site from west to east is about 50 feet. The property is well-vegetated with trees and dense undergrowth. Concrete elements which appear to be a foundation for a small building were found near the center of the southern half of the site.

Subsurface

The subsurface conditions were explored by excavating ten test pits at the approximate locations shown on the Site Exploration Plan, Plate 2. The field exploration program was based upon the proposed construction and required design criteria, the site topography and access, the subsurface conditions revealed during excavation, and on the scope of work outlined in our proposal.

The test pits were excavated on July 24, 1998, with a trackhoe. A geotechnical engineer from our staff observed the excavation process, logged the test pits, and obtained representative samples of the soils encountered. "Grab" samples of selected subsurface soils were collected from the trackhoe bucket. The Test Pit Logs are attached to this report as Plates 3 through 7.

In the westernmost portion of the site, adjacent to East Marine View Drive, the test pits encountered 6 to 10 feet of fill consisting of loose, brown, silty sand with some organics, gravel, and concrete and asphalt debris. Beneath 6 to 12 inches of topsoil, found below the fill or mostly at the ground surface, the native soils consist of 3 to 5 feet of loose to medium-dense, brown, weathered, silty sand with gravel which then became gray and very dense. The silty sands have been glacially consolidated and are referred to as glacial till. In our explorations, the dense to very dense glacial till was encountered to a maximum explored depth of 16.5 feet below existing surface grade.

The final logs represent our interpretations of the field logs and laboratory tests. The stratification lines on the logs represent the approximate boundaries between soil types at the exploration locations. The actual transition between soil types may be gradual, and subsurface conditions can vary between exploration locations. The logs provide specific subsurface information only at the locations tested. The relative densities and moisture descriptions indicated on the test pit logs are interpretive descriptions based on the conditions observed during excavation. The compaction of backfill was not in the scope of our services. Loose soil will therefore be found in the area of the test pits. If this presents a problem, the backfill will need to be removed and replaced with structural fill during construction.

Groundwater

No groundwater seepage was observed in any of the test pits, however, they were left open for only a short time period. It should be noted that groundwater levels vary seasonally with rainfall and other factors. We anticipate that groundwater could be found between the near-surface, weathered soil and the underlying glacial till and in more permeable soil layers or pockets within the till soils, especially during the normally wet winter and spring months.

CONCLUSIONS AND RECOMMENDATIONS

General

Based on the test pits and our observations made during our site visit, it is our opinion that the proposed multi-residential development is feasible on this site from a geotechnical engineering standpoint. The proposed buildings should be supported on conventional foundations bearing on the dense to very dense glacial till soils. Due to the large size of the buildings and the deep cuts proposed on the western ends of the buildings, we recommend that no structural fill be placed under any portion of the buildings due to the potential for differential settlement. Lean-mix concrete could be used beneath footings on the eastern sides of the buildings where the proposed finish floor levels are above the existing ground level.

One of the main geotechnical challenges for this project is the construction of the below-grade parking levels and the proximity of East Marine View Drive to the excavation. Because of the large cuts proposed for the two buildings near the western property line, temporary shoring would be needed unless construction easements can be acquired from the City of Everett. All cuts slopes in the existing fill and weathered soils should be inclined at 1:1 (Horizontal: Vertical), and 0.75:1 (H:V) in the dense glacial till.

Due to the relatively high bearing capacities recommended in this report, extra care must be utilized to remove loosened or disturbed soils from the footing subgrades prior to concrete placement. The site soils are generally silty and moisture sensitive, therefore, it is important that the bearing surfaces be protected from disturbance, especially during wet weather. Although no structural fill should be placed beneath the proposed foundations, the bearing surface should be protected by a thin layer of lean concrete or a thin layer of washed crushed rock. This reduces the potential for disturbance of footing subgrades during placement of footing drains and reinforcing. The silty native soils will not be usable as structural fill in general during the wet season or when they have high moisture contents. Therefore, it would be advantageous to perform earthwork during the normally dry summer and early fall months when the soils will be drier or can be aerated to lower their moisture content.

Groundwater was not encountered in any of our test pits. However, if significant groundwater is encountered in the excavation, a system of underslab drains may be needed to ensure that seepage does not come through the basement slab. Underslab drainage considerations are covered more fully in the later section **Drainage Considerations**.

Geotech Consultants, Inc. should be allowed to review the final development plans to verify that the recommendations presented in this report are adequately addressed in the design. Such a plan review would be additional work beyond the current scope of work for this study, and it may include revisions to our recommendations to accommodate site, development, and geotechnical constraints that become more evident during the review process.

Conventional Foundations

The proposed structure can be supported on conventional continuous and spread footings bearing on undisturbed, dense to very dense, native soil. We recommend that continuous and individual spread footings have minimum widths of 16 and 24 inches, respectively. They should be bottomed at least 12 inches below the lowest adjacent finish ground surface for frost protection. The local building codes should be reviewed to determine if different footing widths or embedment depths are required. Footing subgrades must be cleaned of loose or disturbed soil prior to pouring concrete. Depending upon site and equipment constraints, this may require removing the disturbed soil by hand.

Because of the relatively high bearing values recommended in this report, lean concrete could be used to fill any areas of overexcavation. The lean-mix concrete should be at a 1-1/2 sack mix. No structural fill should be placed beneath the foundations.

An allowable bearing pressure of 5,000 pounds per square foot (psf) is appropriate for footings supported on competent native soil. A one-third increase in this design bearing pressure may be used when considering short-term wind or seismic loads. For the above design criteria, it is anticipated that the total post-construction settlement of footings founded on competent native soil, will be about one-half inch, with differential settlements on the order of one-quarter inch in a distance of 100 feet along a continuous footing.

Lateral loads due to wind or seismic forces may be resisted by friction between the foundation and the bearing soil, or by passive earth pressure acting on the vertical, embedded portions of the foundation. For the latter condition, the foundation must be either poured directly against relatively level, undisturbed soil, or surrounded by level, structural fill. We recommend using the following design values for the foundation's resistance to lateral loading:

Parameter	Design Value
Coefficient of Friction	0.50
Passive Earth Pressure	300 pcf

Where: (i) pcf is pounds per cubic foot, and (ii) passive earth pressure is computed using the equivalent fluid density.

If the ground in front of a foundation is loose or sloping, the passive earth pressure given above will not be appropriate. We recommend a safety factor of at least 1.5 for the foundation's resistance to lateral loading, when using the above design values.

Seismic Considerations

The site is located within Seismic Zone 3 as illustrated on Figure No. 16-2 of the 1997 Uniform Building Code (UBC). In accordance with Table 16-J of the 1997 UBC, the site soil profile is best represented by Profile Type S_C (Very Dense Soil). The glacial till soils which underlie the site are not susceptible to liquefaction during an earthquake.

Slabs-on-Grade

The building floors may be constructed as slabs-on-grade atop competent native soil or on structural fill. The subgrade soil must be in a firm, non-yielding condition at the time of slab construction or underslab fill placement. Any soft areas encountered should be excavated and replaced with select, imported structural fill.

All slabs-on-grade should be underlain by a capillary break or drainage layer consisting of a minimum 4-inch thickness of coarse, free-draining structural fill with a gradation similar to that discussed later in **Permanent Foundation and Retaining Walls**. In areas where the passage of moisture through the slab is undesirable, a vapor barrier, such as a 6-mil plastic membrane, should be placed beneath the slab. Additionally, sand should be used in the fine-grading process to reduce damage to the vapor barrier, to provide uniform support under the slab, and to reduce shrinkage cracking by improving the concrete curing process.

Permanent Foundation and Retaining Walls

Retaining walls backfilled on only one side should be designed to resist the lateral earth pressures imposed by the soil they retain. The following recommended design parameters are for walls that restrain level backfill:

Parameter	Design Value
Active Earth Pressure *	35 pcf
Passive Earth Pressure	350 pcf
Coefficient of Friction	0.50
Soil Unit Weight	135 pcf

Where: (i) pcf is pounds per cubic foot, and (ii) active and passive earth pressures are computed using the equivalent fluid densities.

*** For restrained walls that cannot deflect at least 0.002 times its height, a uniform lateral pressure equal to 25H psf should be used as active earth pressure. H is the effective design height of the wall, including surcharges.**

The values given above are to be used to design permanent foundation and retaining walls only. The passive pressure given is appropriate for the depth of level structural fill placed in front of a retaining or foundation wall only. We recommend a safety factor of at least 1.5 for overturning and sliding, when using the above recommended values to design the walls.

The design values given above do not include the effects of any hydrostatic pressures behind the walls and assume that no surcharge slopes or loads, such as vehicles, will be placed behind the walls. The surcharge due to traffic loads behind a wall can typically be accounted for by adding a uniform pressure equal to 2 feet multiplied by the above active fluid density.

Heavy construction equipment should not be operated behind retaining and foundation walls within a distance equal to the height of a wall, unless the walls are designed for the additional lateral pressures resulting from the equipment. The wall design criteria assumes that the backfill will be well-compacted in lifts no thicker than 12 inches. The compaction of backfill near the walls should be accomplished with hand-operated equipment to prevent the walls from being overloaded by the higher soil forces that occur during compaction.

Retaining Wall Backfill

Backfill placed behind retaining or foundation walls should be coarse, free-draining, structural fill containing no organics. This backfill should contain no more than 5 percent silt or clay particles and have no gravel greater than 4 inches in diameter. The percentage of particles passing the No. 4 sieve should be between 25 and 70 percent. For increased protection, drainage composites should be placed along cut slope faces, and the walls should be backfilled with pervious soil.

The purpose of these backfill requirements is to ensure that the design criteria for a retaining wall are not exceeded because of a build-up of hydrostatic pressure behind the wall. The top 12 to 18 inches of the backfill should consist of a compacted, relatively impermeable soil or topsoil, or the surface should be paved. The ground surface must also slope away from backfilled walls to reduce the potential for surface water to percolate into the backfill. The sub-section entitled **General Earthwork and Structural Fill** contains recommendations regarding the placement and compaction of structural fill behind retaining and foundation walls.

The above recommendations are not intended to waterproof the below-grade walls. If moist conditions or some seepage through the walls are not acceptable, waterproofing should be provided. This typically includes limiting cold-joints and wall penetrations, and using bentonite panels or membranes on the outside of the walls. Applying a thin coat of asphalt emulsion is not considered waterproofing, but it will only help to prevent moisture, generated from water vapor or capillary action, from seeping through the concrete.

Excavations and Slopes

Excavation slopes should not exceed the limits specified in local, state, and national government safety regulations. Temporary cuts to a depth of about 4 feet may be attempted vertically in unsaturated soil if there are no indications of slope instability. Based upon Washington Administrative Code (WAC) 296, Part N, the dense glacial till soil at the subject site would be classified as Type A. Therefore, temporary cut slopes greater than 4 feet in height cannot be excavated at an inclination steeper than 0.75:1 (Horizontal:Vertical), extending continuously between the top and the bottom of a cut. The weathered and fill soils are Type B, thus, temporary cuts greater than 4 feet in height cannot be excavated at an inclination steeper than 1:1 (H:V), extending continuously between the top and the bottom of a cut. Temporary cut slopes should extend no closer than 5 feet to traveled streets, alleys, or parking areas. Other excavation considerations are discussed in the **General** section.

The above recommended temporary slope inclination is based on what has been successful at other sites with similar soil conditions. Temporary cuts are those that will remain unsupported for a relatively short duration to allow for the construction of foundations, retaining walls, or utilities. Temporary cut slopes should be protected with plastic sheeting during wet weather. The cut slopes should also be backfilled or retained as soon as possible to reduce the potential for instability. Please note that sand can cave suddenly and without warning. Utility contractors should be made especially aware of this potential danger.

All permanent cuts into native soil should be inclined no steeper than 2:1 (H:V). To reduce the potential for shallow sloughing, fill must be compacted to the face of these slopes. This could be accomplished by overbuilding the compacted fill and then trimming it back to its final inclination. Water should not be allowed to flow uncontrolled over the top of any temporary or permanent slope. Also, all permanently exposed slopes should be seeded with an appropriate species of vegetation to reduce erosion and improve the stability of the surficial layer of soil.

Temporary Shoring

This section presents design considerations for cantilevered or tied-back soldier pile walls. We suggest that the contractor work closely with the structural engineer during the shoring design. The design should be submitted to Geotech Consultants, Inc. for review prior to beginning site excavation. We are available and would be pleased to assist in this design effort.

Cantilevered and Tied-Back Soldier Pile Walls

Cantilevered and tied-back soldier pile shoring systems have proven to be an efficient and economical method for providing excavation shoring. Tied-back walls are typically more economical than cantilevered walls where the depth of excavation is greater than 15 feet.

Soldier Pile Installation

Soldier pile walls would be constructed prior to commencing the excavation by setting steel H-beams in a drilled hole and grouting the space between the beam and the soil with concrete for the entire height of the drilled hole. We anticipate that the holes could be drilled without casing, but the contractor should be prepared to case the holes or use the slurry method if caving soil is encountered. Excessive ground loss in the drilled holes must be avoided to reduce the potential for settlement on adjacent properties. If water is present in a hole at the time the soldier pile is poured, concrete must be tremied to the bottom of the hole.

As excavation proceeds downward, the space between the piles should be lagged with treated timber, and any voids behind the timbers should be filled with pea gravel or a sand and fly ash slurry. The prompt and careful installation of lagging is important, particularly in loose or caving soil, to maintain the integrity of the excavation and provide safer working conditions. Additionally, care must be taken by the excavator to remove no more soil between the soldier piles than is necessary to install the lagging. Caving or overexcavation during lagging placement could result in loss of ground on neighboring properties.

1. For the excavation depths anticipated and with pile spacings of about 6 feet, nominal 4-inch lagging can be used.

2. Timber lagging should be designed for an applied lateral pressure of 30 percent of the design wall pressure, if the pile spacing is less than three pile diameters. For larger pile spacings, the lagging should be designed for 50 percent of the design load.

If permanent building walls are to be constructed against the shoring walls, drainage should be provided by attaching a geotextile drainage composite with a solid plastic backing, similar to Miradrain 6000, to the face of the lagging, prior to pouring the foundation wall. These drainage composites should be hydraulically connected to the foundation drainage system through weep holes placed in the foundation walls.

Soldier Pile Wall Design

Temporary cantilevered shoring with a level backslope should be designed for an active soil pressure equal to that pressure exerted by an equivalent fluid with a unit weight of 30 pcf. A surcharge of 15H psf should be added to the active pressure for 1:1 (H:V) slopes above shoring walls, where it is the height of the slope. Traffic surcharges can be accounted for by increasing the effective height of the shoring wall by 2 feet.

Lateral movement of the soldier piles below the excavation level will be resisted by an allowable passive soil pressure equal to that pressure exerted by a fluid with a density of

400 pcf. This soil pressure is valid only for a level excavation in front of the soldier pile; it acts on two times the grouted pile diameter. The minimum embedment below the floor of the excavation for cantilever soldier piles should be equal to the height of the "stick-up." The maximum bending moment in the soldier pile will occur at the point of zero shear, where the active and passive soil forces are equivalent. The depth of embedment below the bottom of the excavation can be calculated by determining the embedment that will satisfy moment equilibrium about the bottom of the pile and then adding 20 percent to that length to satisfy force equilibrium.

The vertical capacity of soldier piles will be developed by a combination of frictional shaft resistance along the embedded length and pile end-bearing.

Parameter	*Design Value*
Pile Shaft Friction	1,000 psf
Pile End-Bearing	10,000 psf

The above values assume that the excavation is level in front of the soldier pile and that the bottom of the pile is embedded a minimum of 10 feet below the floor of the excavation. The concrete surrounding the embedded portion of the pile must have sufficient bond and strength to transfer the vertical load from the steel section through the concrete into the soil.

Drainage Considerations

If foundation walls are constructed against the shoring walls, a drainage composite should be placed against the lagging prior to pouring the foundation wall. Weep pipes located no more than 6-feet-on-center should be connected to the drainage composite and pour into the foundation walls or the perimeter footing. A footing drain installed along the inside of the perimeter footing will be used to collect and carry the water discharged by the weep pipes to the storm drain system. Footing drains placed inside the building or behind backfilled walls should consist of 4-inch PVC pipe surrounded by at least 6 inches of 1-inch minus, washed rock wrapped in a non-woven, geotextile filter fabric (Mirafi 140N, Supac 4NP, or similar material). At its highest point, a perforated pipe invert should be at least as low as the bottom of the footing, and it should be sloped for drainage. All roof and surface water drains must be kept separate from the foundation drain system. For the best long-term performance, perforated PVC pipe is recommended for all subsurface drains.

If seepage is encountered in an excavation, it should be drained from the site by directing it through drainage ditches, perforated pipe or French drains, or by pumping it from sumps interconnected by shallow connector trenches at the bottom of the excavation.

The excavation and site should be graded so that surface water is directed off the site and away from the tops of slopes. Water should not be allowed to stand in any area where foundations, slabs, or pavements are to be constructed. Final site grading in areas adjacent to the building should slope away at least 2 percent, except where the area is paved.

General Earthwork and Structural Fill

Structural fill is defined as any fill placed under a building, behind permanent retaining or foundation walls, or in other areas where the underlying soil needs to support loads. All structural fill should be placed in horizontal lifts with a moisture content at, or near, the optimum moisture content. The optimum moisture content is that moisture content that results in the greatest compacted dry density. The moisture content of fill is very important and must be closely controlled during the filling and compaction process.

The allowable thickness of the fill lift will depend on the material type selected, the compaction equipment used, and the number of passes made to compact the lift. The loose lift thickness should not exceed 12 inches. We recommend testing the fill as it is placed. If the fill is not compacted to specifications, it can be recompacted before another lift is placed. This eliminates the need to remove the fill to achieve the required compaction. The following table presents recommended relative compactions for structural fill:

Location of Fill Placement	Minimum Relative Compaction
Beneath footings, slabs or walkways	95%
Behind retaining walls	90%
Beneath pavements	95% for upper 12 inches of subgrade; 90% below that level

Where: Minimum Relative Compaction is the ratio, expressed in percentages, of the compacted dry density to the maximum dry density, as determined in accordance with ASTM Test Designation D 1557-78 (Modified Proctor).

Use of On-Site Soil

If grading activities take place during wet weather, or when the silty, on-site soil is wet, site preparation costs may be higher because of delays due to rain and the potential need to import granular fill. The on-site soil is generally silty and therefore moisture-sensitive. Grading operations will be difficult during wet weather, or when the moisture content of this soil exceeds the optimum moisture content.

The moisture content of the silty, on-site soil must be at, or near, the optimum moisture content, as the soil cannot be consistently compacted to the required density when the moisture content is significantly greater than optimum. The moisture content of the on-site soil was generally above the estimated optimum moisture content at the time of our explorations.

Moisture-sensitive soil may also be susceptible to excessive softening and "pumping" from construction equipment, or even foot traffic, when the moisture content is greater than the optimum moisture content. It may be beneficial to protect footing subgrades with a layer of washed crushed rock or a thin layer of lean concrete to limit disturbance from traffic.

Ideally, structural fill that will be placed in wet weather should consist of a coarse, granular soil with a silt or clay content of no more than 5 percent. The percentage of particles passing the No. 200 sieve should be measured from that portion of soil passing the three-quarter-inch sieve.

LIMITATIONS

The analyses, conclusions, and recommendations contained in this report are based on site conditions as they existed at the time of our exploration and assume that the soil encountered in the test pits is representative of subsurface conditions on the site. If the subsurface conditions encountered during construction are significantly different from those observed in our explorations, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary. Unanticipated soil conditions are commonly encountered on construction sites and cannot be fully anticipated by merely taking soil samples in test pits. Subsurface conditions can also vary between exploration locations. Such unexpected conditions frequently require making additional expenditures to attain a properly constructed project. It is recommended that the owner consider providing a contingency fund to accommodate such potential extra costs and risks. This is a standard recommendation for all projects.

This report has been prepared for the exclusive use of Steffen Jacobson, and his representatives, for specific application to this project and site. Our recommendations and conclusions are based on observed site materials, and selective laboratory testing and engineering analyses. Our conclusions and recommendations are professional opinions derived in accordance with current standards of practice within the scope of our services and within budget and time constraints. No warranty is expressed or implied. The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. We recommend including this report, in its entirety, in the project contract documents so the contractor may be aware of our findings.

ADDITIONAL SERVICES

In addition to reviewing the final plans, Geotech Consultants, Inc. should be retained to provide geotechnical consultation, testing, and observation services during construction. This is to confirm that subsurface conditions are consistent with those indicated by our exploration, to evaluate whether earthwork and foundation construction activities comply with the intent of contract plans and specifications, and to provide recommendations for design changes in the event subsurface conditions differ from those anticipated prior to the start of construction. However, our work would not include the supervision or direction of the actual work of the contractor and its employees or agents. Also, job and site safety, and dimensional measurements, will be the responsibility of the contractor.

The scope of our work did not include an environmental assessment, but we can provide this service, if requested.

The following plates are attached and complete this report:

Plate 1	Vicinity Map
Plate 2	Site Exploration Plan
Plates 3 - 7	Test Pit Logs
Plate 8	Footing Drain Detail

We appreciate the opportunity to be of service on this project. If you have any questions, or if we may be of further service, please do not hesitate to contact us.

Respectfully submitted,

GEOTECH CONSULTANTS, INC.

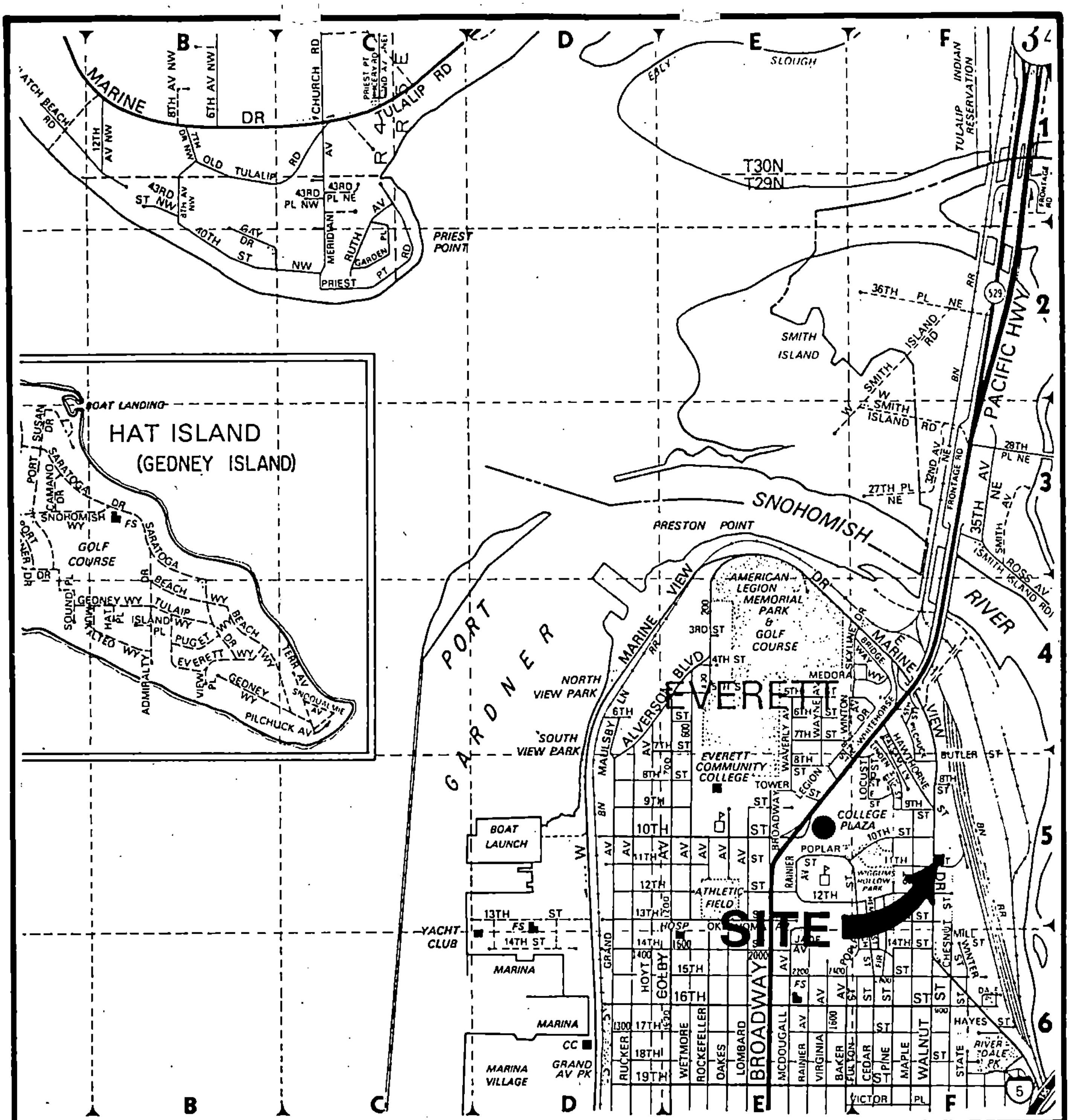
D. ROBERT WARD
STATE OF WASHINGTON
29740
REGISTERED PROFESSIONAL ENGINEER

8-17-98

EXPIRES 10-21-99

D. Robert Ward, P.E.
Associate

DBG/DRW: alt



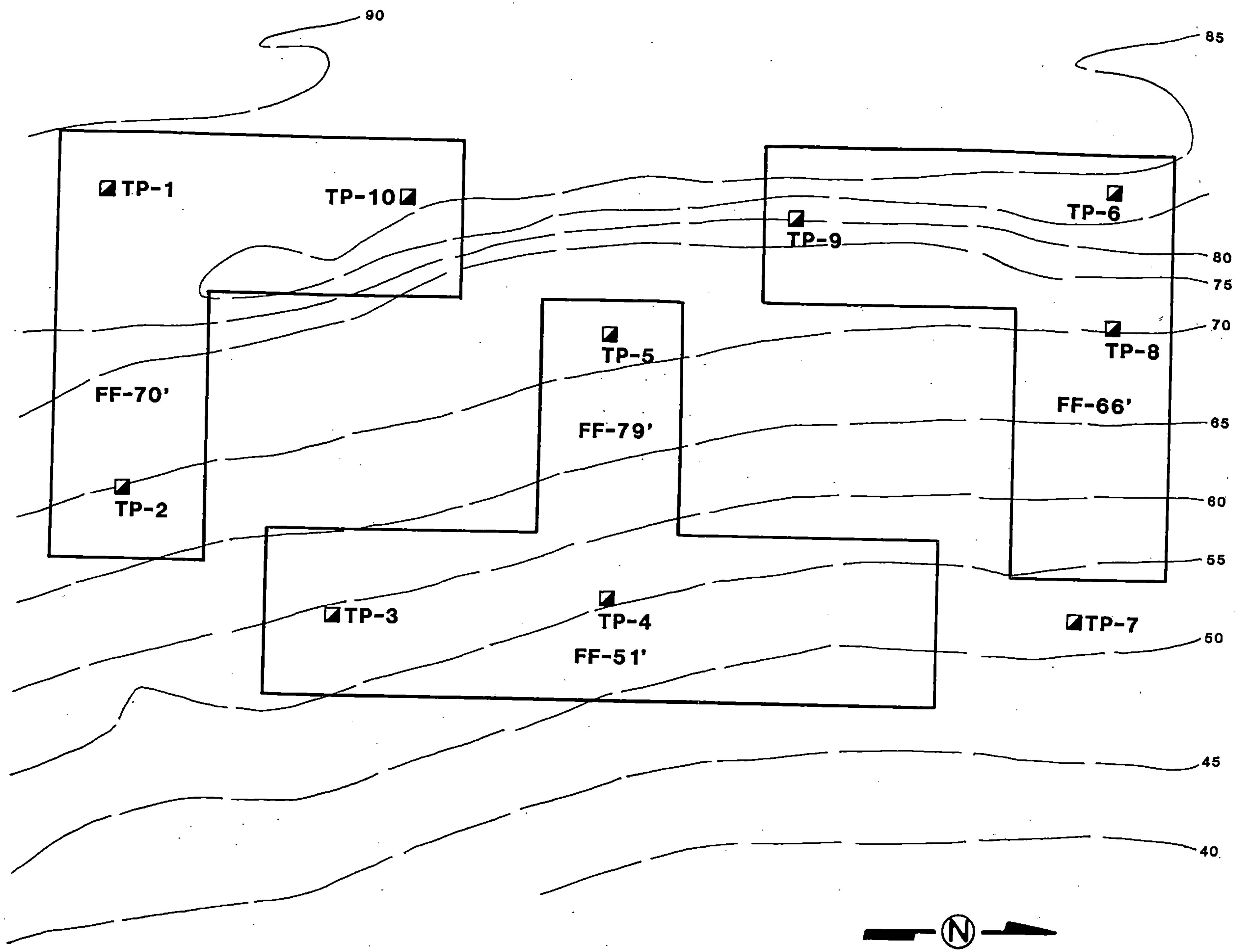
GEOTECH CONSULTANTS

VICINITY MAP

10XX E. MARINE VIEW DR.

EVERETT, WA

Job No.:	Date:		Plate:
98313	AUG 1998		1



LEGEND:

APPROXIMATE TEST PIT LOCATIONS

GEOTECH CONSULTANTS

SITE PLAN

10XX E. MARINE VIEW DR.

EVERETT, WA

Job No.:	Date:	Scale:	Plate:
98313	AUG 1998		2

TEST PIT 1

Depth (ft.)	Moisture Content (%)	Water Table	USCS	Description
0–6			FILL	Tall grass, weeds Brown, silty SAND with some organics and gravel, moist, loose ***(FILL)***
6–7				**TOPSOIL**
7–9			SM	Red-brown, silty, fine SAND with some gravel, moist, loose to medium-dense
9–16.5			SM	Gray, silty SAND with some gravel, moist, dense to very dense ***(Glacial Till)***

Depth scale: 5, 10, 15

* *Test Pit was terminated at 16.5 feet on July 24, 1998.*
* *No groundwater seepage was observed during excavation.*
* *No caving was observed during excavation.*

TEST PIT 2

Depth (ft.)	Moisture Content (%)	Water Table	USCS	Description
0–1				**TOPSOIL**
1–3			SM	Red-brown, silty SAND with some gravel, fine-grained, dry, loose
3–9.5			SM	Gray, silty SAND with gravel, moist, very dense ***(Glacial Till)***

Depth scale: 5, 10, 15

* *Test Pit was terminated at 9.5 feet on July 24, 1998.*
* *No groundwater seepage was observed during excavation.*
* *No caving was observed during excavation.*

GEOTECH
CONSULTANTS, INC.

TEST PIT LOG

10xx East Marine View Drive
Everett, Washington

Job No:	Date:	Logged by:	Plate:
98313	July 1998	DBG	3

TEST PIT 3

Depth (ft.)	Moisture Content (%)	Water Table	USCS	Description
				TOPSOIL
			SM	Red-brown, silty SAND with some gravel, fine-grained, dry to moist, loose - becomes medium-dense
5			SM	Gray, silty SAND with some gravel, moist, very dense ***(Glacial Till)***
10				
15				

* *Test Pit was terminated at 10 feet on July 24, 1998.*
* *No groundwater seepage was observed during excavation.*
* *No caving was observed during excavation.*

TEST PIT 4

Depth (ft.)	Moisture Content (%)	Water Table	USCS	Description
				TOPSOIL
5			SM SP	Red-brown, silty SAND, fine- to medium-grained, dry, loose to medium-dense - becomes less silty
			SM	Gray, silty SAND with some gravel, moist, very dense ***(Glacial Till)***
10				
15				

* *Test Pit was terminated at 9 feet on July 24, 1998.*
* *No groundwater seepage was observed during excavation.*
* *No caving was observed during excavation.*

GEOTECH
CONSULTANTS, INC.

TEST PIT LOG

10xx East Marine View Drive
Everett, Washington

Job No:	Date:	Logged by:	Plate:
98313	July 1998	DBG	4

TEST PIT 5

Depth (ft.)	Moisture Content (%)	Water Table	USCS	Description
				TOPSOIL
			SM	Brown, silty SAND, dry, loose
5			SM	Gray, silty SAND with some gravel, moist, very dense *(Glacial Till)*
10				
15				

**** Test Pit was terminated at 8.5 feet on July 24, 1998.***
**** No groundwater seepage was observed during excavation.***
**** No caving was observed during excavation.***

TEST PIT 6

Depth (ft.)	Moisture Content (%)	Water Table	USCS	Description
5			FILL	Light brown to brown, silty SAND with gravel, moist, loose to medium-dense ***(FILL)*** - with some asphalt debris and organics
10			SM	Red-brown, silty SAND with some gravel, moist, medium-dense
15			SM	Gray, silty SAND with some gravel, moist, dense to very dense ***(Glacial Till)***

**** Test Pit was terminated at 15.5 feet on July 24, 1998.***
**** No groundwater seepage was observed during excavation.***
**** No caving was observed during excavation.***

GEOTECH
CONSULTANTS, INC.

TEST PIT LOG

10xx East Marine View Drive
Everett, Washington

Job No:	Date:	Logged by:	Plate:
98313	July 1998	DBG	5

TEST PIT 7

Depth (ft.)	Moisture Content (%)	Water Table	USCS	Description
				TOPSOIL/Forest Duff
			SM	Red-brown, silty SAND with some gravel, fine-grained, moist, loose to medium-dense
5			SM	Gray, silty SAND with gravel, moist, very dense ***(Glacial Till)***
10				
15				

*** Test Pit was terminated at 9.5 feet on July 24, 1998.***
*** No groundwater seepage was observed during excavation.***
*** No caving was observed during excavation.***

TEST PIT 8

Depth (ft.)	Moisture Content (%)	Water Table	USCS	Description
			FILL	**TOPSOIL *(FILL)***
			SM	Red-brown, silty SAND with some gravel, fine-grained, dry to moist, loose - becomes medium-dense
5			SM	Gray, silty SAND with gravel, moist, very dense ***(Glacial Till)***
10				
15				

*** Test Pit was terminated at 9 feet on July 24, 1998.***
*** No groundwater seepage was observed during excavation.***
*** No caving was observed during excavation.***

GEOTECH
CONSULTANTS, INC.

TEST PIT LOG

10xx East Marine View Drive
Everett, Washington

Job No:	Date:	Logged by:	Plate:
98313	July 1998	DBG	6

TEST PIT 9

Depth (ft.)	Moisture Content (%)	Water Table	USCS	Description
0–10			FILL	Brown, silty SAND with some gravel, bricks and organics, moist, loose to medium-dense ***(FILL)*** - with occasional concrete debris and asphalt
10–11			SM	Red-brown, silty SAND with some gravel, fine-grained, moist, medium-dense
11–15			SM	Gray, silty SAND with gravel, moist, very dense ***(Glacial Till)***

**** Test Pit was terminated at 15 feet on July 24, 1998.***
**** No groundwater seepage was observed during excavation.***
**** No caving was observed during excavation.***

TEST PIT 10

Depth (ft.)	Moisture Content (%)	Water Table	USCS	Description
0–10			FILL	Dark brown, silty SAND with gravel, organics and concrete/asphalt debris, loose to medium-dense ***(FILL)***
10–11			SM	Red-brown, silty SAND with some gravel, fine-grained, moist, medium-dense
11–13			SM	Gray, silty SAND, moist, very dense

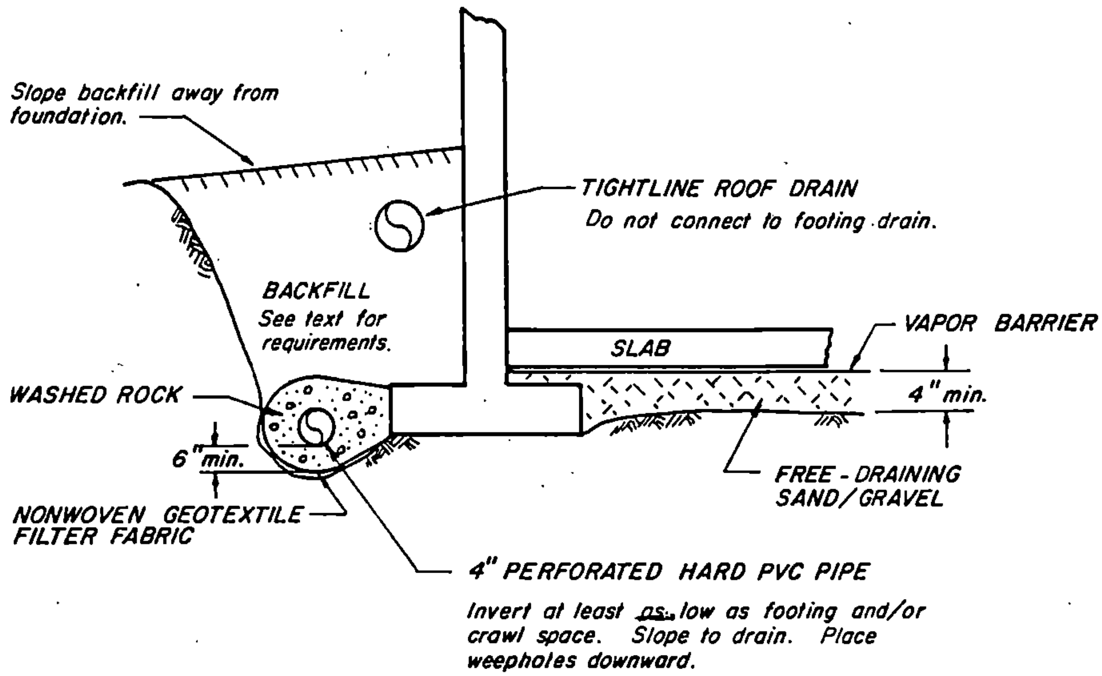
**** Test Pit was terminated at 13 feet on July 24, 1998.***
**** No groundwater seepage was observed during excavation.***
**** No caving was observed during excavation.***

GEOTECH
CONSULTANTS, INC.

TEST PIT LOG

10xx East Marine View Drive
Everett, Washington

Job No:	Date:	Logged by:	Plate:
98313	July 1998	DBG	7



GEOTECH CONSULTANTS

FOOTING DRAIN DETAIL

10XX E. MARINE VIEW DR.
EVERETT, WA

Job No.:	Date:	Scale:	Plate:
98313	AUG 1998	N.T.S.	8