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MAY 11 2005

January 17, 2005

Mr. Terry Ellingson
Ms. Elaine Morgan
5145 NW El Camino Boulevard
Bremerton, Washington 98312

Geotechnical Evaluation &
Design Report
Lot 8, Division 5, Bridgehaven
Thorndyke Road
Jefferson County, Washington
Job No. Ellingson.Thorndyke.01RG

INTRODUCTION and SCOPE

This geotechnical report presents the results of our geotechnical evaluation of the above referenced lot to provide geotechnical design criteria and recommendations for the proposed single-family residential development at the above referenced site. The project site is located at Lot 8, Division 5 of Bridgehaven, in unincorporated Jefferson County, Washington. The site is generally situated in the South Point area of Jefferson County, along Hood Canal, east of the intersection Finch Lane and Thorndyke Road. The location of the site is shown on the Vicinity Map, Figure 1.

Our understanding of the project is based on our discussions with you, our site observations and test pit, our experience in the area and our review of the data provided. We understand that the site development will consist of a single-family residence on the lot. Development at the site will include the typical associated utilities and driveway. Based on our site observations and discussions with you, grading at the site will be associated with construction of the driveway and excavation of the foundation/driveway areas. The general layout of the site is illustrated in the Site Plan, Figure 2.

The proposed residential structure will be situated to take advantage of the grade changes at the site, which are well suited to conventional daylight basement construction. The site is bounded by established residences to the north and south, with Thorndyke Road forming the western property margin. The site consists of a relatively level upland area where the residence is proposed. The upland area abuts a steep slope area which descends to the east. Access to the proposed house site will be from Thorndyke Road to a proposed garage which will be located below the proposed residence on the north side of the residence.

Slopes in the eastern portion of the site exceed 30 percent, with maximum relief well in excess of 10 vertical feet. The purpose of our services is to evaluate the site soils and groundwater conditions as a basis for assessing the critical areas, potential landslide, seismic and erosion hazards, at the site, and to develop geotechnical recommendations and design criteria for the proposed site development. Specifically, our scope of services for this project includes the following:

1. Review the available surface and subsurface soil and ground water information, including the existing geotechnical and perc-hole data, Washington DOE maps and Jefferson County Soil Conservation Service documents.
2. Visit the site and conduct a geologic reconnaissance to assess the site's slope, soil and ground water conditions.
3. Evaluate the shallow subsurface conditions at the site by monitoring the excavation of test pits at the building site.
4. Provide geotechnical recommendations for site grading including site preparation, subgrade preparation, fill placement criteria, suitability of on-site soils for use as structural fill, temporary and permanent cut and fill slopes, drainage and erosion control measures.

5. Provide recommendations and design criteria for foundation and floor slab support, including allowable bearing capacity, subgrade modulus, lateral resistance values and estimates of settlement.
6. Provide recommendations and design criteria for the design of conventional subgrade/retaining (basement) walls, including backfill and drainage requirements, lateral design loads, and lateral resistance values.

SITE CONDITIONS

SURFACE & GEOLOGIC CONDITIONS

The site is located in the South Point area of Jefferson County. The lot is an irregularly shaped parcel that measures 88-feet along Thorndyke Road by 230 to 244-feet east to west. The lot width tapers to the east, and is only 52-feet wide at the eastern property margin. The steeper slopes in the eastern portion of the site appear to be related to steep soils that formed on canyon slopes and ocean bluffs. The upland materials are deposits that likely formed in outwash and are somewhat excessively drained. The relative topography of the site area is shown on the Site Plan, Figure 2. Areas with slopes of 15 to 29 percent, and the local slope area in excess of 30 percent are illustrated on Figure 2.

The upland portion of the site is currently vegetated with scattered timber and locally dense brush undergrowth. The trees consist of a mix of evergreen and madrona. No evidence of erosion was observed at the site at the time of our site observations, particularly where the vegetation is established. The slope area below the proposed home site is densely covered with low brush. No shallow groundwater seepage and/or surface flow was observed in the portion of the site where the home site is proposed.

Based on our data review (available geologic and geotechnical data), our geologic reconnaissance of the site area, our test pit excavations, review of perc test hole data provided to us, and our experience in the area, the shallow soils at the site likely consist of outwash sand with a trace gravel. These soils likely were deposited over glacially consolidated deposits (till or hardpan and outwash material) and interglacial sediments.

Recessional outwash soils were deposited as the glacial ice retreated and are typically medium dense. These surficial soils were deposited subsequent to the Fraser Glaciation, some 12,000 to 15,000 years ago. Below the recessional deposits, glacially consolidated soils are typically present. Vashon glacial till was deposited at the base of the advancing glacial ice and is in a very dense condition where undisturbed. Advance outwash material was deposited by meltwater from the advancing glacial ice, and subsequently over-ridden by the glacial ice. The advance outwash soils are likewise in a dense condition, except where disturbed by weathering or previous grading activity. No significant intersecting geologic contacts were observed in our test pit excavations or the open perc-holes at the site. Shallow groundwater and surface seepage was not observed in the test holes advanced in the building or septic drainfield areas. No evidence of surficial erosion was observed at the site at the time of our site visits, particularly where vegetation is well established.

SITE SOILS

A review of the Soil Survey of Jefferson County (Soil Conservation Survey) indicates that the site soils consist of Everett gravelly sandy loam (0 to 15 per cent) in the upland area abutting Cassolary sandy loam (30 to 50 per cent). The Everett soils are generally derived from sandy glacial outwash soils and consist of somewhat excessively well-drained sands. Based on the SCS data, the Everett soils have a slight to moderate erosion hazard. The steeper Cassolary deposits have a severe erosion hazard.

SUBSURFACE EXPLORATIONS

Subsurface conditions at the site were evaluated by observing the exposed soils in perc holes excavated on site and observing 2 test pit excavated in the proposed building area, reviewing the available geologic and geotechnical data for the site area and our site reconnaissance. The perc holes were excavated in 4-locations west of the home in the proposed location of the on-site septic drainfield. Two additional test pit was excavated near the proposed building area. The perc-holes extended to a maximum of about 4-feet below ground surface (bgs), while the test pits were extended to 6.5 to 7-feet bgs. Uniform and favorable soils were disclosed at all locations explored. Site soils generally consist of a layer of topsoil above moist red-brown grading to light brown fine to medium sand. The light brown sand

included a trace of gravel.

No groundwater was encountered within the depths explored, and the sidewalls of the test pit were stable. Based on the consistent nature of the soil conditions encountered in the perc holes and test pit, and our previous experience in the area, it is our opinion that no additional excavations or borings are required to characterize the site soils or evaluate their stability.

The outwash soils were in a medium dense to dense condition, except where disturbed by surficial weathering. No ground water seepage was observed in our explorations. Groundwater conditions may vary with changes in precipitation, changes in site utilization, and other factors.

CONCLUSIONS

GENERAL

Based on the results of our site reconnaissance, data review, subsurface explorations and our experience in the area, it is our opinion that the site is suitable for the proposed single-family residential development. The construction of the daylight basement structure would provide additional stability in the building areas with sloping surfaces. Grading at the site will generally occur in the western and southwestern portions of the site associated with excavations for foundations and the driveway. Based on the soils encountered and our understanding of the proposed site development, conventional earthwork and foundation support is feasible at the site. Conventional foundation support may be utilized for the structure. Pertinent conclusions and geotechnical recommendations regarding the design and construction of the proposed development are presented below.

SEISMIC - LIQUEFACTION

According to the Seismic Zone Map of the United States contained in Figure 16-2 of the 1997 UBC (Uniform Building Code), the project site is located within Seismic Risk Zone 3. Based on the subsurface conditions observed at the site, we interpret the site conditions to correspond to a seismic Soil Profile type S_D, for Dense Soil, as defined by Table 16-J (UBC), or as Site Class "D" in the 2003 IBC/IRC building code documents, in accordance with Table 1615.1.1. This is based on the inferred range of SPT (Standard Penetration Test) blow counts relative to test pit excavation progress and probing with a ½-inch diameter steel probe rod. The shallow soil conditions were assumed to be representative for the site conditions beyond the depths explored.

Based on our review of the subsurface conditions, we conclude that the site soils are not susceptible to liquefaction. The near-surface soils below the upper weathered soils are generally in a medium dense to dense condition, and are likely underlain by very dense glacially overridden soils, and the static water table is located well below the site. Shaking of the already medium dense soil is not apt to produce a denser configuration and subsequently excess pore water pressures are not likely to be produced. Collection of the shallow perched groundwater in the south and west central portions of the site will improve overall stability at the site.

LANDSLIDE HAZARD

Classification

Portions of the project site are located in an area mapped as "Unstable" by the Washington State Department of Ecology in the Coastal Zone Atlas. In addition, based on the proximity of the steep slope to the east, and previous repeated landslide activity associated with retaining wall construction on a nearby property, we understand that Jefferson County has designated the project vicinity as a landslide hazard overlay area. The writer was involved in the forensic evaluation of the previous landslide activity which occurred several properties north of the subject property. Based on that work, the landslide activity at the nearby site was triggered by the construction of a bin wall which was located below the residence and on the steep descending slope below the home. That localized slide area was repaired by the construction of a series of short timber walls extending full height up the slope which restored the slope and is intended to protect against further erosion and loss of ground.

The soils in the flatter portion of the site where the residence will be constructed are mapped by the SCS (Jefferson County Soil Conservation Survey) as Everett gravelly sandy loam. The limitations for home site relate to the moderately steep to steep soils. Based on the above, we conclude that the site does the meet the technical criteria for a landslide hazard area.

EROSION HAZARD

The building site on the subject lot is located in an area mapped by the Soil Conservation Service as Everett gravelly sandy loam. The erosion hazard for these soils is slight to moderate. However, the stepper Cassolary soils comprising the slope below the home are rated as a severe erosion hazard.

It is our opinion that the potential erosion hazard of the site is not a limiting factor for the proposed residential development. The proposed new home would be set back from the edge of the steep slope by an appropriate buffer (greater than 30-feet). Removal of natural vegetation should be minimized and limited to the active construction areas, except for the removal of hazard trees in proximity to the break in slope. Temporary and permanent erosion control measures should be installed and maintained during construction or as soon as practical thereafter to limit the additional influx of water to exposed areas and protect potential receiving waters.

Erosion control measures should include but not be limited to berms and swales with check dams to channel surface water runoff, ground cover/protection in exposed areas and silt fences. Graded areas should be shaped to avoid concentrations of runoff onto cut or fill slopes, natural slopes or other erosion-sensitive areas. Temporary ground cover/protection such as jute or excelsior matting, wood chips or plastic sheeting should be used until permanent erosion protection is established.As previously discussed, weathering and erosion are natural processes that affect steep slope areas. As noted, no evidence of surficial raveling or sloughing was observed on site. To manage and reduce the potential risk for these natural processes, we recommend the following:

- No drainage of concentrated surface water or significant sheet flow onto or near the slope area.
- Replant/vegetate disturbed slope areas outside of the building limits with deeply rooted low vegetation.
- Install erosion control measures (as described above) as soon as practical in the disturbed building area. We expect this will include conventional landscaping and erosion protection.

Building Setback

Jefferson County requires a building setback and buffer area from all landslide and erosion hazard areas. The buffer distance is calculated based on the vertical height of the slope. Alternatively, a structural setback may be recommended by a licensed geotechnical engineer. Vegetation in the buffer may be enhanced, if approved or required. Clearing, grading and filling within the setback area is allowed if it can be demonstrated that the buffer vegetation will not be adversely impacted, or if the impacts can be mitigated.

Based on our geotechnical evaluation of the site, we recommend a Structural Setback of 30 feet where footings will be founded in the medium dense native soils. The Structural Setback may be measured horizontally from the bottom of the footing to the face of the slope where slopes are 30 percent or steeper, as described in the "**Buffer Modification**" section of this report.

Buffer Modification

Where necessary, the **Structural Setback** may be measured from the bottom of the footing to the face of the steep slope, in accordance with UBC/ IBC. Where the Setback Modification is utilized, the foundation elements should be extended vertically to meet the recommended setback criteria. This modification is based on the foundation elements extending to and being founded in medium dense to dense soils. Maintaining the prescribed setback in this manner provides the conventional 2 to 1 bearing prism. A schematic section is provided as Figure 6.

Roadways and driveways are exempt from the Building Setback criteria. Conventional earthwork guidelines should be utilized with the recommended geotechnical design criteria for cuts and fills in the roadway and driveway areas, as described in the **"Earthwork Section"** of this report.

As previously discussed, weathering, erosion and the resulting surficial sloughing and shallow landsliding are natural processes that affect steep slope areas. As noted, localized evidence of surficial raveling and riling were not observed in the steeper portions of the site owing to the dense ground cover. To mitigate and reduce the potential for these natural processes to become exacerbated, we recommend the following: No drainage of concentrated surface water or significant sheet flow onto or near the slope area. Drainage from the roof and driveway area should be collected and tightlined to the site's on-site infiltration system, or sheet flowed to densely vegetated portions of the site.

- No filling within the setback zone **unless** retained by engineered retaining walls or constructed as a monitored and engineered fill.
- No percolation of surface water within 30 feet of the top of the steep slope unless the seepage rate is controlled to a slow seep (similar to septic systems).

EARTHWORK

Site Preparation

Grading at the site is expected to be limited to and generally associated with construction of the driveway and excavation for the garage and residence. Depending on site grades, we anticipate the garage floor will be constructed below existing site grades, requiring the construction of retaining/basement walls around the perimeter of the garage. The house would be constructed one story above the garage elevation. All areas to be graded/excavated should be cleared of deleterious matter including any existing structures, foundations, abandoned utility lines, debris and vegetation. Graded areas should be stripped of any forest duff and organic-laden soils.

Based on our explorations, we estimate that stripping on the order of 5 to 8 inches will be necessary to remove the root zone and surficial soils containing significant organic materials. Areas with deeper, unsuitable organics should be expected in the vicinity of depressions, steep slopes or heavy vegetation. Stripping depths of up to 2.5 feet may occur in these areas. These organic materials may be stockpiled and later used for erosion control and landscaping/revegetation. Materials that cannot be used for landscaping or erosion control should be removed from the project site.

Existing areas of uncontrolled fill material, if present, below proposed final grades of the future home site or project improvement areas, should be removed and recompacted in accordance with the recommendations provided in this report.

Where placement of fill material is required, the exposed subgrade areas should be compacted to a firm and unyielding surface prior to placement of any fill. We recommend that trees be removed by overturning in fill areas so that a majority of the roots are removed. Excavations for tree stump removal should be backfilled with structural fill compacted to the densities described in the **"Structural Fill"** section of this report.

Any soft, loose or otherwise unsuitable areas delineated during proofrolling or probing should be recompacted, if practical, or overexcavated and replaced with structural fill, based on the recommendations of our site representative.

Structural Fill

All fill material/trench backfill should be placed as structural fill. The structural fill should be placed in horizontal lifts of appropriate thickness to allow adequate and uniform compaction of each lift. Fill should be compacted to at least 95 percent of MDD (maximum dry density as determined in accordance with ASTM D-1557).

The appropriate lift thickness will depend on the fill characteristics and compaction equipment used. We recommend that the appropriate lift thickness be evaluated by our field representative during construction. We recommend that our representative be present during site grading activities to observe the work and perform field density tests.

The suitability of material for use as structural fill will depend on the gradation and moisture content of the soil. As the amount of fines (material passing US No. 200 sieve) increases, soil becomes increasingly sensitive to small changes in moisture content and adequate compaction becomes more difficult to achieve. During wet weather, we recommend use of well-graded sand and gravel with less than 5 percent (by weight) passing the US No. 200 sieve based on that fraction passing the 3/4-inch sieve. If prolonged dry weather prevails during the earthwork and foundation installation phase of construction, a somewhat higher (up to 10 to 12 percent) fines content will be acceptable.

Material placed for structural fill should be free of debris, organic matter, trash and cobbles greater than 6 inches in diameter. The moisture content of the fill material should be adjusted as necessary for proper compaction

Suitability of On-Site Materials as Fill

During dry weather construction, any nonorganic on-site soil may be considered for use as structural fill, provided it meets the criteria described above in the structural fill section and can be compacted as recommended. If the material is over-optimum moisture content when excavated, it will be necessary to aerate or dry the soil prior to placement as structural fill. Many of the soils encountered in our test pits appeared near optimum moisture content.

The workability of material for use as structural fill will depend on the gradation and moisture content of the soil. As the amount of fines increases, soil becomes increasingly more sensitive to small changes in moisture content and adequate compaction becomes more difficult or impossible to achieve.

The soils at the site generally consist of fine to medium sand with trace gravel. These soils are comparable to Class A "pit run" material and will be suitable for use as structural fill provided the moisture content is appropriate. Any organic the soils should be stockpiled and treated in a similar manner as the topsoil strippings.

All fill material in the building and driveway areas should be placed as described in the **"Structural Fill"** section of this report and compacted to at least 95 percent of the MDD. If fill material is imported to the site for wet weather construction, we recommend that it be a sand and gravel mixture such as high quality pit run with less than 5 percent fines.

CUT AND FILL SLOPES

All job site safety issues and precautions are the responsibility of the contractor providing services/work. Temporary cut slopes will likely be necessary during grading operations or utility installation. As a general guide, temporary slopes of 1.5 to 1 (horizontal to vertical) or flatter may be used for temporary cuts for the site soils in a medium dense condition. Should ground water seepage be encountered, such as in proximity to the drainage swale, flatter temporary slopes may be required.

These guidelines assume that all surface loads are kept at a minimum distance of at least one half the depth of the cut away from the top of the slope and that significant seepage is not present on the slope face. Flatter cut slopes will be necessary where significant raveling or seepage occurs.

We recommend a maximum slope of 2 to 1 for permanent cut and fill slopes in areas of medium dense sand and gravel. Where 2 to 1 slopes are not feasible in these soils, retaining structures should be considered. Where retaining structures are greater than 4-feet in height (bottom of footing to top of structure) or have slopes of greater than 15 percent above them, they should be engineered. In areas of dense to very dense undisturbed glacial till, permanent cut slopes of 1.5 to 1 may be constructed. It should be recognized that slopes of this nature do ravel and require occasional maintenance. Where raveling or maintenance is unacceptable, we recommend that flatter slopes or retaining systems be considered.

Fill placed on slopes that are steeper than 5 to 1 should be "keyed" into the undisturbed native soils by cutting a series of horizontal benches. The benches should be 1½ times the width of equipment used for grading and a maximum of 3 feet in height. Subsurface drainage may be required in seepage areas. Surface drainage should be directed away from all slope faces. Some minor raveling may occur with time. All disturbed areas should be vegetated or otherwise protected as soon as practical to facilitate the development of a protective vegetative layer or establishment of a permanent erosion protection.

FOUNDATION SUPPORT

We recommend that spread footings for any residence be founded on medium dense or denser native soils or on structural fill that extends to suitable native soils. The soil at the base of the excavations should be disturbed as little as possible. All loose, soft or unsuitable material should be removed or recompacted, as appropriate. A representative from our firm should observe the foundation excavations to determine if suitable bearing surfaces have been prepared, particularly in the areas where the foundation will be situated in fill material. We recommend that daylight basement structures be considered for the site. All exterior footing elements should be embedded at least 18 inches below grade for frost protection. Where foundation elements are located near slopes of 15 percent of more, the footings should be located a minimum of 2 times the footing width from the slope face (horizontally), and founded in medium dense or denser native soils or properly prepared structural fill.

We recommend a minimum width of 2 feet for isolated footings and at least 16 inches for continuous wall footings. Footings founded as described above can be designed using an allowable soil

bearing capacity of 2,000 psf (pounds per square foot) for combined dead and long-term live loads. The weight of the footing and any overlying backfill may be neglected. The allowable bearing value may be increased by one-third for transient loads such as those induced by seismic events or wind loads.

Lateral loads may be resisted by friction on the base of footings and floor slabs and as passive pressure on the sides of footings. We recommend that an allowable coefficient of friction of 0.35 be used to calculate friction between the concrete and the underlying soil. Passive pressure may be determined using an allowable equivalent fluid density of 300 pcf (pounds per cubic foot). Factors of safety have been applied to these values.

We estimate that settlements of footings designed and constructed as recommended will be less than 1 inch, for the anticipated load conditions, with differential settlements between comparably loaded footings of 1/2 inch or less. Most of the settlements should occur essentially as loads are being applied. However, disturbance of the foundation subgrade during construction could result in larger settlements than predicted.

FLOOR SLAB SUPPORT

Slabs-on-grade (garage or floor) should be supported on medium dense or denser native soils or on structural fill prepared as described in the **Structural Fill** section of this report. We recommend that floor slabs be directly underlain by a minimum 4-inch thickness of coarse sand and/or gravel containing less than 3 percent fines. The drainage material should be placed in one lift and compacted to an unyielding condition.

A synthetic vapor barrier is recommended for the control of moisture migration through the slab, in particular where adhesives are used to anchor carpet or tile to the slab. A thin layer of sand may be placed over the vapor barrier and immediately below the slab to protect the liner during steel and/or concrete placement.

A subgrade modulus of 400 kcf (kips per cubic foot) may be used for floor slab design. We estimate that settlement of the floor slabs designed and constructed as recommended, will be 1/2 inch or less over a span of 50 feet.

SUBGRADE AND RETAINING WALLS

The lateral pressures acting on subgrade and retaining (basement) walls will depend upon the nature and density of the soil behind the wall. It is also dependent upon the presence or absence of hydrostatic pressure. If the walls are backfilled with granular well-drained soil, the design active pressure may be taken as 35 pcf (pounds per cubic foot) equivalent fluid density. This design value assumes a level backslope and drained conditions as described below. The design for active pressure assumes the walls can yield 0.001 times the wall height. Stiffer walls, or walls restrained from movement by diaphragms or floors, should be designed to resist at-rest pressures of 50 pcf.

Positive drainage, which controls the development of hydrostatic pressure, can be accomplished by placing a zone of coarse sand and gravel behind the walls. The granular drainage material should contain less than 5 percent fines. The drainage zone should extend horizontally at least 18 inches from the back of the wall. The drainage zone should also extend from the base of the wall to within 1 foot of the top of the wall. The drainage zone should be compacted to approximately 90 percent of the MDD. Over-compaction should be avoided as this can lead to excessive lateral pressures.

A perforated PVC pipe with a minimum diameter of 4 inches should be placed in the drainage zone along the base of the wall to direct accumulated water to an appropriate discharge location. We recommend that a non-woven geotextile filter fabric be placed between the drainage material and the remaining wall backfill to reduce silt migration into the drainage zone. The infiltration of silt into the drainage zone can, with time, reduce the permeability of the granular material. The filter fabric should be placed such that it fully separates the drainage material and the backfill, and should be extended over the top of the drainage zone.

Lateral loads may be resisted by friction on the base of footings and as passive pressure on the sides of footings and the buried portion of the wall. We recommend that an allowable coefficient of friction of 0.35 be used to calculate friction between the concrete and the underlying soil. Passive pressure may be determined using an allowable equivalent fluid density of 300 pcf. Factors of safety have been applied to these values.

PAVEMENT or DRIVEWAY SUBGRADE

We recommend that pavement and/or driveway slab subgrades be prepared in accordance with the previously described site preparation and structural fill recommendations. The upper 2 feet of roadway subgrade should have a density of at least 95 percent of the MDD (ASTM D-1577).

SITE DRAINAGE

All ground surfaces, pavements and sidewalks should be sloped away from the residence and associated structures. Surface water runoff should be controlled by a system of curbs, berms, drainage swales, and or catch basins, and dispersed into vegetated areas, or conveyed to the site's stormwater infiltration system. We recommend that conventional roof and footing drains be installed for all structures. Drains should be provided behind all retaining walls. The roof drain should not be connected to the footing drain unless an adequate gradient will prevent a surcharge of the footing drain. Collected stormwater should be directed to the site's stormwater system. The system location has yet to be determined. Ideally, storm water should be tightlined to the base of the hill side. However, that will result in some disturbance to the sensitive slope area below the proposed home. Alternatively, as discussed earlier, stormwater may be infiltrated. No drainage of concentrated surface water or significant sheet flow onto or over the slope area should be allowed. Drainage from the driveway area should be sheet flowed to the adjacent vegetated portions of the site. No percolation of surface water within 30 feet of the top of the steep slope unless the seepage rate is controlled to a slow seep (similar to septic systems).

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LIMITATIONS

We have prepared this report for use by Mr. Terry Ellingson and Ms. Elaine Morgan, and members of their design team, for use in the design of a portion of this project. The data used in preparing this report and this report should be provided to prospective contractors for their bidding or estimating purposes only. Our report, conclusions and interpretations are based on data from others and limited site reconnaissance, and should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations and may also occur with time. A contingency for unanticipated conditions should be included in the budget and schedule. Sufficient monitoring, testing and consultation should be provided by our firm during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork and foundation installation activities comply with contract plans and specifications.

The scope of our services does not include services related to environmental remediation and construction safety precautions. 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.

If there are any changes in the loads, grades, locations, configurations or type of facilities to be constructed, the conclusions and recommendations presented in this report may not be fully applicable. If such changes are made, we should be given the opportunity to review our recommendations and provide written modifications or verifications, as appropriate.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No other conditions, express or implied, should be understood.

Respectfully submitted,
GeoResources, LLC

State of Washington
Engineering Geologist
2228
Licensed Geologist

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Attachments

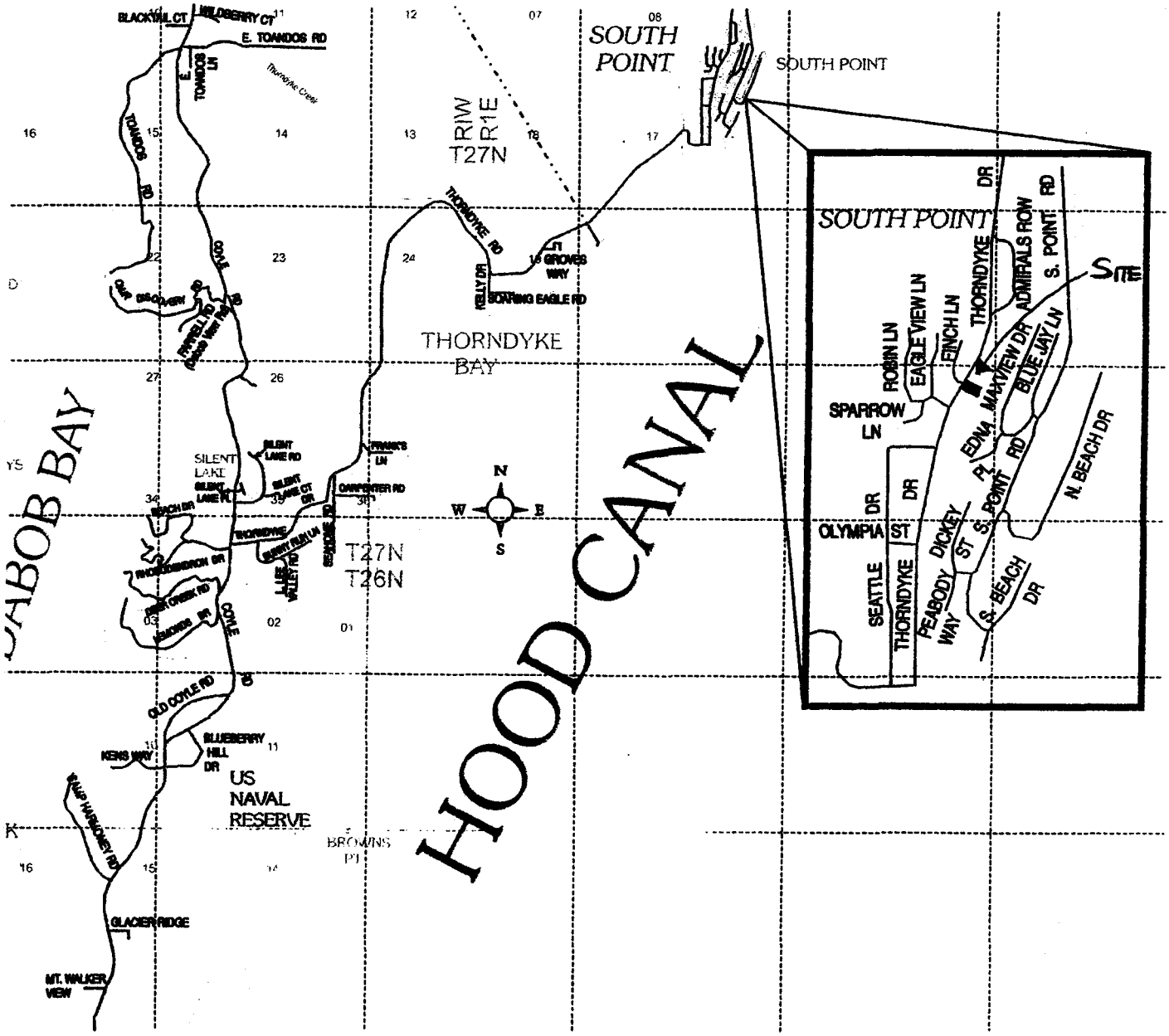

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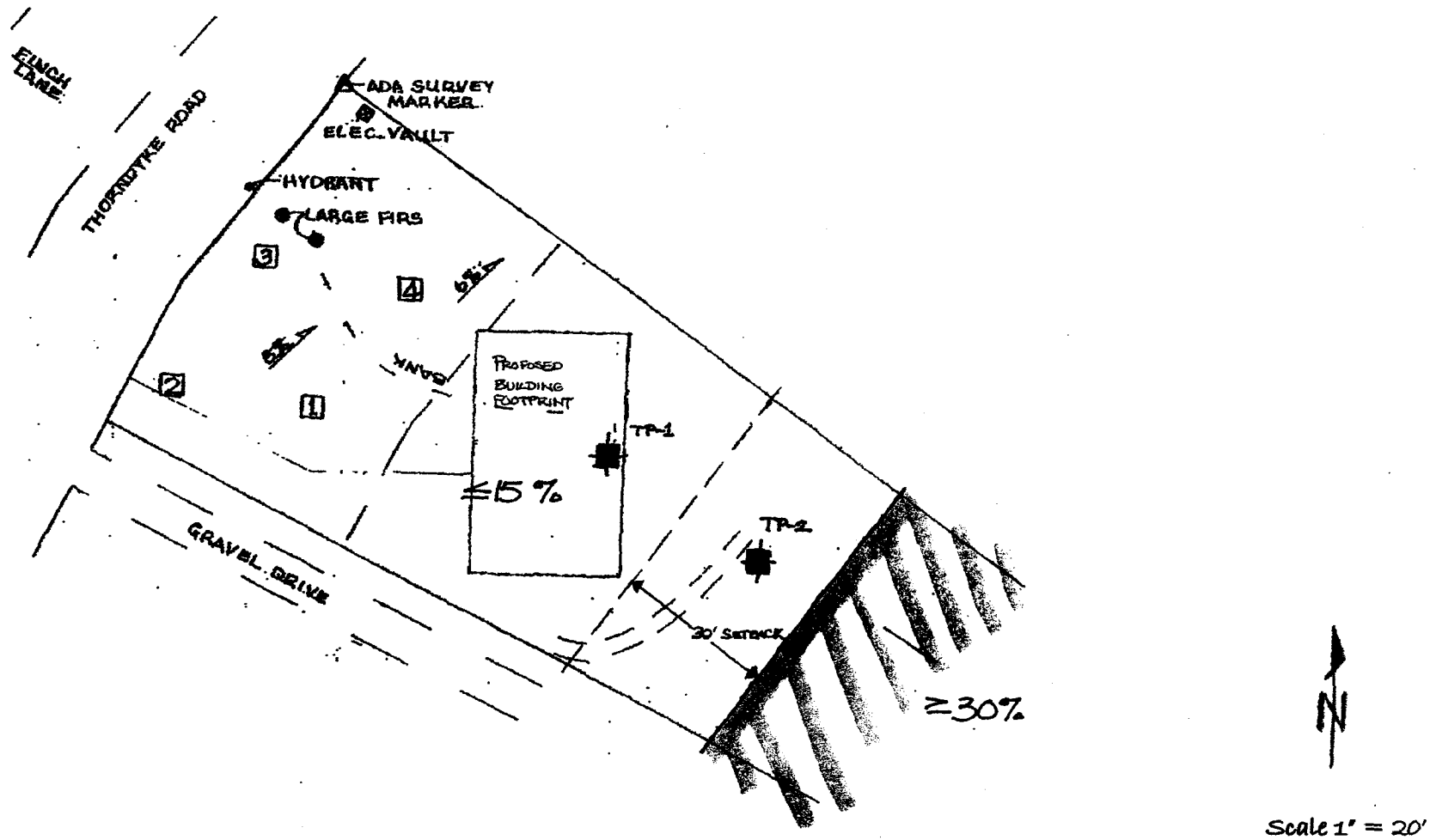
Figure 1: Site Vicinity Map



APPROXIMATE LOCATION OF TEST PIT TP-1

15 to 29 PERCENT SLOPE AREA

30 PERCENT OR GREATER SLOPE AREA

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FIGURE 2 - Site Plan

Project : Ellingson/Morgan Residence
Location : Lot 8, Div 5 Bridgehaven off Thorndyke Road
Jefferson County, Washington
Client : Elaine Morgan/ Ellingson
Date : January 7th, 2004 **Job #**: MorganEllingson.Thorndyke.RG

JEFFERSON COUNTY AREA, WASHINGTON — SHEET NUMBER 62

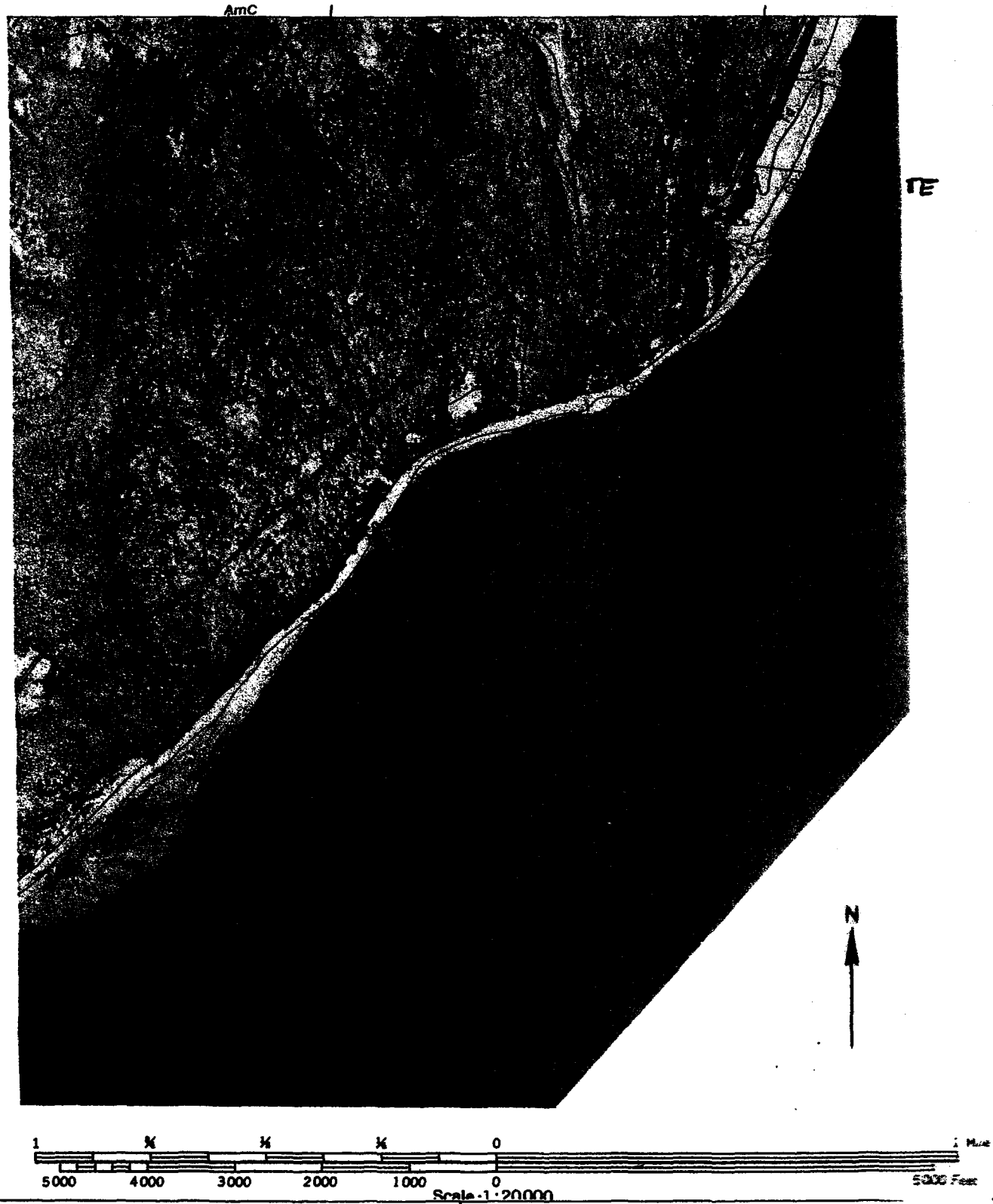

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Figure 3: USDA SCS Map

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More than 50% Retained on No. 200 Sieve	GRAVEL More than 50% Of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More than 50% Of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or more	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D2487-90.
3. Description of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and or test data.

SOIL MOISTURE MODIFIERS:

Dry- Absence of moisture, dry to the touch

Moist- Damp, but no visible water

Wet- Visible free water or saturated, usually soil is obtained from below water table

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SOIL CLASSIFICATION SYSTEM

FIGURE 4

TEST PIT LOGS
MORGAN/ELLINGSON RESIDENTIAL SITE
LOT 8, DIVISION 5 BRIDGEHAVEN, OFF THORNDYKE RD
JEFFERSON COUNTY, WASHINGTON

TEST PIT 1 - See Figure 2

Depth (ft)	Soil Type	Description
0.0 - 1.0		Topsoil
1.0 - 2.5	SP	Rd/Brn SAND w/ silt and occ gravel (loose to med dense, moist)
2.5 - 6.0	SP	Brn SAND w/ occ gravel (loose to med dense, moist)
6.0 - 7.0	SP	Brn SAND w/ occ gravel (med dense, moist) (small roots to 2.5')

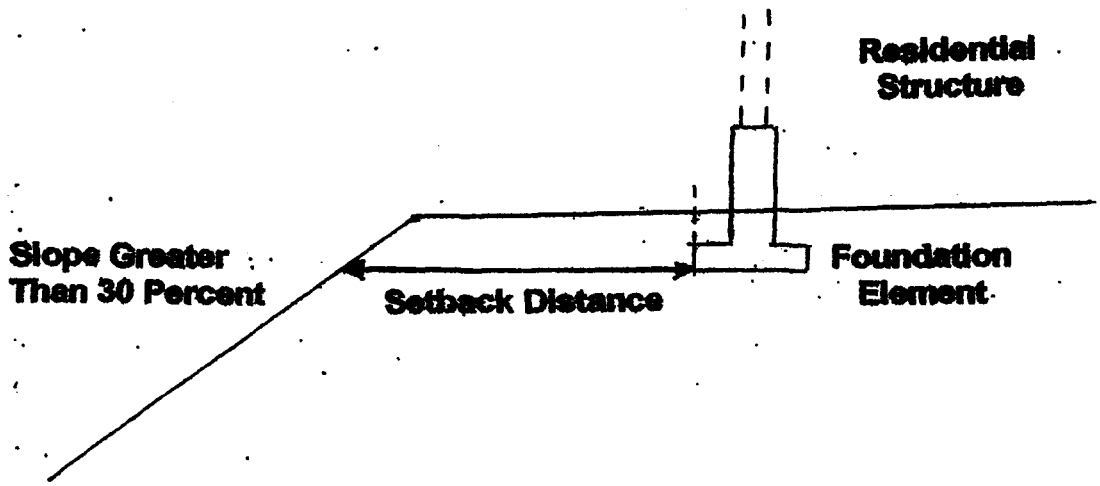
No caving observed
No groundwater seepage observed

TEST PIT 2 - See figure 2

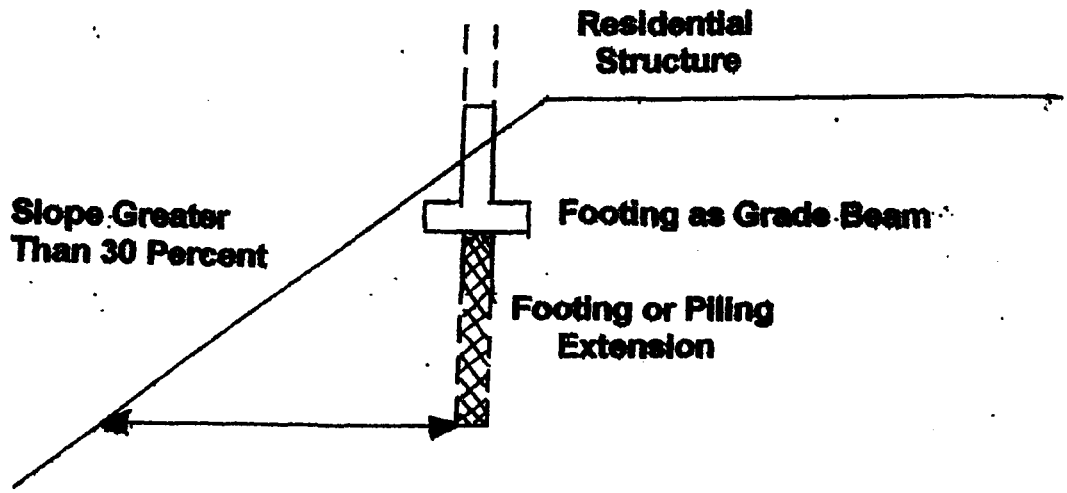
Depth (ft)	Soil Type	Description
0.0 - 1.0		Topsoil
1.0 - 2.0	SP	Rd/Brn SAND w/ silt and occ gravel (loose to med dense, moist)
2.0 - 5.0	SP	Brn SAND w/ occ gravel (loose to med dense, moist)
5.0 - 6.5	SP	Brn SAND w/ occ gravel (med dense, moist) (small roots to 4')

No caving observed
No groundwater seepage observed

Conventional Footing



Footing Extension or Pile Support



GeoResources	STRUCTURAL SETBACK
	FIGURE 6