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GEOTECHNICAL ENGINEERING EVALUATION METAL WAREHOUSES ARLINGTON AIRPORT ARLINGTON WASHINGTON PREPARED FOR WESTAR PROPERTIES

NELSON GEOTECHNICAL ASSOCIATES, INC.
GEOTECHNICAL ENGINEERS & GEOLOGISTS

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August 8, 2003

Mr. Larry Dunn
Westar Properties
PO Box 3339
Arlington, Washington 98223

Geotechnical Engineering Evaluation
New Metal Warehouses at Arlington Airport
62xx – 192nd Street NE
Arlington, Washington
NGA File No. 374903

Dear Mr. Dunn:

We are pleased to submit this report titled "Geotechnical Engineering Evaluation – New Metal Warehouses at Arlington Airport - 62xx-192nd Street NE – Arlington, Washington." This report summarizes the existing surface and subsurface conditions on the site and provides recommendations for proposed site development and stormwater infiltration. Our services were completed in general accordance with the contract signed by you on July 14, 2003.

We monitored the excavation of six test pits in the areas of the planned buildings and parking. In general, our explorations encountered fine to coarse sand with gravel and cobbles consistent with the description of Recessional Outwash.

We have concluded that the site should be compatible with the planned development. We have recommended that the building be founded on shallow spread footings supported on native, medium dense or better soils, for bearing capacity and settlement considerations.

We have also concluded that on-site infiltration should be feasible. We performed grain-size analysis on representative soil samples to determine infiltration rates for the on-site the soils. We have provided design infiltration rates and recommendations for installing the infiltration system.

It has been a pleasure to provide service to you on this project. Please contact us if you have any questions regarding this report or require further information.

Sincerely,
NELSON GEOTECHNICAL ASSOCIATES, INC.

David L. Nelson, PG
Professional Engineering Geologist

Two copies submitted
cc: Ryan Ellinghaus – Gary Parkinson Architect (two copies – unbound)

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Geotechnical Engineering Evaluation
New Metal Warehouses at Arlington Airport
62xx – 192nd Street NE
Arlington, Washington

INTRODUCTION

This report represents the results of our geotechnical engineering investigation and evaluation of the planned light industrial project site in Arlington, Washington. The site is located immediately east of the property located at 6115 – 192nd Street NE near the Arlington Airport, as shown on the Vicinity Map in Figure 1. The purpose of this study is to explore and characterize the soil conditions within the planned development areas, and to provide recommendations for site development and stormwater infiltration. For our use in preparing this report, we have been provided with plans titled, "Two New Pre-manufactured Metal Warehouses For: Westar Properties, 62xx – 192nd Street NE, Arlington, Washington, 98223."

Development within this property is proposed to consist of two metal, light industrial buildings with slabs-on-grade, and associated access and utilities. The site will be accessed off of 192nd Street NE on the southern side of the property. Stormwater infiltration is planned for this site, however, specific infiltration system locations or design had vhnot been determined at this time this report was prepared.

SCOPE

The purpose of this study is to explore and characterize the site subsurface conditions, and provide recommendations for site development and stormwater infiltration. Specifically, our scope of services includes the following:

1. Review geologic and soils maps of the area.
2. Explore the site subsurface soil and ground water conditions with backhoe test pits. The backhoe was provided by the owner.
3. Perform laboratory grain-size analyses on selected soils samples obtained in the explorations.
4. Provide recommendations for site grading and earthwork, including structural fill.
5. Provide recommendations for foundation support and slabs-on-grade.
6. Provide recommendations for site drainage and erosion control.

7. Provide our opinion regarding the feasibility of infiltrating storm runoff on site based on the 2001 DOE Manual.
8. Provide preliminary stormwater infiltration rates.
9. Provide recommendations for site drainage and infiltration system design and installation.
10. Document the results of our explorations, findings, and conclusions and recommendations in a written geotechnical report.

SITE CONDITIONS

Surface Conditions

The site is located immediately east of the property located at 6115 – 192nd Street NE. The site is an irregular-shaped parcel measuring approximately 170 feet in the east to west direction and 400 feet in the north to south direction. The current site layout is shown on the Site Plan in Figure 2. The site is level and covered with crushed rock, grass, and scattered equipment/machinery. We did not observe surface water on the site during our site visit on July 23, 2003.

Subsurface Conditions

Geology: The Geologic Map of the Arlington West 7.5 Minute Quadrangle, Snohomish County, Washington, by James P. Minard (U.S.G.S., 1985) was referenced for the geologic conditions at the site. The site is mapped as the Marysville Sand Member (Qvrm) of the Recessional Outwash (Qvr). Recessional Outwash consists of sand and gravel, and the Marysville Member consists of sand with some gravel and silt. Our explorations generally encountered sand with gravel and cobbles consistent with the description of Recessional Outwash.

Explorations: The subsurface conditions within the site were explored on July 23, 2003 by excavating six test pits to depths ranging from 5.0 to 9.0 feet below the existing surface using a backhoe. The approximate locations of our explorations are shown on the Site Plan in Figure 2. A geologist from Nelson Geotechnical Associates, Inc. (NGA) was present during the explorations, examined the soils and geologic conditions encountered, obtained samples of the different soil types, and maintained logs of the test pits. The westernmost 50 feet of the site were fenced into the neighboring property and we therefore, were not able to explore the subsurface conditions in this area.

The soils were visually classified in general accordance with the Unified Soil Classification System, presented in Figure 3. The logs of our test pits are attached to this report and are presented as Figures 4 and 5. Sieve analysis results on selected soil samples obtained from the test pits are presented as Figures 6, 7, and 8. We present a brief summary of the subsurface conditions in the following paragraph. For a detailed description of the subsurface conditions, the logs of the test pits should be reviewed.

We encountered approximately 0.2 feet of crushed rock at the surface of Test Pits 1, 2, and 4. Below the crushed rock, and at the surface of Test Pit 3, we encountered approximately two feet of orangish-brown, fine to medium sand with silt and gravel. This material was underlain by orangish-gray to gray medium to coarse sand with gravel. The soil was interpreted to be Recessional Outwash and all of the test pits were terminated in the outwash material.

Hydrologic Conditions

Ground water seepage was not encountered in any of the test pits. We did not observe indications of high ground water conditions. The ground water table on this site appears to be relatively deep and should not impact site development within the explored depths.

SENSITIVE AREA EVALUATION

Seismic Hazard

The project is located within Zone 3 of the Seismic Zone Map shown as Figure 16-2 of the 1997 Uniform Building Code (UBC). This corresponds to a Seismic Zone Factor, Z, of 0.3. Since medium dense to dense soils were encountered underlying the site, the site conditions best fit the UBC description for Soil Profile Type S_D.

Hazards associated with seismic activity include liquefaction potential and amplification of ground motion. Liquefaction is caused by a rise in pore pressures in a loose, fine sand deposit beneath the ground water table. The dense outwash sands interpreted to underlie the site have a low potential for liquefaction or amplification of ground motion.

Erosion Hazard

The erosion hazard criteria used for determination of affected areas includes soil type, slope gradient, vegetation cover, and ground water conditions. The erosion sensitivity is related to vegetative cover and the specific surface soil types, which are related to the underlying geologic soil units. The Soil Survey, Snohomish County Area, Washington, by the Soil Conservation Service (SCS) was reviewed to determine the erosion hazard of the on-site soils. The site surface soils were classified using the SCS classification system as Everett gravely sandy loam, 0 to 8 percent slopes. This unit is listed as having a slight erosion hazard after the soils are exposed.

CONCLUSIONS AND RECOMMENDATIONS

General

It is our opinion, from a geotechnical standpoint, that the site is compatible with the planned development. Our explorations within the site indicated that the site is underlain by competent Recessional Outwash at a shallow depth. This soil should provide adequate support for the planned improvements. The new structures could be designed utilizing shallow foundations. Footings, however, should extend through any loose surficial soil and be founded on the underlying medium dense or better native soils, or structural fill extending to these soils. Medium dense or better soils should typically be encountered between 1 and 2 feet below the existing surface, based on our explorations. This is discussed further in the **Foundations** sub-section of this report.

We encountered clean sand with gravel across the site. This material should be suitable for stormwater infiltration. Also, we did not encounter high groundwater conditions or evidence of high groundwater in any of the test pits. We recommend that the infiltration trench excavations extend through any silty material and advance into the underlying clean gravel and sand, and that the excavations be cleaned of any sloughing or debris prior to installing the infiltration system. We have provided infiltration rates to be used in designing the planned infiltration systems. We should be retained to observe the material exposed in the excavated infiltration trenches.

Erosion Control Measures

The erosion hazard for the on-site soils is considered slight, but will be dependent on how the site is graded and water is allowed to accumulate. Best Management Practices (BMPs) should be used to control erosion. Areas disturbed during construction should be protected from erosion. Measures taken may include diverting surface water away from the stripped areas and possibly covering the areas with straw. Silt fences or straw bales should be erected to prevent muddy water from leaving the site. Disturbed areas should be planted with vegetation as soon as practical. The erosion potential of areas not disturbed should be low.

Site Preparation and Grading

The first step of site preparation should be to remove the grasses, crushed rock, asphalt, equipment/ machinery, or any loose soils to expose medium dense or better native soils in new foundation, slab-on-grade, and pavement areas. If the ground surface, after site stripping, should appear to be loose, it should be compacted to a non-yielding condition and then proofrolled. Areas observed to pump or weave should be reworked to structural fill specifications or over-excavated and replaced with properly compacted structural fill or rock spalls. If significant surface water flow is encountered during construction, this flow should be diverted around areas to be developed.

The majority of the on-site soils are not considered moisture sensitive, and earthwork could be performed even in marginally wet weather conditions. However, these soils could disturb and become difficult to work with in extreme wet weather and/or if they become contaminated with silt or silty soils.

Foundations

Conventional shallow spread foundations should be placed on undisturbed medium dense or better native soils, or be supported on structural fill or rock spalls extending to those soils. Where less dense soils are encountered at footing bearing elevation, the subgrade should be over-excavated to expose suitable bearing soil. If footings are supported on structural fill or rock spalls, this material should extend outside the edges of the footing a distance equal to one-half of the depth of the over-excavation below the bottom of the footing.

Footings should extend at least 18 inches below the lowest adjacent finished ground surface for frost protection and bearing capacity considerations. Minimum foundation widths of 18 and 24 inches should be used for continuous and isolated spread footings, respectively. Standing water should not be allowed to accumulate in footing trenches. All loose or disturbed soil should be removed from the foundation excavation prior to placing concrete.

For foundations constructed as outlined above, we recommend an allowable design bearing pressure of not more than 2,000 pounds per square foot (psf) be used for the footing design for footings founded on the medium dense or better glacial soils or structural fill extending to the native competent material. The foundation bearing soil should be evaluated by a representative of our firm. We should be consulted if higher bearing pressures are needed. Current Uniform Building Code (UBC) guidelines should be used when considering increased allowable bearing pressure for short-term transitory wind or seismic loads. Potential foundation settlement using the recommended allowable bearing pressure is estimated to be less than 1 inch total and 1/2 inch differential between adjacent footings or across a distance of about 30 feet, based on our experience with similar projects.

Lateral loads may be resisted by friction on the base of the footing and passive resistance against the subsurface portions of the foundation. A coefficient of friction of 0.35 may be used to calculate the base friction and should be applied to the vertical dead load only. Passive resistance may be calculated as a triangular equivalent fluid pressure distribution. An equivalent fluid density of 200 pounds per cubic foot (pcf) should be used for passive resistance design for a level ground surface adjacent to the footing. This level surface should extend a distance equal to at least three times the footing depth. These recommended values incorporate safety factors of 1.5 and 2.0 applied to the estimated ultimate values for frictional and passive resistance, respectively. To achieve this value of passive resistance, the foundations should be poured "neat" against the native medium dense soils or compacted fill should be used as backfill against the front of the footing. We recommend that the upper 1 foot of soil be neglected when calculating the passive resistance.

Structural Fill

General: Fill placed beneath foundations, pavement, or other settlement-sensitive structures should be placed as structural fill. Structural fill, by definition, is placed in accordance with prescribed methods and

standards and is monitored by an experienced geotechnical professional or soils technician. Field monitoring procedures would include the performance of a representative number of in-place density tests to document the attainment of the desired degree of relative compaction. The area to receive the fill should be suitably prepared as described in the **Site Preparation and Grading** sub-section prior to beginning fill placement.

Materials: Structural fill should consist of a good quality granular soil, free of organics and other deleterious material and be well-graded to a maximum size of about three inches. All-weather fill should contain no more than five- percent fines (soil finer than U.S. No. 200 sieve, based on that fraction passing the U.S. 3/4-inch sieve). The use of the native on-site soils as structural fill should be generally feasible, but will be dependent on moisture content and weather conditions. We should be retained to evaluate structural fill material prior to construction.

Fill Placement: Following subgrade preparation, placement of structural fill may proceed. All backfilling should be accomplished in uniform lifts up to eight inches thick. Each lift should be spread evenly and be thoroughly compacted prior to placement of subsequent lifts. All structural fill should be compacted to a minimum of 95 percent of its maximum dry density. Maximum dry density, in this report, refers to that density as determined by the ASTM D-1557 Compaction Test procedure. The moisture content of the soils to be compacted should be within about two percent of optimum so that a readily compactable condition exists. It may be necessary to overexcavate and remove wet soils in cases where drying to a compactable condition is not feasible. All compaction should be accomplished by equipment of a type and size sufficient to attain the desired degree of compaction.

Slab-on-Grade

Slabs-on-grade should be supported on subgrade soils prepared as described in the **Site Preparation and Grading** sub-section of this report. If moisture control is important, we recommend that all floor slabs be underlain by at least 6 inches of free-draining sand or gravel for use as a capillary break. We recommend that the capillary break be hydraulically connected to the footing drain system to allow free drainage from under the slab. A suitable vapor barrier, such as heavy plastic sheeting (6-mil minimum), should be placed over the capillary break material. An additional 2-inch-thick sand blanket may be used to cover

the vapor barrier. This sand blanket is to protect the vapor barrier membrane and to aid in curing the concrete.

Pavements

Pavement subgrade preparation, and structural filling where required, should be completed as recommended in the **Site Preparation and Grading** and **Structural Fill** sub-sections of this report. The pavement subgrade should be proofrolled with a heavy, rubber-tired piece of equipment, to identify soft or yielding areas that require repair. We should be retained to observe the proofrolling and recommend repairs prior to placement of the asphalt or hard surfaces.

Stormwater Infiltration

We performed three grain-size sieve analyses on soil samples obtained from the explorations in order to establish infiltration rates for on-site infiltration system design. We referred to "Table 3.8 Alternative Recommended Infiltration Rates based on ASTM Gradation Testing," in the "Stormwater Management Manual for Western Washington," (Ecology, 2001) to classify the soil samples analyzed. This table is based on gradation analyses and provides long-term design infiltration rates. The results of the grain-size analyses are presented as Figures 6, 7, and 8. Based on the grain-size analyses, and the information found in the manual, the on-site material has average long-term infiltration rate of nine inches per hour in Test Pit 3 at 4.5 feet, 9 inches per hour in Test Pit 5 at 5.0 feet, and 2 inches per hour in Test Pit 6 at 2.6 feet. We would expect that a long-term infiltration rate of 9 inches per hour would be adequate across the site if clean outwash is exposed in infiltration system excavations. We should be retained to observe infiltration system installation.

The above referenced manual requires a 5-foot separation between the bottom of the infiltration systems and high groundwater elevations. Based on our explorations, this criteria should be met with infiltration depths of approximately four feet. We should be retained to review specific infiltration trench locations and depths prior to finalizing design.

Site Drainage

Surface Drainage: The finished ground surface should be graded such that stormwater is directed to an appropriate stormwater collection system. Water should not be allowed to stand in any area where footings, slabs, or pavements are to be constructed. Final site grades should allow for drainage away from the structure. We suggest that the finished ground be sloped at a minimum gradient of three percent for a distance of at least 10 feet away from the structure. Surface water should be collected by permanent catch basins and drain lines, and be discharged into an appropriate discharge system.

Subsurface Drainage: If ground water is encountered during construction, we recommend that the contractor slope the bottom of the excavation and collect the water into ditches and small sump pits where the water can be pumped out and routed into a permanent storm drain.

It is prudent to use footing drains around the planned structures. However, if the foundations are supported on clean free-draining material and the entire building perimeters is sealed such that surface water could not reach the footings, footing drains may be omitted. Footing drains, if used, should be installed at least 1 foot below planned finished floor elevation. The drains should consist of a minimum 4-inch-diameter, rigid, slotted or perforated, PVC pipe surrounded by free-draining material wrapped in a filter fabric. We recommend that the free-draining material consist of an 18-inch-wide zone of clean (less than 3 percent fines), granular material placed along the back of walls. Pea gravel is an acceptable drain material or drainage composite may be used instead. The free-draining material should extend up the foundation wall to 1 foot below the finished surface. The top foot of soil should consist of impermeable soil placed over plastic sheeting or building paper to minimize surface water or fines migration into the footing drain. Footing drains should discharge into tightlines leading to an appropriate collection and discharge point with convenient cleanouts to prolong the useful life of the drains. Roof drains should not be connected to wall or footing drains.

USE OF THIS REPORT

NGA has prepared this report for Westar Properties, and their agents, for use in the planning and design of the development planned on this site only. The scope of our work does not include services related to construction safety precautions and our recommendations are not intended to direct the contractors'

methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design. There are possible variations in subsurface conditions between the explorations and also with time. Our report, conclusions, and interpretations should not be construed as a warranty of subsurface conditions. A contingency for unanticipated conditions should be included in the budget and schedule.

We recommend that NGA be retained to provide monitoring and consultation services 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 or not earthwork and foundation installation activities comply with contract plans and specifications. We should be contacted a minimum of one week prior to construction activities and could attend pre-construction meetings if requested.

Within the limitations of scope, schedule and budget, our services have been performed in accordance with generally accepted geotechnical engineering practices in effect in this area at the time this report was prepared. No other warranty, expressed or implied, is made. Our observations, findings, and opinions are a means to identify and reduce the inherent risks to the owner.

0-O-0

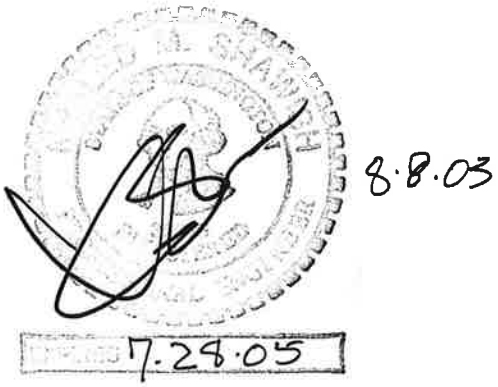
It has been a pleasure to provide service to you on this project. If you have any questions or require further information, please call.

Sincerely,

NELSON GEOTECHNICAL ASSOCIATES, INC.

Bala Dodoye-Alali

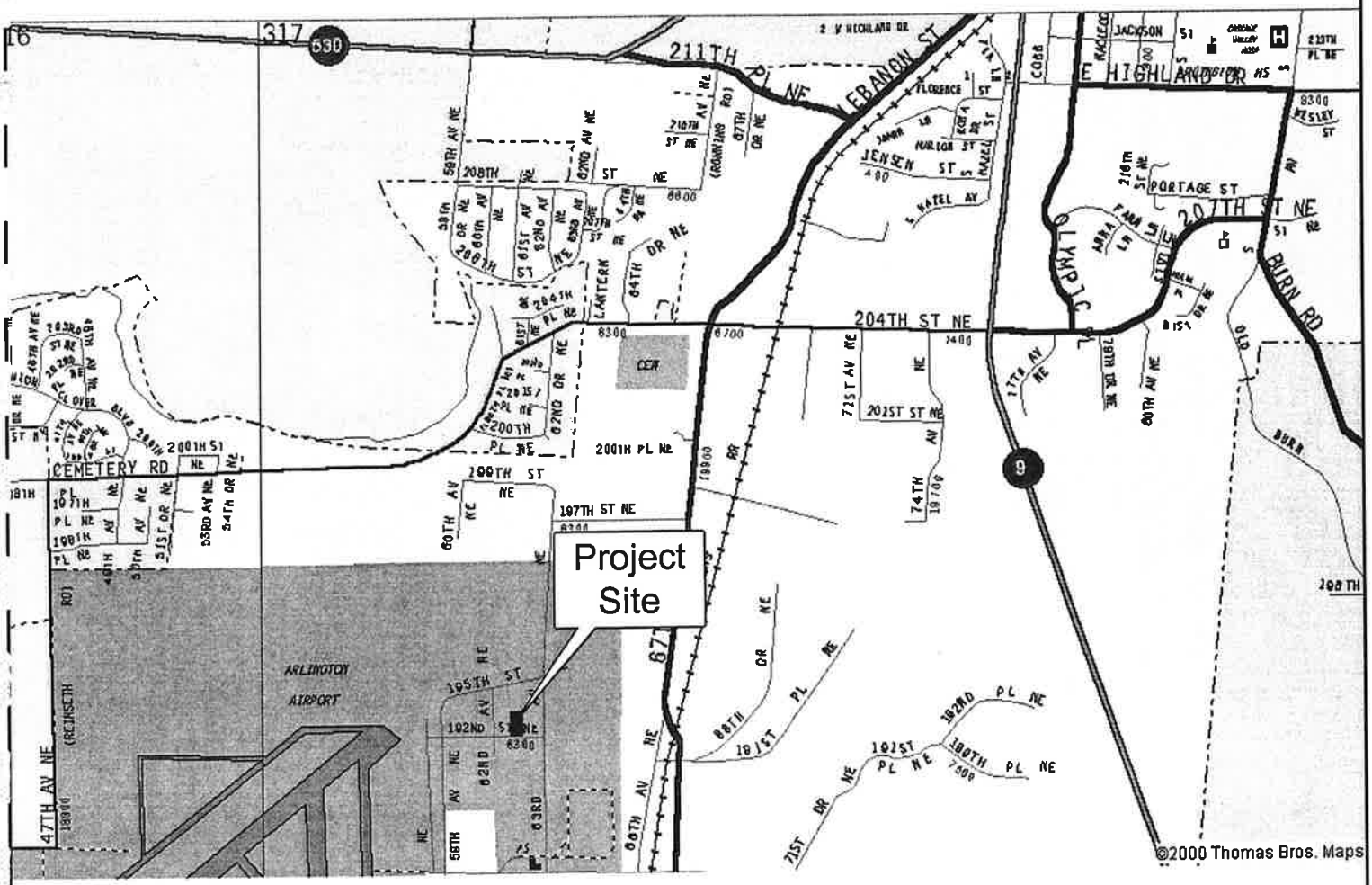
Bala Dodoye-Alali
Project Geologist



Khaled M. Shawish, PE
Senior Engineer

BAD:KMS:kmn

Eight Figures Attached



Not to Scale

PROJECT NUMBER 374903	Westar Properties New Metal Warehouses Vicinity Map	NELSON GEOTECHNICAL ASSOCIATES, INC. GEOTECHNICAL ENGINEERS & GEOLOGISTS 17311–135th Ave. NE, A–500, Woodinville, WA 98072, (425) 486–1669 / Fax 481–2510 Snohomish County (425) 337–1669, Wenatchee/Chelan (509) 784–2758, www.nelsongeotech.com	No.	Date	Revision	By	CK
Figure 1			1	7/23/03	Original	ADJ	BAD

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N

LEGEND

TP-1 — Number and Approximate Location of Test Pit

Property Line

0 40 80

Approximate Scale: 1 inch = 40 feet

Reference: Site plan based on an undated, electronic site plan prepared by Gary Parkinson Architects, titled "Westar Warehouses Preliminary Site Plan."

No.	Date	Revision	By	CK
1	7/23/03	Original	ADJ	BAD

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Westar Properties
New Metal Warehouses
Site Plan

PROJECT NUMBER
374903

Figure 2

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
GRAVEL 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, 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, FLAT 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 D 2488-93.

2) Soil classification using laboratory tests is based on ASTM D 2488-93.

3) Descriptions of soil density or consistency are based on interpretation of blowcount data, visual appearance of soils, and/or test data.

SOIL MOISTURE MODIFIERS:

Dry - Absence of moisture, dusty, dry to the touch

Moist - Damp, but no visible water.

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

PROJECT NUMBER 374903	Westar Properties New Metal Warehouses Soil Classification	NELSON GEOTECHNICAL ASSOCIATES, INC. GEOTECHNICAL ENGINEERS & GEOLOGISTS	No.	Date	Revision	By	CK
Figure 3		17311–135th Ave. NE, A–500, Woodinville, WA 98072, (425) 486–1669 / Fax 481–2510 Snohomish County (425) 337–1669, Wenatchee/Chelan (509) 784–2756 www.nelsongeotech.com	1	7/23/03	Original	ADJ	BAD

NGA Drafting 2003\AutoCAD\374903 Westar\Soil Classification.dwg

LOG OF EXPLORATION

DEPTH (FEET)	USC	SOIL DESCRIPTION
TEST PIT ONE		
0.0 – 0.3		CRUSHED ROCK
0.3 – 2.0	SP	ORANGISH-BROWN, MEDIUM SAND (MEDIUM DENSE TO DENSE, DRY TO MOIST)
2.0 – 5.0	SP	GRAYISH-BROWN, MEDIUM SAND WITH GRAVEL (MEDUM DENSE TO DENSE, DRY)
5.0 – 6.0	SP	GRAY, MEDIUM TO COARSE SAND WITH GRAVEL (DENSE, DRY)
		SAMPLES WERE COLLECTED AT 4.5 AND 5.5 FEET GROUND WATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT WAS COMPLETED AT 6.0 FEET ON 7/23/03
TEST PIT TWO		
0.0 – 0.4		CRUSHED ROCK
0.4 – 1.2	SP-SM	DARK ORANGISH-BROWN, MEDIUM SAND WITH SILT (MEDIUM DENSE, DRY TO MOIST)
1.2 – 2.0	SP	ORANGISH-BROWN, MEDIUM SAND (MEDIUM DENSE, DRY TO MOIST)
2.0 – 7.5	SP	GRAYISH-BROWN, MEDIUM SAND WITH GRAEL (DENSE, DRY TO MOIST)
		SAMPLE WAS COLLECTED AT 6.0 FEET GROUND WATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT WAS COMPLETED AT 7.5 FEET ON 7/23/03
TEST PIT THREE		
0.0 – 1.7	SP-SM	ORANGISH-BROWN, FINE TO MEDIUM SAND WITH SILT (MEDIUM DENSE, DRY TO MOIST)
1.7 – 5.0	SP	ORANGISH-GRAY, TO GRAY MEDIUM SAND WITH GRAVEL (DENSE, DRY TO MOIST)
		SAMPLE WAS COLLECTED AT 4.0 FEET GROUND WATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT WAS COMPLETED AT 5.0 FEET ON 7/23/03
TEST PIT FOUR		
0.0 – 0.2		CRUSHED ROCK
0.2 – 2.2	SP	ORANGISH-BROWN, MEDIUM SAND WITH GRAVEL (MEDIUM DENSE TO DENSE, DRY TO MOIST)
2.2 – 5.0	SP	ORANGISH-GRAY MEDIUM SAND WITH GRAVEL (DENSE, DRY TO MOIST)
5.0 – 9.0	SP	GRAY MEDIUM SAND (DENSE, DRY TO MOIST)
		SAMPLE WAS COLLECTED AT 8.0 FEET GROUND WATER SEEPAGE WAS NOT ENCOUNTERED MINOR TEST PIT CAVING WAS ENCOUNTERED BETWEEN 5.0 AND 9.0 FEET TEST PIT WAS COMPLETED AT 9.0 FEET ON 7/23/03

LOG OF EXPLORATION

DEPTH (FEET)	USC	SOIL DESCRIPTION
TEST PIT FIVE		
0.0 – 0.2		CRUSHED ROCK
0.2 – 0.8	SM	ORANGISH-BROWN, SILTY FINE TO MEDIUM SAND WITH GRAVEL AND TRACE ROOTS (MEDIUM DENSE, DRY)
0.8 – 2.3	SP / GP	ORANGISH-BROWN, MEDIUM TO COARSE SAND WITH GRAVEL TO GRAVEL WITH MEDIUM TO COARSE SAND (DENSE, DRY)
2.3 – 5.0	SP	GRAY, MEDIUM TO COARSE SAND WITH GRAVEL (DENSE, DRY)
		SAMPLE WAS COLLECTED AT 5.0 FEET GROUND WATER SEEPAGE WAS NOT ENCOUNTERED TEST PIT CAVING WAS NOT ENCOUNTERED TEST PIT WAS COMPLETED AT 5.0 FEET ON 7/23/03
TEST PIT SIX		
0.0 – 1.5	SP-SM	ORANGISH-BROWN, FINE TO MEDIUM SAND WITH SILT; GRAVEL, AND TRACE ROOTS (MEDIUM DENSE, DRY)
1.5 – 3.0	SP	ORANGISH-BROWN, MEDIUM TO COARSE SAND WITH GRAVEL AND TRACE COBBLES (DENSE, DRY)
3.0 – 8.5	SP	BROWNISH-GRAY, MEDIUM TO COARSE SAND WITH GRAVEL AND TRACE COBBLES (DENSE, DRY)
		SAMPLE WAS COLLECTED AT 8.5 FEET GROUND WATER SEEPAGE WAS NOT ENCOUNTERED MINOR TEST PIT CAVING WAS ENCOUNTERED BETWEEN 4.0 AND 8.5 FEET TEST PIT WAS COMPLETED AT 8.5 FEET ON 7/23/03

Figure 6

PROJECT NUMBER
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Westar Properties
New Metal Warehouses
Sieve Analysis

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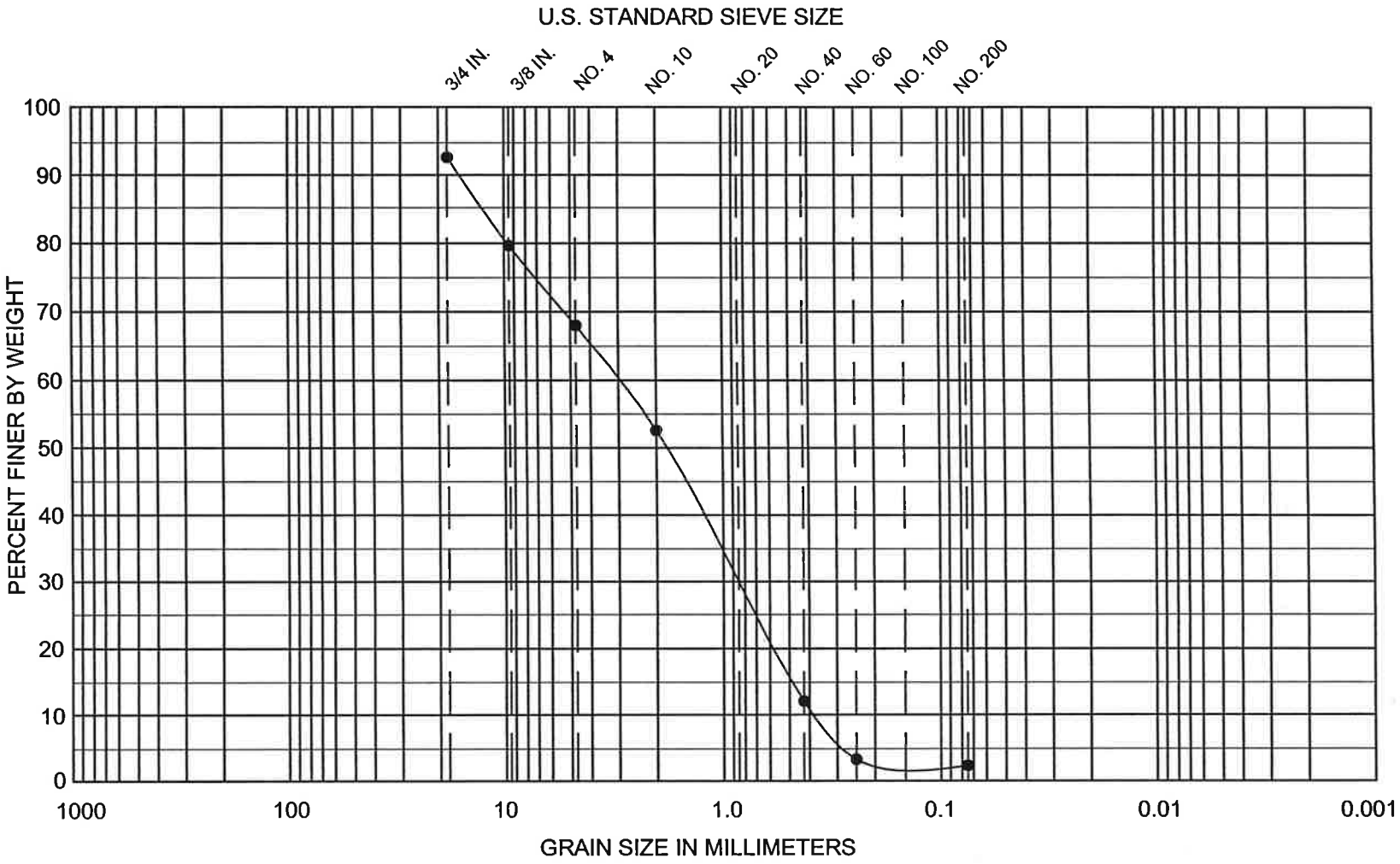
No.	Date	Revision	By	CK
1	7/28/03	Original	ADJ	BAD



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

U.S.C. SYMBOL	EXPLORATION NUMBER	SAMPLE DEPTH	SOIL DESCRIPTION	SOIL DISTRIBUTION
● SP	TP-3	4.5 Feet	Brown, coarse to fine sand with gravel	Gravel = 32% Sand = 66% Silt/Clay = 2%

NGA Drafting 2003\AutoCAD\374903 Westar\374903sieves.dwg

Figure 7

PROJECT NUMBER
374903

Westar Properties
New Metal Warehouses
Sieve Analysis

NELSON GEOTECHNICAL ASSOCIATES, INC.
GEOTECHNICAL ENGINEERS & GEOLOGISTS
17311–135th Ave. NE, A–500
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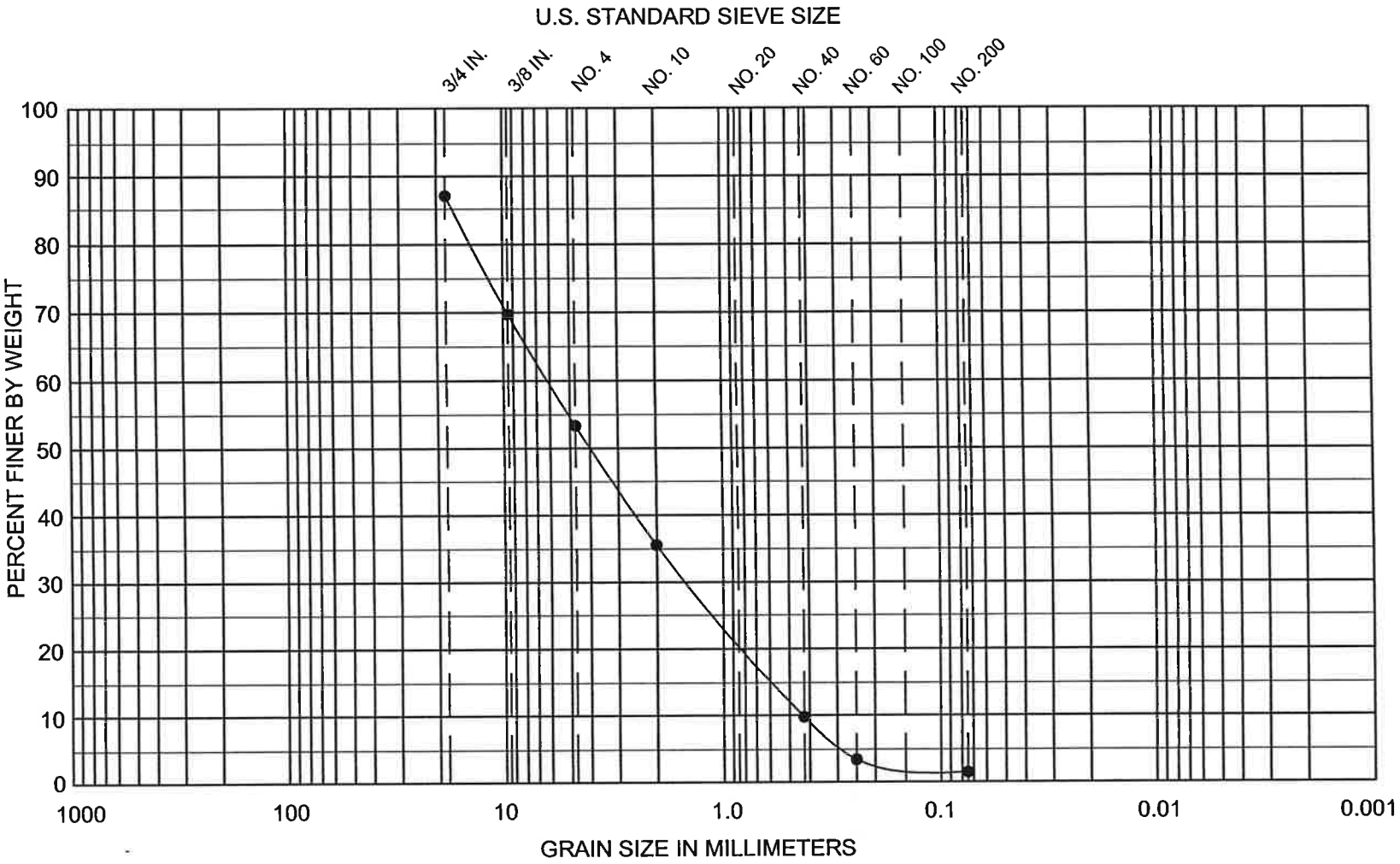
No.	Date	Revision	By	CK
1	7/28/03	Original	ADJ	BAD



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

U.S.C. SYMBOL	EXPLORATION NUMBER	SAMPLE DEPTH	SOIL DESCRIPTION	SOIL DISTRIBUTION
● SP	TP-5	5.0 Feet	Brown, coarse to fine sand with gravel	Gravel = 46% Sand = 52% Silt/Clay = 2%

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PROJECT NUMBER
374903

Figure 8

Westar Properties
New Metal Warehouses
Sieve Analysis

NELSON GEOTECHNICAL ASSOCIATES, INC.
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No.	Date	Revision	By	CK
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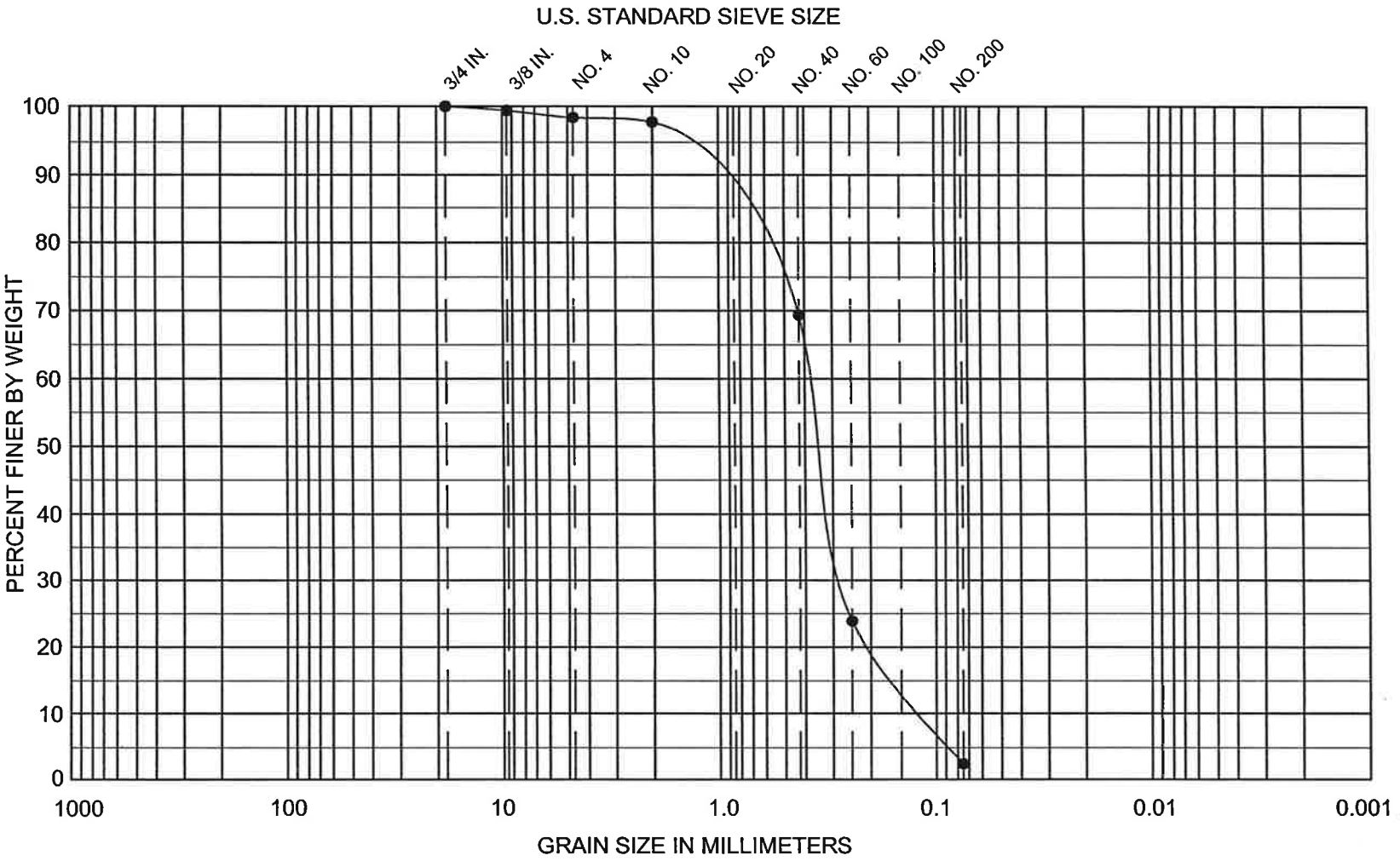

COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

U.S.C. SYMBOL	EXPLORATION NUMBER	SAMPLE DEPTH	SOIL DESCRIPTION	SOIL DISTRIBUTION
● SP	TP-6	2.6 Feet	Orangish-brown, medium to fine sand with trace silt	Gravel = 1% Sand = 97% Silt/Clay = 2%

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