For Preliminary Planning Purposes Only

Report of Preliminary Geotechnical Engineering Evaluation

Proposed Multifamily Development
777 South Yarrow Street
Lakewood, Colorado

Prepared for

Kairoi Residential
711 Navarro Street, Suite 400
San Antonio, Texas 78205
ATTN: Mr. Tyler Sibley

Prepared by

Professional Service Industries, Inc.
1070 West 124th Avenue
Suite 800
Westminster, Colorado 80234

March 10, 2021

PSI Project 05322170

Hannah C. Tawfik, P.E.
Project Engineer

Kyle R. Duitsman, P.E.
Site Manager

Project Number: 05322170
March 10, 2021

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Mr. Tyler Sibley
Kairoi Residential
711 Navarro Street, Suite 400
San Antonio, Texas 78205

Subject: Report of Preliminary Geotechnical Engineering Evaluation
Proposed Multifamily Development
777 South Yarrow Street
Lakewood, Colorado

Dear Mr. Sibley:

Professional Service Industries, Inc. (PSI), an Intertek Company, is pleased to transmit our Preliminary Geotechnical Engineering Report which includes the field exploration and laboratory testing results, as well as site preparation and preliminary foundation design recommendations.

If you have questions pertaining to this report, or if we may be of further service, please contact us at your convenience.

We thank you for your business and we look forward to finding ways to grow our partnership, expand our services, and continue Building Better Together.

For Professional Service Industries, Inc.

Hannah Tawfik
Digitally signed by Hannah Tawfik
Date: 2021.03.10 10:11:18 -07'00'

Kyle R. Duitsman, P.E.
Site Manager

Hannah C. Tawfik, P.E.
Project Engineer

Reviewed by: Lloyd Lasher, P.E.
Principal Consultant

TABLE OF CONTENTS

ATTACHMENTS

1.0 INTRODUCTION

Professional Service Industries, Inc. (PSI), an Intertek Company, has conducted a preliminary geotechnical engineering evaluation for the proposed multifamily development in Lakewood, Colorado. The purpose of our study was to evaluate the general subsurface conditions at the subject site and to provide preliminary geotechnical recommendations for site preparation and a preliminary discussion of potential foundation alternatives for the proposed development. Our services on this project were performed in general accordance with PSI Proposal Number 328840 dated December 3, 2020 and authorized by the Consulting/Professional Services Agreement dated February 2, 2021.

The report, which follows, presents a brief review of PSI's understanding of the project, a discussion of the site and subsurface conditions encountered, and preliminary geotechnical recommendations for design and planning for the construction of foundations, and floor slabs.

Descriptions of the site are based upon observations made during our field exploration program. The geotechnical recommendations presented in this report are based upon the provided project information and the subsurface materials described in this report. If any of the noted information is incorrect, please inform us so that we may amend the recommendations presented in this report, if needed.

PSI did not provide any service to investigate or detect the presence of moisture, mold or other biological contaminates in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence of the amplification of the same. Client acknowledges that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. Client further acknowledges that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or recurrence of mold amplification.

PSI's scope of services for the geotechnical study did not include an assessment of environmental conditions in the soil, bedrock, surface water, groundwater, or air, on or below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes. Please see PSI's environmental reports for information regarding those findings.

2.0 PROJECT INFORMATION

PSI understands that Kairoi Residential is planning the construction of a multi-story building on a 4.55-acre site located at 777 South Yarrow Street in Lakewood, Colorado. Our project understanding is based upon an email from Mr. Sibley with Kairoi Residential, which indicated that the proposed development will be a 4 to 5-story building with no below-grade levels. PSI is anticipating the proposed building will be located near the center of the site, with surface parking around the structure.

Specific details regarding the anticipated structural loads or proposed grades were not provided, therefore our services should be considered preliminary in nature. For the purpose of this report, we anticipate structural loads will be on the order of 500 kips, and that final grades will be near existing grade. Please notify PSI of the anticipated loads when available, such that our recommendations may be reviewed and modified if necessary.

The site lies at 39° 42' 15.5" N latitude and 105° 05' 10.4" W longitude. The site is currently occupied by three buildings near the center of the site with asphalt pavement surrounding the buildings. Based on Google Earth elevations, the site appears to experience approximately 6-feet of relief from east to west.

Based upon historical aerial photographs from Google Earth and the Phase 1 ESA documentation, the site has been relatively unchanged since the 1970s. Prior to that, the site was in use as a large single-family home and agricultural land.

A site plan was not provided and the existing structures limited boring placement; therefore, the soil borings were performed in pavement areas around the exterior portions of the site. Once a final site plan, building size/type, structural loads and other documents are available, please forward them to PSI for review, and a proposal for a final, design level report will be provided.

3.0 SUBSURFACE INFORMATION

The following sections provide information relating to subsurface conditions encountered at the boring locations and published geologic information in the general vicinity of the project site. The geology section is based upon the "Geologic Map of the Greater Denver Area, Front Range Urban Corridor, Colorado," by Donald E. Trimble and Michael N. Machette, dated 1979, and information relating to subsurface conditions within the property gathered from our current field study.

3.1 Site Geology and Geologic Hazards

Based on the referenced map by Trimble and Machette, the surficial soils are Denver and Arapahoe Formations (Cretaceous Tertiary, TKda) described as "Sandstone, mudstone, claystone, and conglomerate; Denver is characterized by andesitic materials."

The site is bounded on the west by Kountze Lake. Multiple other small lakes and reservoirs exist in the surrounding area.

3.2 Subsurface Conditions

As part of PSI's preliminary evaluation of this site, six (6) exploratory borings were drilled to depths of approximately 30 to 50 feet each below the existing ground surface. The approximate boring locations are provided on Figure 2. Auger refusal materials were encountered in Borings B2 and B4. Due to the existing buildings, PSI was unable to access the central portion of the lot.

The borings were advanced using a CME-55 truck-mounted drill rig equipped with 4-inch diameter, solid-stem, continuous-flight augers. Soil samples were recovered at selected depths during drilling with the truck-mounted drill rig using a Modified California Barrel Sampler (with an inside diameter of 2 inches and an outside diameter of 2.4 inches) or split spoon sampler (with a outside diameter of 2 inches) driven by a 140-pound hammer free-falling 30 inches. The total number of blows required to drive the sampler for 12 inches of penetration is designated as the penetration resistance (N-value, blows per foot) which provides an indication of the consistency of cohesive soils and the relative density of granular materials. While the procedure is similar to that employed in the Standard Penetration Test (ASTM D1586), the penetration resistance obtained using the California barrel sampler is generally higher than that obtained using the standard split-spoon sampler. A correction factor of 0.6 for sand and 0.77 for clay is used for N-Values collected using the Modified California sampler. The N-values on the logs were not corrected for the Modified California sampler or hammer efficiency.

A representative from our office observed the drilling of the borings and logs were prepared of the encountered conditions. Individual logs of the borings are presented on Figures 3 through 8. It should be noted that the subsurface conditions presented on the boring logs are representative of the conditions at the specific locations drilled. Variations may occur and should be expected across the site. The stratification represents the approximate boundary between subsurface materials and the transitions may be gradual and indistinct. Water level information obtained during our field operations is also shown on the boring logs.

3.2.1 General Subsurface Profile

From the surface in the test borings, PSI observed 4 to 6-inches of asphalt. PSI encountered apparent fill materials, layers of clayey sand and clay overburden materials, and bedrock. The apparent fill materials extended to depths of approximately 1 to 4 feet. The apparent fill materials consisted of sand and clay with wood and asphalt debris in areas. Underlying the apparent fill, PSI encountered thin layers of clayey sand or clay which can be described as fine to medium grained sand, moist, brown with white and dark brown, and medium dense/stiff in consistency. Claystone/sandstone interbedded bedrock was encountered at depths of

approximately 2 to 7 feet below existing grade. The bedrock was brown, yellow, and gray to black with iron staining in parts, moist, and very hard. The bedrock contains high plasticity clays, and high plasticity clays may also be present in portions of the overburden soils.

3.2.2 Groundwater Conditions

Groundwater was not observed within the depths explored during drilling operations. However, due to the proximity to Kountze Lake, it should be noted that it is possible for the groundwater to be perched within the bedrock or fluctuate during the year depending upon climatic and rainfall conditions and changes to surface topography and drainage patterns. Discontinuous zones of perched water may also exist, or develop, within the overburden and bedrock materials. The groundwater levels presented in this report are the levels that were observed at the time of our field activities.

3.2.3 Swell Potential

PSI has reviewed the "Potentially Swelling Soil and Rock in the Front Range Urban Corridor, Colorado" by Stephen S. Hart, dated 1972. Based on this published map, the subject site lies with an area described as having "Moderate Swell Potential." Moderate Swell Potential designation is described as "This category includes several bedrock formations and few surficial deposits of variable thickness. Special foundation designs are generally necessary to prevent damage."

PSI performed Denver Swell Testing (Figures A-1 through A-9) on selected samples of the recovered bedrock material from the soil borings at depths believed to be below the finished floor elevation. The laboratory swell test results are included in Appendix A and on the individual boring logs (Figures 3 through 8). The following table summarizes the swell test results:

Boring	Sample Depth (feet)	Surcharge (psf)	Swell Potential (%)	Swell Pressure (psf)	Moisture Content (%)
B1	5	500	**1.2**	4,000	25
B2	2 ½	250	**1.9**	1,500	22
B2	7 ½	750	**0.5**	2,100	27
B2	10	1,000	**0.1**	1,400	28
B3	5	500	**0.3**	2,000	21
B4	2 ½	250	**1.1**	1,400	27
B4	5	500	**0.3**	1,600	23
B4	10	1,000	**1.6**	5,300	24
B5	2 ½	250	**0.9**	2,500	26

The laboratory swell test results are included in Appendix A and on the individual boring logs (Figures 3 through 9). The test results indicated swell percentages of 0.1 to 1.9 percent when tested under a surcharge pressure of 250, 500, 750, and 1,000 psf. The surcharge values were applied based on the sample depth, with 100 psf surcharge applied for every 1 foot below the anticipated finished floor elevation. Once the samples were hydrated under the surcharge pressure and swelling had stopped, additional pressure was applied until the sample was at or below its initial volume.

Based upon the swell test results, PSI classifies the overburden and bedrock material encountered onsite as having a "low" potential for swell. Based on these preliminary results, swell mitigation is not believed to be necessary. However, if excessive drying and rewetting of these soils is allowed to occur, the risk of swell will increase. Therefore, proper drainage and good maintenance should be followed.

3.2.4 Laboratory Testing

The soil samples obtained during the field exploration were transported to the laboratory and selected soil samples were tested in the laboratory to determine material properties for our evaluation. Laboratory testing was accomplished in general accordance with ASTM and other applicable procedures. Laboratory testing was performed on selected samples to evaluate the classification and other engineering characteristics of the subsurface materials. Laboratory test data along with detailed descriptions of the soils can be found on the logs of borings and in Appendix A. The samples that were not altered by laboratory testing will be retained for 30 days from the date of this report and then will be discarded without further notice.

4.0 PRELIMINARY GEOTECHNICAL EVALUATION

The primary concerns at this site are the presence of apparent fill materials, potentially high structural loads and the demolition and removal of the existing building, utilities, pavements and associated debris. All of the borings encountered apparent fill materials likely resulting from the previous development of the site. The apparent fill materials extended to depths of approximately 1 to 4 feet below current grade. One of the borings (B-3) encountered clay, wood and asphalt within the apparent fill materials. These materials are generally not considered suitable for support of foundations, floor slabs and pavements. These materials should be completely removed, cleaned, and replaced as structural fill. We recommend an environmental assessment of the site be performed to determine proper handling and disposal of the apparent fill materials. It should be noted that the apparent fill materials may contain more deleterious materials or extend to deeper depths in unexplored areas of the site.

Based upon the anticipated structural loads, a drilled pier or deep foundation system may be required. Bedrock was typically encountered at depths of approximately 2 to 5 feet with the exception of B-2 where bedrock was as deep as approximately 7 feet below current grade. Depending on proposed grades, it may be feasible to bear shallow foundations directly upon bedrock. It is unknown if the existing structures have below-grade levels, and further investigation will be necessary to explore the subsurface conditions below the existing buildings. If the bedrock below the existing structures has been excavated, then shallow foundations option may not be feasible.

The building should be completely removed and associated utilities should be properly capped and abandoned unless used for the proposed development. PSI was unable to access the central portion of the site. Additional borings may be required following building demolition to determine that soils are consistent. Depths of the apparent fill may vary across the site where PSI was unable to access.

The following preliminary geotechnical design commentary has been developed on the basis of the described preliminary project characteristics and subsurface conditions encountered in our preliminary exploration. When final loads, grading, and other design features have been finalized, additional explorations and laboratory testing will be necessary to develop design level geotechnical recommendations for the planned development.

5.0 PRELIMINARY SITE GRADING RECOMMENDATIONS

Prior to site grading or excavation for foundation construction, the site will need to be stripped of all topsoil, vegetation, concrete, asphalt, existing utilities, building debris, etc. Our exploration encountered apparent fill materials to depths of up to approximately 4-feet, however, deeper pockets of fill may be encountered as the center portion of the site was inaccessible. Pending the results of an environmental assessment, the soil portion of the fill may be reused provided it is properly cleaned and mixed prior to placement as structural fill. Soils should be compacted in accordance with Section 5.2. Recommended over-excavation depths may vary as additional project information and subsurface explorations are performed in proposed development areas.

5.1 Structural Fill

Based on PSI's preliminary field and laboratory data, excluding the apparent fill materials the majority of the on-site material is generally suitable for re-use as backfill soils and for use as structural fill provided it is properly moisture-conditioned, and all debris, organic and deleterious materials, if encountered, are removed. Weathered and competent claystone bedrock should not be reused. High plasticity clays should also not be reused if encountered.

Imported structural fill, if required, should be free of organic or other deleterious materials, have a liquid limit less than 30, a plasticity index less than 10, and meet the following gradation:

Screen Size	Percent Passing
2-inch	100
#4	50 – 100
#200	10 - 30

For planning purposes, this structural fill criteria is intended as a general guideline. Imported structural fill materials should have a swell potential of less than 1 percent when compacted to 95 percent of maximum dry unit weight (MDUW) and at 2 percent below optimum moisture content (OMC) and tested under a swell test surcharge of 500 psf. The MDUW and OMC should be determined by ASTM D698 (Standard Proctor).

Imported fill material proposed for use on this site that does not meet these criteria should be submitted to the project geotechnical engineer for evaluation and approval. The geotechnical engineer should evaluate the proposed import fill prior to purchase and delivery. Fine-grained soils used for fill require close moisture content control and careful placement by the contractor to achieve the recommended degree of compaction and to control swell potential and settlement.

5.2 General Fill Placement and Testing

For initial planning purposes, fill material should be compacted to at least 95 percent of the maximum dry unit weight as determined by the Standard Proctor Test (ASTM D 698). Fills greater than 5 feet should be compacted to 100 percent of the maximum dry unit weight as determined by the ASTM D 698. Each lift of compacted fill should be tested for density by a representative of the geotechnical engineer prior to placement of subsequent lifts. Sand fill soils should be moisture conditioned to between two percent below and two percent above optimum moisture content and clay fill soils should be moisture conditioned to a range from optimum moisture content to four percent above optimum moisture content. Fill material should be placed in maximum eight-inch loose lifts.

A sample(s) of the proposed backfill soil(s) should be obtained for moisture density relationship (proctor test) three to four days prior to backfilling operations to expedite compaction and moisture content testing by the materials testing service provider.

Weather conditions in the site area are typically dry in the summer and early fall. While grading can be inhibited for short periods during and following times of precipitation, grading can generally be conducted year around. The major factor that must be considered during the winter months is ground freezing. During extended periods of sub-freezing weather, it can be difficult to properly moisture condition and compact soils. Grading must be conducted during the warmer parts of the day in freezing weather.

6.0 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

6.1 Drilled Pier Foundations

The structure may require a deep foundation system to limit total and differential settlements within tolerable limits based upon the potentially high structural loads. Drilled pier or shafts are a common foundation type in the project area. Drilled piers develop the majority of their capacity through end bearing and skin friction developed along the sides of the shaft within the underlying competent bedrock. Typical allowable end bearing capacities in competent bedrock for drilled piers is 30,000 to 50,000 psf, with 3,000 to 5,000 psf allowable skin friction in bedrock. We would expect shafts to be socketed into the bedrock a minimum of 10 to 15 feet to develop sufficient capacity to support heavier loaded structures such as the one anticipated. Competent bedrock materials were encountered at depths of approximately 2 to 7 feet below current grades. Therefore, we would anticipate pier lengths on the order of 15 to 25 feet, assuming finished floor elevations being at or near existing grades. The actual length of the piers required should be based on the anticipated structural loads and performance requirements of the foundations.

6.2 Slabs-on-Grade

A slab-on-grade may be utilized for the proposed development if a consistent bearing surface of no less than 12-inches of moisture conditioned and recompacted soils are placed, with all of the undocumented fill materials removed.

6.3 Strip and Spread Footings

Shallow strip and spread footings may be used to support the structure provided they bear on competent bedrock. An allowable soil bearing capacity of 5,000 pounds per square foot can be used for preliminary sizing of strip and spread footings on competent bedrock. With the exception of one boring (B-2), bedrock was generally encountered within 5 feet of existing grade.

Continuous footings supporting bearing walls should incorporate a minimum lateral dimension of 18 inches while individual column footings should be at least 36 inches. Exterior footings should bear at a minimum of 36 inches below final grade for frost protection. Additional depth may be required to bear on competent bedrock. Interior footings should bear at a minimum of 18 inches below grade.

6.4 Preliminary Pavement Recommendations

Based on the subsurface materials encountered during our preliminary subsurface exploration, PSI has preliminarily used a correlated R-value of 9 for support of proposed pavement sections. We recommend fill should not be used for support of at-grade pavements, and should be completely removed, cleaned, and replaced as structural fill.

PSI has identified two pavement categories based on anticipated traffic use and traffic loads. We have assigned estimated traffic loads to each category expressed in EDLA's, where the EDLA is the equivalent daily load applications of vehicles relative to an 18-kip single axle load.

- PSI has assigned an estimated EDLA of 2 for the general parking stall (Light-Duty Traffic) area. Anticipated traffic in this area includes private passenger vehicles or similar vehicles. Minimum pavement sections on the order of 3 to 5 inches of asphalt atop 6 to 8 inches of base materials are typical for developments similar to those proposed. The addition of road base will decrease the asphalt thickness.

- The drive lanes within the site have been assigned an estimated EDLA of 5 (Heavy-Duty Traffic - Drive Lanes), PSI anticipates that traffic in this area will be mixed use consist of delivery vehicles of varying size and weight and passenger vehicles. Heavy-duty sections are anticipated to be 5 to 7 inches of asphalt or 5 to 6 inches of concrete. The addition of road base will decrease the asphalt thickness.

Concrete pavement is also a viable option for pavement areas, and it should be at least **seven inches thick** in the **trash dumpster run-up** due to the heavy wheel and impact loads that this area receives. The run-up should extend far enough away to support all wheels of the sanitation

truck while stopped and in the loading position. Concrete pavement is also recommended in areas, which receive continuous repetitive traffic such as product unloading areas and parking lot entrances.

6.5 Seismic Parameters

The project site is located within a municipality that employs the International Building Code, 2015 edition. As part of this code, the design of structures must consider dynamic forces resulting from seismic events. These forces are dependent upon the magnitude of the earthquake event as well as the properties of the soils that underlie the site. As part of the procedure to evaluate seismic forces, the code requires the evaluation of the Seismic Site Class, which categorizes the site based upon the characteristics of the subsurface profile within the upper 100 feet of the ground surface. To define the Site Class for this project, we have interpreted the expected results of soil test borings drilled with the project site and estimated appropriate soil properties below grade to a depth of 100 feet, as permitted by Section 1615.1.1 of the code. The estimated soil properties were based upon data available in published geologic reports and our experience with subsurface conditions in the general site area.

Based upon our evaluation, it is our opinion that the subsurface conditions within the site are consistent with the characteristics of Site Class C as defined in Table 1615.1.1 of the building code.

The USGS-NEHRP interpolated probabilistic ground motion values near latitude 39.7044º North and -105.0846º West obtained from the USGS geohazards web page are as follows:

Period (seconds)	2% Probability of Event in 50 years (g)	Site Coefficients	Max. Spectral Acceleration parameters	Design Spectral Acceleration Parameters	
0.2 (S_s)	0.19	F_a = 1.2	S_{ms} = 0.228	S_{Ds}= 0.152	T_0= 0.089
1.0 (S_1)	0.06	F_v = 1.7	S_{m1} = 0.102	S_{D1}= 0.068	T_s= 0.447
			$S_{ms} = F_aS_s$ $S_{m1} = F_vS_1$	$S_{Ds} = ⅔*S_{ms}$ $S_{D1} = ⅔*S_{m1}$	$T_0= 0.2*S_{D1}/S_{Ds}$ $T_s= S_{D1}/S_{Ds}$

The Site Coefficients, Fa and Fv presented in the above table were interpolated from IBC Tables 1613.3.1(1) and 1613.3.1(2) as a function of the site classification and mapped spectral response acceleration at the short (S_s) and 1 second (S_1) periods.

6.6 Drainage Recommendations

Groundwater was not observed in the borings at the time of drilling. Based on the proposed development having no levels below grade, a drainage system and permanent dewatering will likely not be required.

Groundwater was not observed during our investigation. Due to the proximity to Kountze Lake, groundwater may fluctuate or be perched within the bedrock. A perimeter drain and

permanent dewatering system should not be required for the proposed development or the majority of the anticipated construction activities unless below grade levels are proposed.

PSI recommends that the surface infiltration be minimized to reduce the potential for surface water to saturate the soils below the foundations. The ground surface, landscaping, and flatwork should be sloped to drain away from the building. Roof down spouts and drains should discharge well beyond the limits of the building or into the sewer collection system.

6.7 Recommended Additional Services

In order to provide a final, design level report, PSI will need to perform additional explorations in currently inaccessible areas of the site and additional information about the proposed development. Site plans including building locations, grading plans, and building loads should be provided to PSI in order to develop a scope of services for additional field and laboratory testing. Recommendations contained in this report should be considered preliminary in nature and not relied upon for final design or construction of the project.

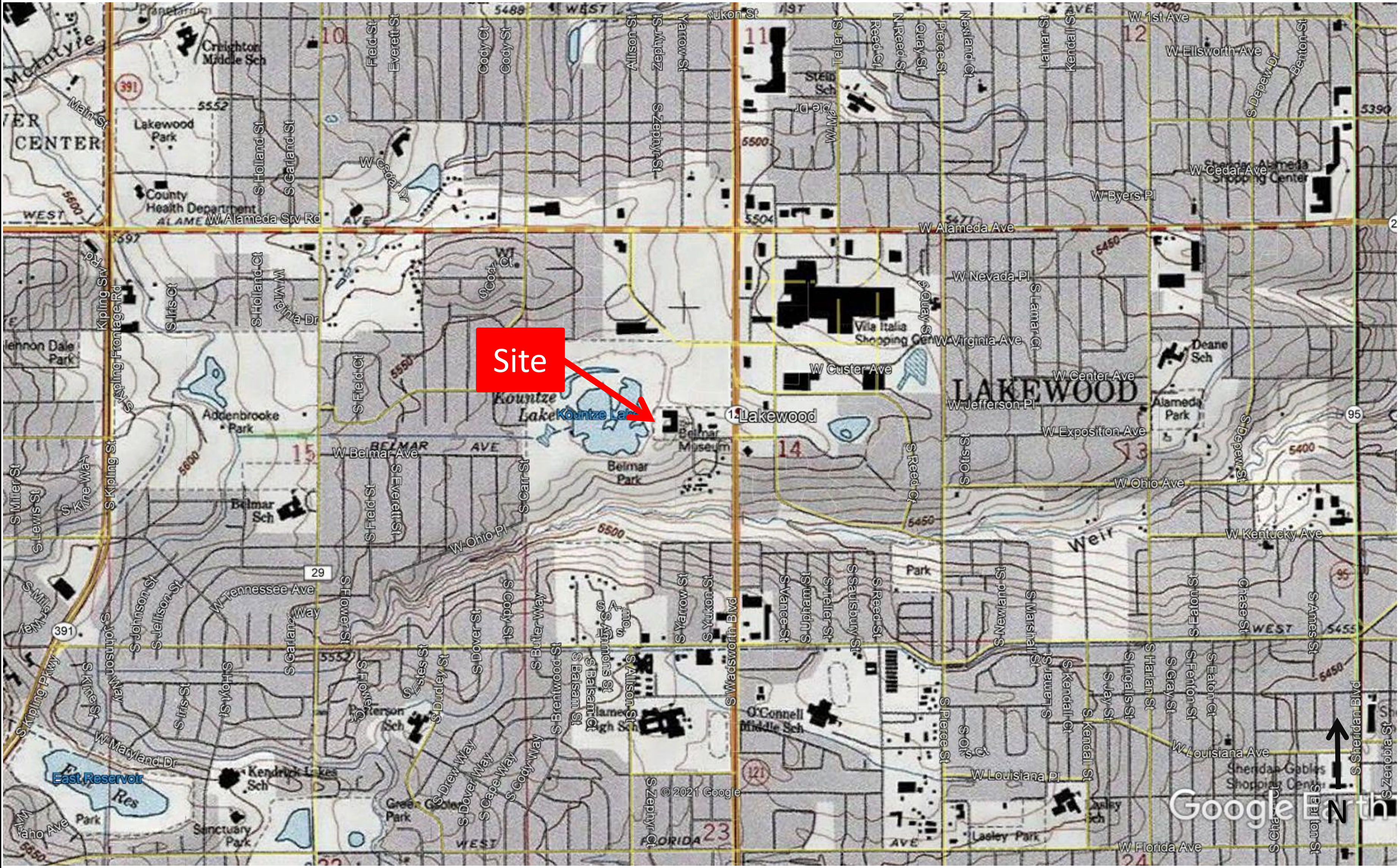
7.0 LIMITATIONS

The recommendations submitted are based on the subsurface information obtained by PSI and design details provided by Kairoi Residential. If there are revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation recommendations are required. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the project.

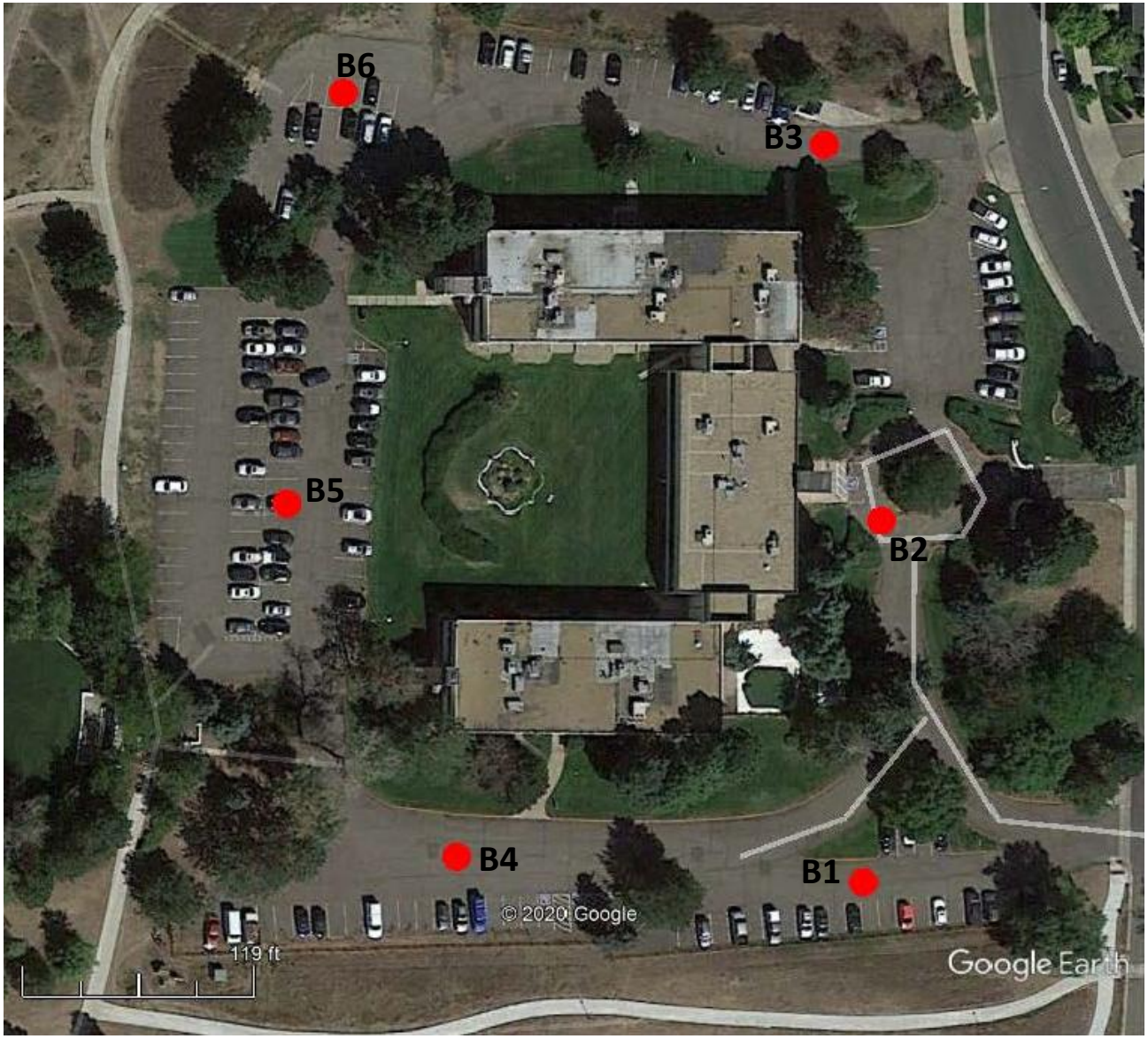
The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. This report has been prepared for the exclusive use of Kairoi Residential and their consultants for the specific application to the proposed development to be located at 777 South Yarrow Street in Lakewood, Colorado.

Taken From Google Earth	intertek psi	777 S Yarrow St	JOB NO.	5322170
		Site Vicinity Map	FIGURE NO.	1a



Taken From USGS Map -	intertek psi	777 S Yarrow St	JOB NO.	5322170
		Site Vicinity Map	FIGURE NO.	1b



N

Indicates Approximate location of Boring

Taken From Google Earth

intertek psi

777 S Yarrow St		JOB NO.	5322170
Boring Location Map		FIGURE NO.	2

FIGURE: 3

DATE STARTED:	2/16/21	**DRILL COMPANY:**	Dakota Drilling		
DATE COMPLETED:	2/16/21	**DRILLER:** ER	**LOGGED BY:** BP		
COMPLETION DEPTH	50.0 ft	**DRILL RIG:**	CME-55		
BENCHMARK:	N/A	**DRILLING METHOD:**	Solid Stem Auger		
ELEVATION:	N/A	**SAMPLING METHOD:**	Modified California		
LATITUDE:	39.7044°	**HAMMER TYPE:**	Manual		
LONGITUDE:	105.0846°	**EFFICIENCY**	N/A		
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	KD		

REMARKS:

BORING B1

Water		
	While Drilling	Not Observed
	Upon Completion	Not Observed
	Delay	N/A

BORING LOCATION:
See Figure 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification		Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ / Moisture × / PL ◪ / LL ✚ (0, 25, 50) / STRENGTH, tsf Qu ▲ / Qp ✳ (0, 2.0, 4.0)	Additional Remarks
	0					**ASPHALT** - Approximately 4-inches thick					
				1	12	**APPARENT FILL** - Fine to medium grained sand, brown, moist, stiff		10-15 N=25	24		-200 = 63.9% DD = 93 pcf
				2	12	**CLAY** - Fine grained sand, dark brown, moist, stiff	CL	20-30 N=50	25		S(500) = 1.2% P = 4.0K DD = 103 pcf
	5					**BEDROCK** - Fine grained sand, yellow-brown to black, moist, hard; high plasticity clay					
				3	7			50/7"	34	>>	DD = 85 pcf Q_u = 2.9 tsf
				4	6			50/6"	27	>>	-200 = 45.3%
	10										
	15			5	5			50/5"	25	>>	-200 = 23.6%
	20			6	3			50/3"		>>	
	25										
	30			7	3			50/3"		>>	
	35										
	40			8	0			Bounce		>>	
	45										
	50			9	2			50/2"		>>	

intertek psi

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PROJECT NO.: 05322170
PROJECT: Kairoi - Multifamily
LOCATION: 777 South Yarrow Street
Lakewood, CO

The stratification lines represent approximate boundaries. The transition may be gradual.

FIGURE: 4

DATE STARTED:	2/16/21	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	2/16/21	**DRILLER:** ER	**LOGGED BY:** BP
COMPLETION DEPTH	36.0 ft	**DRILL RIG:**	CME-55
BENCHMARK:	N/A	**DRILLING METHOD:**	Solid Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	Modified California
LATITUDE:	39.7044°	**HAMMER TYPE:**	Manual
LONGITUDE:	105.0846°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	KD
REMARKS:			

BORING B2

Water		
	While Drilling	Not Observed
	Upon Completion	Not Observed
	Delay	N/A

BORING LOCATION:
See Figure 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification		Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ / Moisture / PL / LL (0, 25, 50) / STRENGTH, tsf Qu / Qp (0, 2.0, 4.0)	Additional Remarks
	0					**ASPHALT** - Approximately 5-inches thick					
						APPARENT FILL - Fine to medium grained					
				1	12	sand, brown, moist, stiff		15-35 N=50	22		S(250) = 1.9% P = 1.5K DD = 99 pcf -200 = 37.7% DD = 112 pcf
	5			2	12	**CLAYEY SAND** - Fine to medium grained sand, brown w/white, moist, medium dense	SC	20-25 N=45	17		
				3	5	**BEDROCK** - Fine grained sand, dark brown to black, moist, hard; high plasticity clay		50/5"	27		>> S(750) = 0.5% P = 2.1K DD = 91 pcf
	10			4	5			50/5"	28		>> S(1000) = 0.1% P = 1.4K DD = 87 pcf
	15			5	2			50/2"	26		>> DD = 91 pcf -200 = 59.8%
	20			6	2			50/2"			>>
	25										
	30			7	3			50/3"			>>
	35					Auger refusal at 36 ft					

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Professional Service Industries, Inc.
1070 West 124th Avenue, Suite 800
Westminster, CO 80234
Telephone: (303) 424-5578

PROJECT NO.:	05322170
PROJECT:	Kairoi - Multifamily
LOCATION:	777 South Yarrow Street
	Lakewood, CO

The stratification lines represent approximate boundaries. The transition may be gradual.

FIGURE: 5

DATE STARTED:	2/26/21	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	2/26/21	**DRILLER:** GM	**LOGGED BY:** BP
COMPLETION DEPTH	30.0 ft	**DRILL RIG:**	CME-55
BENCHMARK:	N/A	**DRILLING METHOD:**	Solid Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	Modified California
LATITUDE:	39.7044°	**HAMMER TYPE:**	Manual
LONGITUDE:	105.0846°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	KD

REMARKS:

BORING B3

Water		
	While Drilling	Not Observed
	Upon Completion	Not Observed
	Delay	N/A

BORING LOCATION:
See Figure 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification		Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ / STRENGTH, tsf	Additional Remarks
	0					**ASPHALT** - Approximately 4-inches thick					
				1	12	**APPARENT FILL** - Contains clay, wood, asphalt; fine to medium grained sand, brown, moist, stiff		6-8 N=14	32		
	5			2	8	**BEDROCK** - Fine grained sand, brown-gray, moist, hard; high plasticity clay		50/8"	21	>>◎	GRAD: -200 = 78.5% CL-CH DD = 89 pcf S(500) = 0.3% P = 2.0K DD = 107 pcf
	10			3	6			50/6"	23	>>◎	
	15										
	20			4	2			50/2"		>>◎	
	25										
	30			5	3			50/3"		>>◎	

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PROJECT NO.: 05322170
PROJECT: Kairoi - Multifamily
LOCATION: 777 South Yarrow Street
Lakewood, CO

The stratification lines represent approximate boundaries. The transition may be gradual.

FIGURE: 6

DATE STARTED:	2/16/21	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	2/16/21	**DRILLER:** ER	**LOGGED BY:** BP
COMPLETION DEPTH	30.0 ft	**DRILL RIG:**	CME-55
BENCHMARK:	N/A	**DRILLING METHOD:**	Solid Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	Modified California
LATITUDE:	39.7044°	**HAMMER TYPE:**	Manual
LONGITUDE:	105.0846°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	KD

REMARKS:

BORING B4

Water		
	While Drilling	Not Observed
	Upon Completion	Not Observed
	Delay	N/A

BORING LOCATION:
See Figure 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification		Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ / STRENGTH, tsf	Additional Remarks
	0					**ASPHALT** - Approximately 6-inches thick					
				1	12	**APPARENT FILL** - Fine to medium grained sand, brown, moist, stiff	SC	10-15 N=25	27		S(250) = 1.1% P = 1.4K DD = 96 pcf
	5			2	12	**CLAYEY SAND** - Fine to medium grained sand, brown w/white, moist, medium dense		15-35/6"	23	>>◎	S(500) = 0.3% P = 1.6K DD = 101 pcf
						BEDROCK - Fine grained sand, brown to black, moist, hard; high plasticity clay					
	10			3	6			50/6"	24	>>◎	S(1000) = 1.6% P = 5.3K DD = 101 pcf
	15			4	6			50/6"	28	>>◎	DD = 92 pcf Q_u = 4.6 tsf
	20			5	2			50/2"		>>◎	
	25										
	30			6	3			50/3"		>>◎	
						Auger refusal at 34 ft					

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Westminster, CO 80234
Telephone: (303) 424-5578

PROJECT NO.: 05322170
PROJECT: Kairoi - Multifamily
LOCATION: 777 South Yarrow Street
Lakewood, CO

The stratification lines represent approximate boundaries. The transition may be gradual.

FIGURE: 7

DATE STARTED:	2/26/21	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	2/26/21	**DRILLER:** GM	**LOGGED BY:** BP
COMPLETION DEPTH	30.0 ft	**DRILL RIG:**	CME-55
BENCHMARK:	N/A	**DRILLING METHOD:**	Solid Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	Modified California
LATITUDE:	39.7044°	**HAMMER TYPE:**	Manual
LONGITUDE:	105.0846°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	KD

REMARKS:

BORING B5

Water		
	While Drilling	Not Observed
	Upon Completion	Not Observed
	Delay	N/A

BORING LOCATION:
See Figure 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification		Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ / STRENGTH, tsf	Additional Remarks
	0					**ASPHALT** - Approximately 4-inches thick					
						APPARENT FILL - Potential base course; fine to medium grained sand, brown, moist, stiff	CL				
				1	7			50/7"	26		S(250) = 0.9%
											P = 2.5K
	5			2	7	**CLAY** - Fine grained sand, dark brown, moist, stiff		50/7"	25		DD = 95 pcf
											-200 = 93.8%
						BEDROCK - Fine grained sand, dark brown and gray w/rust to black, moist, hard; high plasticity clay					
	10			3	8			50/8"	29		LL = 53
											PL = 29
	15										
	20			4	1			50/1"			
	25										
	30			5	3			50/3"			

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PROJECT NO.: 05322170
PROJECT: Kairoi - Multifamily
LOCATION: 777 South Yarrow Street
Lakewood, CO

The stratification lines represent approximate boundaries. The transition may be gradual.

FIGURE: 8

DATE STARTED:	2/26/21	**DRILL COMPANY:**	PSI, Inc.
DATE COMPLETED:	2/26/21	**DRILLER:** GM	**LOGGED BY:** BP
COMPLETION DEPTH	30.0 ft	**DRILL RIG:**	CME-55
BENCHMARK:	N/A	**DRILLING METHOD:**	Solid Stem Auger
ELEVATION:	N/A	**SAMPLING METHOD:**	Modified California
LATITUDE:	39.7044°	**HAMMER TYPE:**	Manual
LONGITUDE:	105.0846°	**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	KD

REMARKS:

BORING B6

Water		
	While Drilling	Not Observed
	Upon Completion	Not Observed
	Delay	N/A

BORING LOCATION:
See Figure 2

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification		Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ / STRENGTH, tsf	Additional Remarks
	0					**ASPHALT** - Approximately 4-inches thick					
				1	12	**APPARENT FILL** - Fine to medium grained sand, brown, moist, stiff		7-12 N=19	33		DD = 87 pcf LL = 67 PL = 23 GRAD: -200 = 80.0% CL-CH
				2	11	**APPARENT FILL** - Contains bedrock; fine grained sand, gray, moist, stiff		50/11"	32		
	5					**BEDROCK** - Fine grained sand, brown-gray, moist, hard; high plasticity clay					
				3	5			50/5"	9		
	10										
	15										
	20			4	2			50/2"			
	25										
	30			5	1			50/1"			

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PROJECT NO.: 05322170
PROJECT: Kairoi - Multifamily
LOCATION: 777 South Yarrow Street
Lakewood, CO

The stratification lines represent approximate boundaries. The transition may be gradual.

KEY TO SYMBOLS


Asphalt


Apparent Fill


USCS Low Plasticity Clay


USCS Clayey Sand


Bedrock

SSA = Solid Stem Auger

HSA = Hollow Stem Auger

CFA = Continuous Flight Auger

SPT = Standard Penetration Test

MC - Modified California Sampler

SS = Split-spoon Sampler

ST = Shelby Tube Sampler

RC = Rock Core

DD = Dry Density

MC = Moisture Content

LL = Liquid Limit

PL = Plastic Limit

-200 = Percent Passing the No. 200 Sieve (%)

S(250) = Swell under 250 psf surcharge pressure (%)

S(500) = Swell under 500 psf surcharge pressure (%)

S(1000) = Swell under 1000 psf surcharge pressure (%)

Qu = Unconfined Compressive Strength

RQD = Rock Quality Designation

REC'D = Rock Core Recovery Percentage

PID = Photo Ionic Detector (ppm)

The borings were advanced into the ground using 4-inch solid stem augers. At regular intervals throughout the boring depths, soil samples were obtained with either a 1.4-inch I.D., 2.0-inch O.D., split-spoon sampler or a 2.0-inch I.D., 2.4-inch O.D. Modified California sampler. The samplers were first seated 6-inches to penetrate any loose cuttings and then driven an additional foot where possible with blows of a 140-pound hammer falling 30-inches. The number of hammer blows required to drive the sampler each 6-inch increment is recorded in the field. The penetration resistance "N-value" is redesignated as the number of hammer blows required to drive the sampler the final foot and, when properly evaluated, is an index to cohesion for clays and relative density for sands. N-values recorded on the boring logs are uncorrected. The split-spoon sampling procedures used during this exploration are in general accordance with ASTM Designation D 1586.

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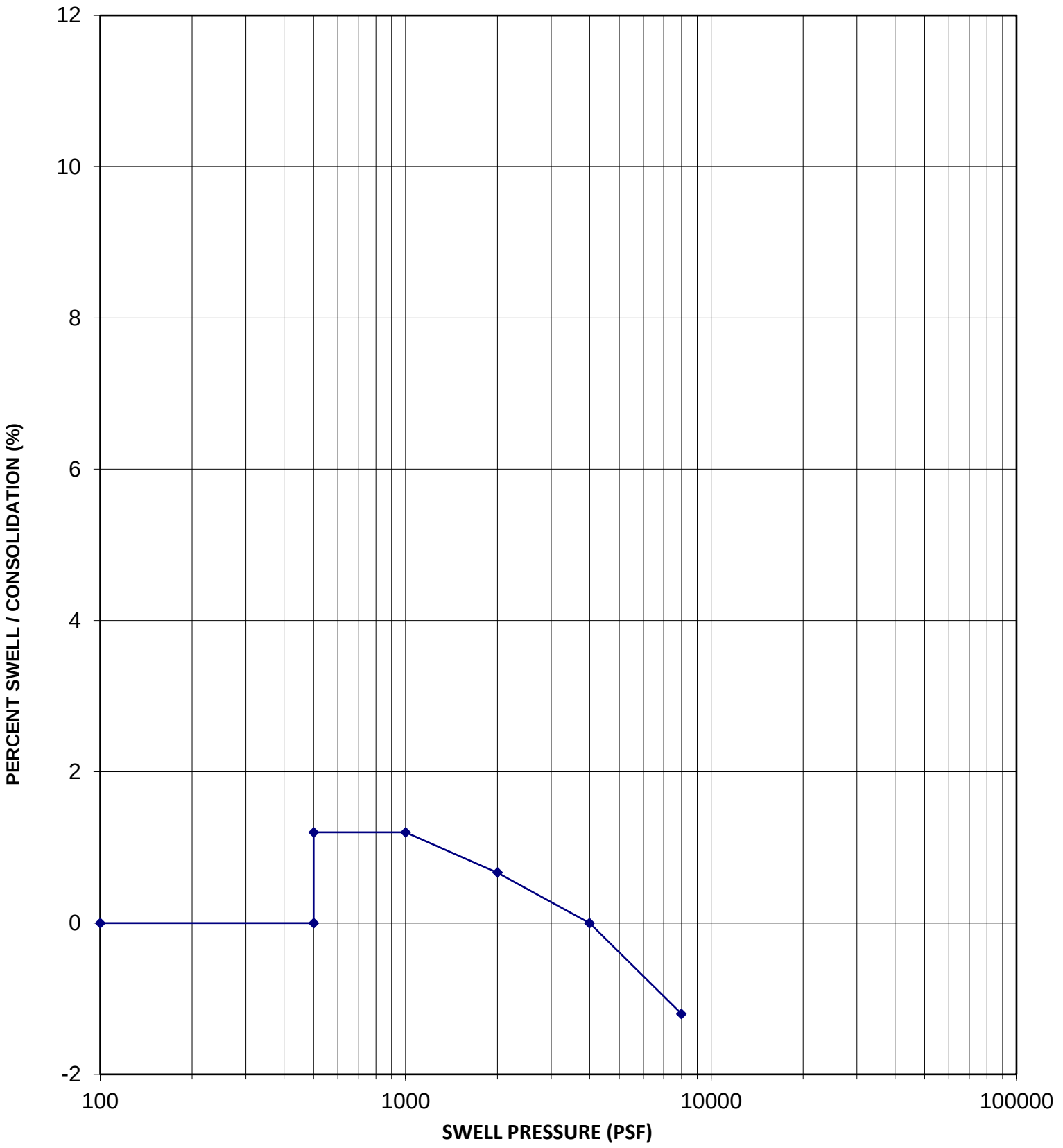
PSI Job No.: 05322170
Project: Kairoi - Multifamily
Location: 777 South Yarrow Street
Lakewood, CO

Appendix A

Laboratory Test Results

SWELL-CONSOLIDATION TEST

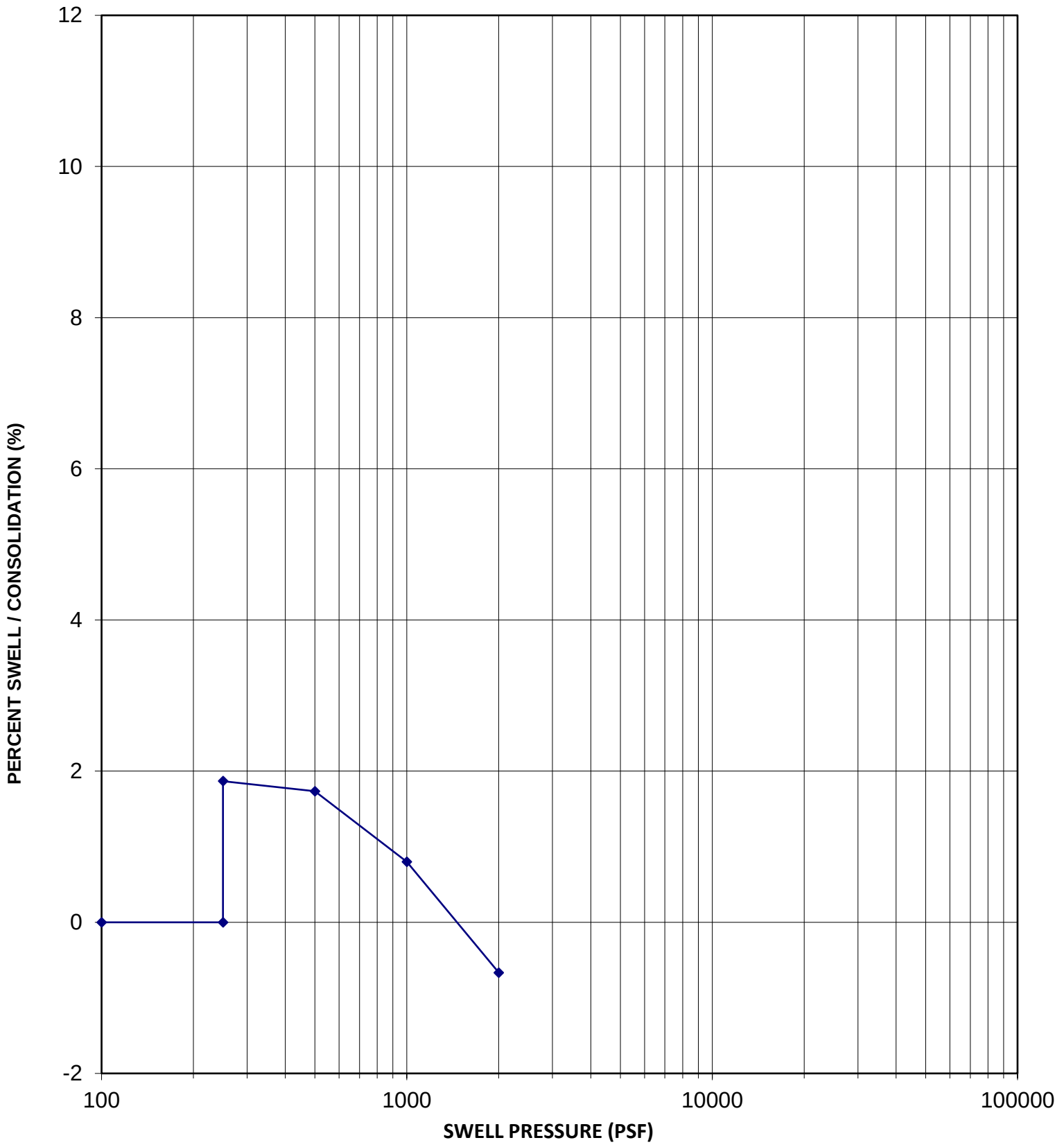


Sample Location	B1
Sample Depth	5 feet
Sample Description	Bedrock
USCS Classification	

Dry Density	103 pcf
In-Situ Moisture Content	24.7 %
Volume Change	1.2 %
Swell Pressure	4,000 psf

intertek psi	**Kairoi - Yarrow**	**JOB NO.**	**5322170**
	SWELL - CONSOLIDATION TEST	**FIGURE NO.**	**A1**

SWELL-CONSOLIDATION TEST

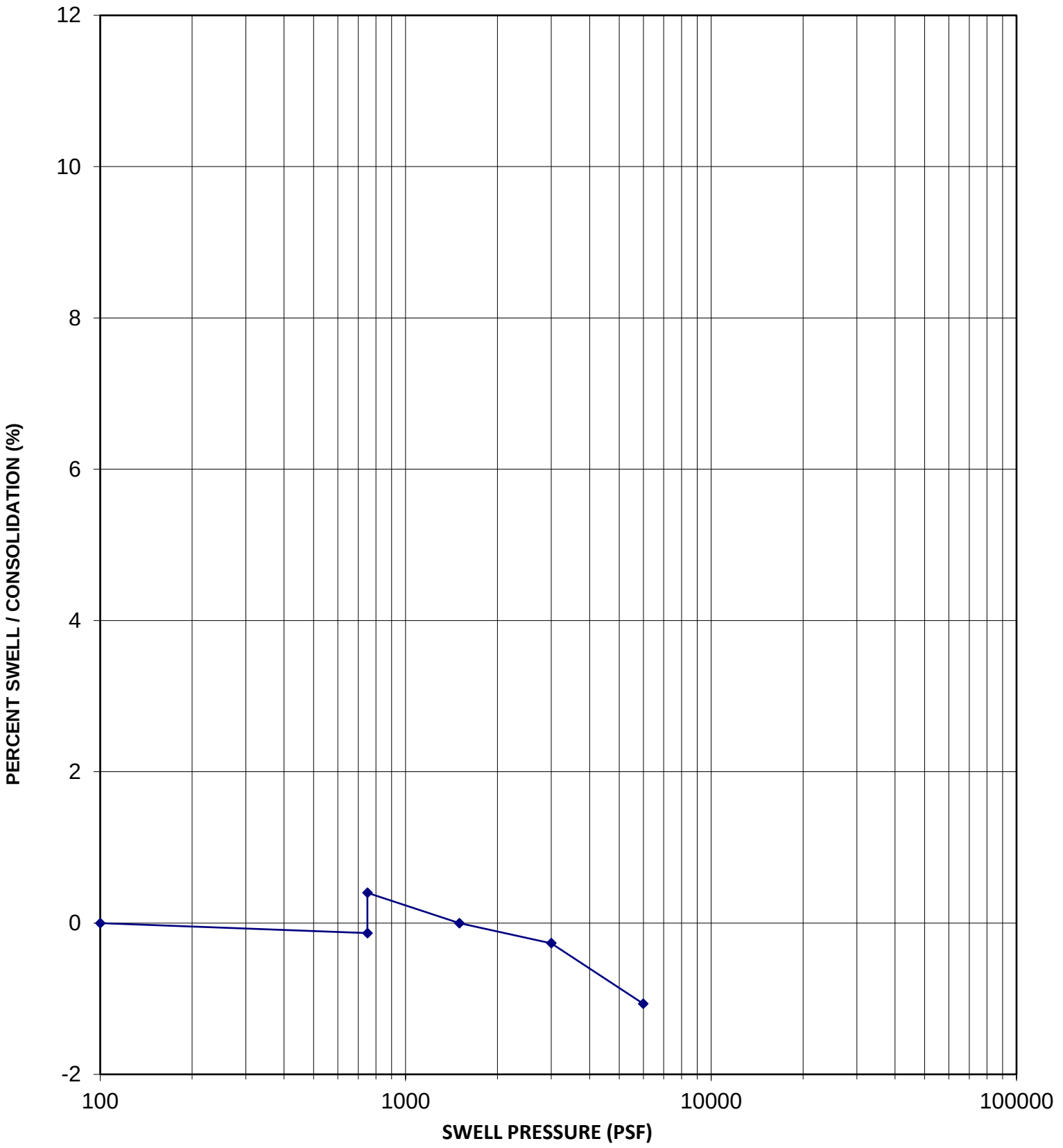


Sample Location	B2
Sample Depth	2.5 feet
Sample Description	Clayey Sand
USCS Classification	SC

Dry Density	99 pcf
In-Situ Moisture Content	21.7 %
Volume Change	1.9 %
Swell Pressure	1,500 psf

intertek psi	**Kairoi - Yarrow**	**JOB NO.**	**5322170**
	SWELL - CONSOLIDATION TEST	**FIGURE NO.**	**A2**

SWELL-CONSOLIDATION TEST

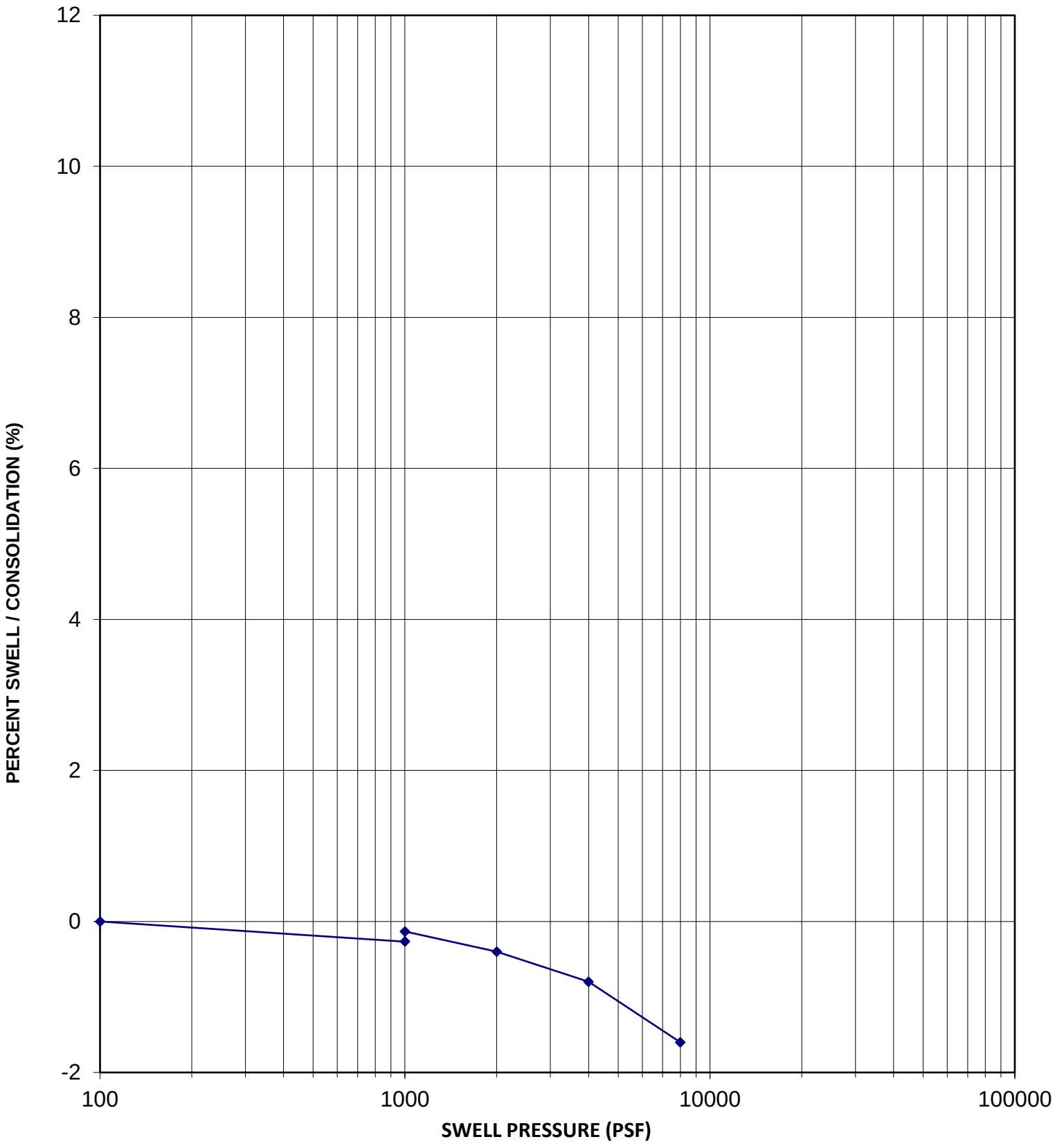


Sample Location	B2
Sample Depth	7.5 feet
Sample Description	Bedrock
USCS Classification	

Dry Density	91 pcf
In-Situ Moisture Content	27.4 %
Volume Change	0.5 %
Swell Pressure	2,100 psf

intertek psi	**Kairoi - Yarrow**	**JOB NO.**	**5322170**
	SWELL - CONSOLIDATION TEST	**FIGURE NO.**	**A3**

SWELL-CONSOLIDATION TEST

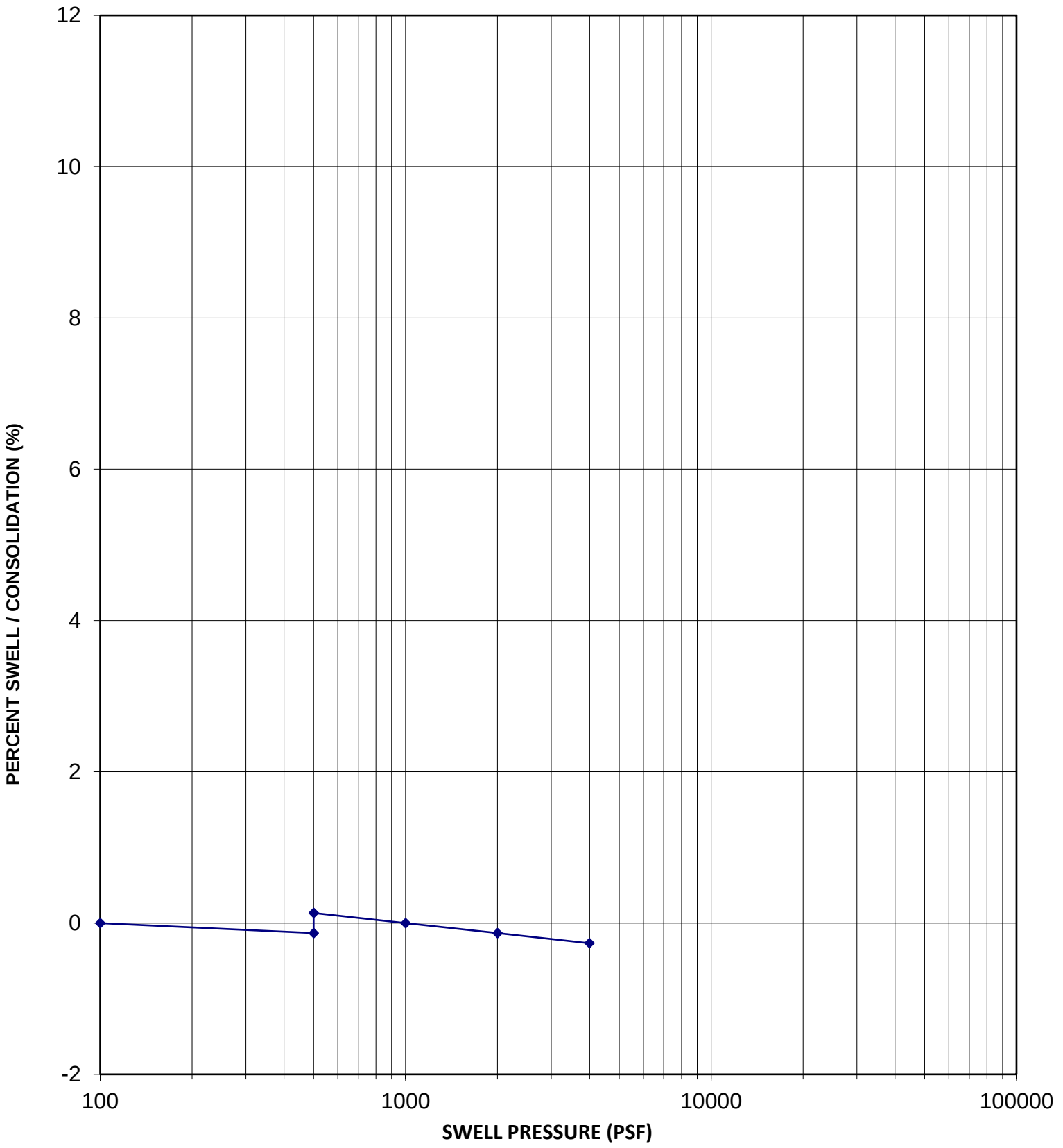


Sample Location	B2
Sample Depth	10 feet
Sample Description	Bedrock
USCS Classification	

Dry Density	87 pcf
In-Situ Moisture Content	28.3 %
Volume Change	0.1 %
Swell Pressure	1,400 psf

intertek psi	**Kairoi - Yarrow**	**JOB NO.**	**5322170**
	SWELL - CONSOLIDATION TEST	**FIGURE NO.**	**A4**

SWELL-CONSOLIDATION TEST

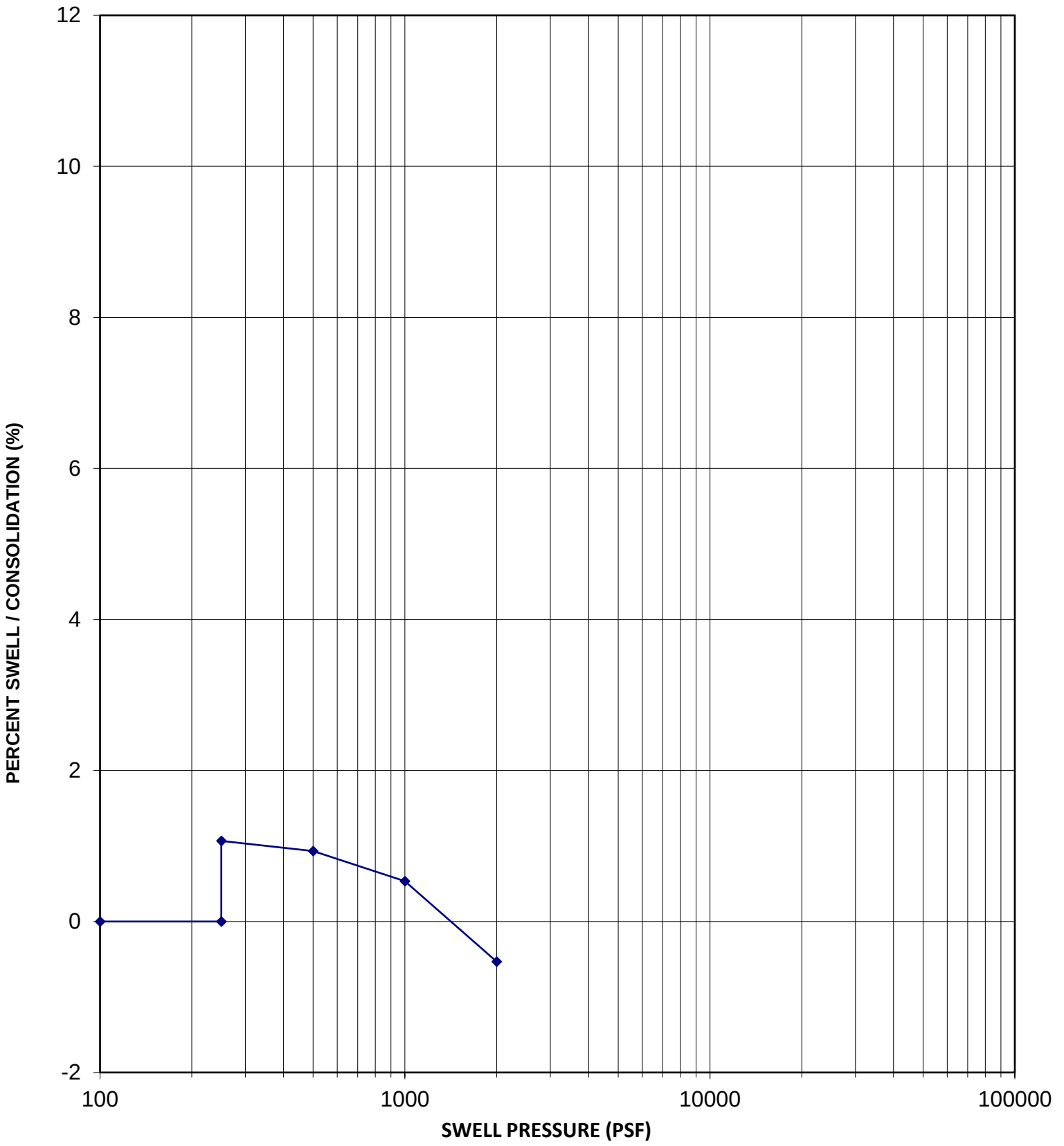


Sample Location	B3
Sample Depth	5 feet
Sample Description	Bedrock
USCS Classification	

Dry Density	107 pcf
In-Situ Moisture Content	21.1 %
Volume Change	0.3 %
Swell Pressure	2,000 psf

intertek psi	**Kairoi - Yarrow**	**JOB NO.**	**5322170**
	SWELL - CONSOLIDATION TEST	**FIGURE NO.**	**A5**

SWELL-CONSOLIDATION TEST

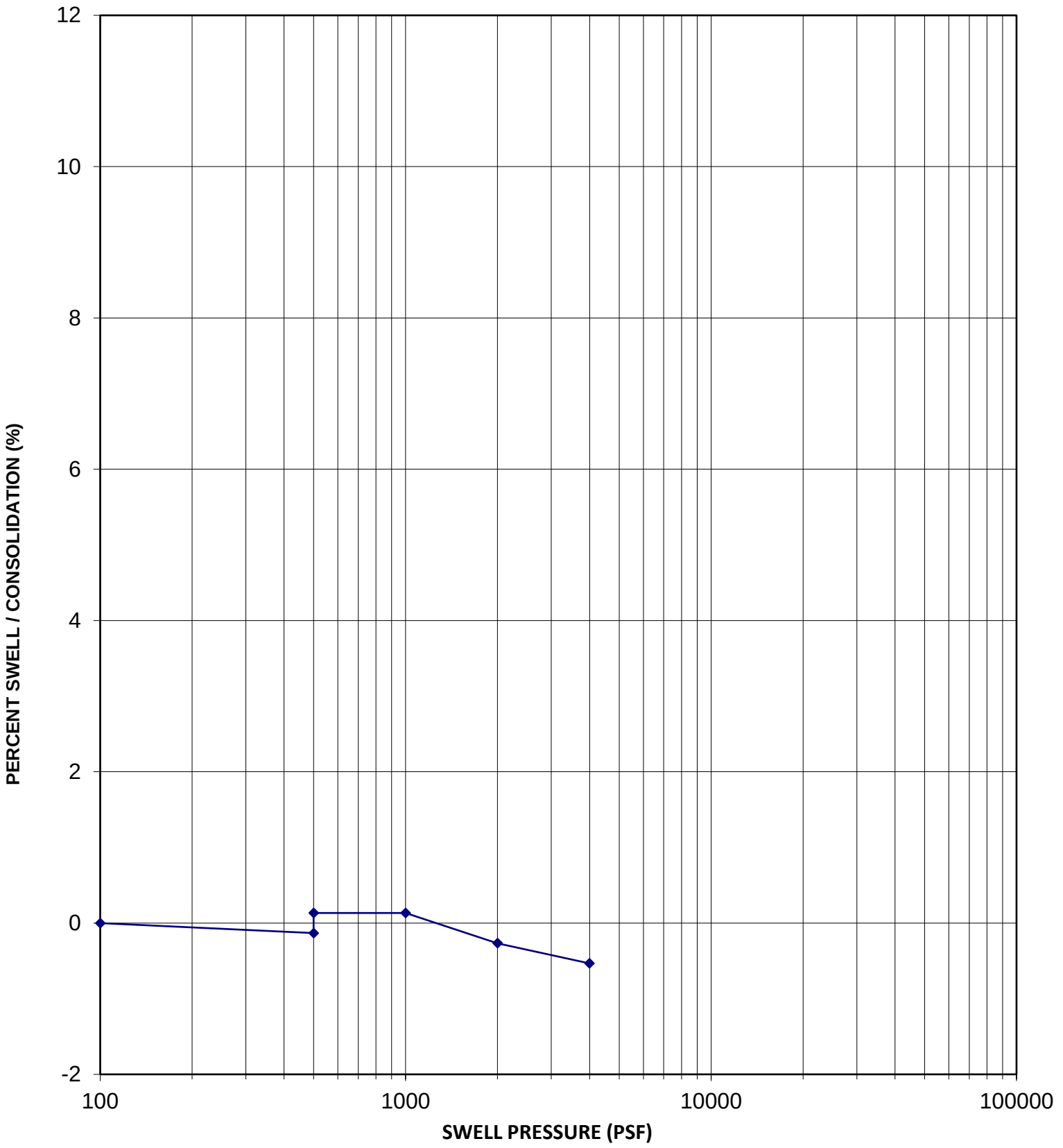


Sample Location	B4
Sample Depth	2.5 feet
Sample Description	Clayey Sand
USCS Classification	SC

Dry Density	96 pcf
In-Situ Moisture Content	27.3 %
Volume Change	1.1 %
Swell Pressure	1,400 psf

intertek psi	**Kairoi - Yarrow**	**JOB NO.**	**5322170**
	SWELL - CONSOLIDATION TEST	**FIGURE NO.**	**A6**

SWELL-CONSOLIDATION TEST

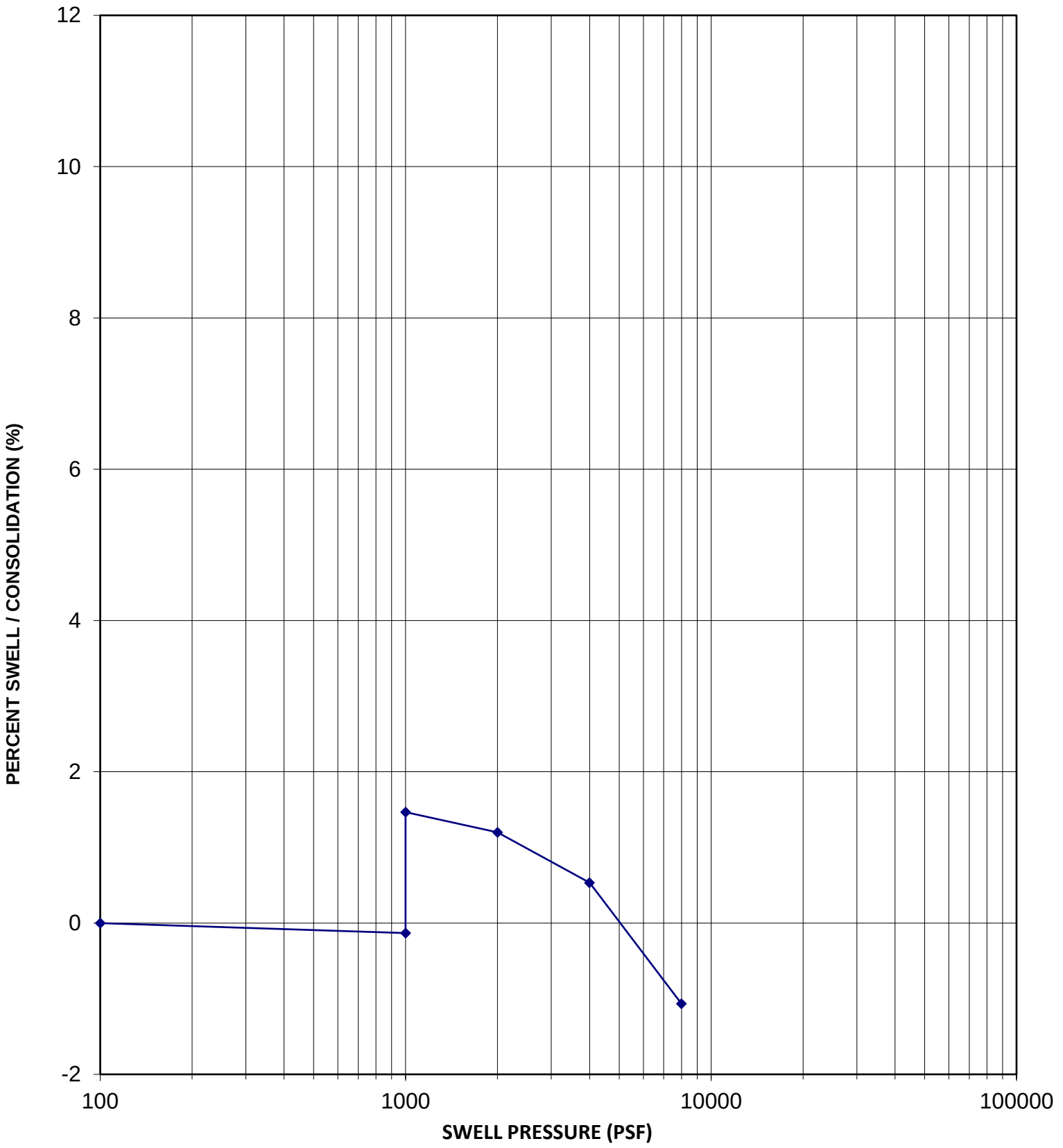


Sample Location	B4
Sample Depth	5 feet
Sample Description	Bedrock
USCS Classification	

Dry Density	101 pcf
In-Situ Moisture Content	23.2 %
Volume Change	0.3 %
Swell Pressure	1,600 psf

intertek psi	**Kairoi - Yarrow**	**JOB NO.**	**5322170**
	SWELL - CONSOLIDATION TEST	**FIGURE NO.**	**A7**

SWELL-CONSOLIDATION TEST

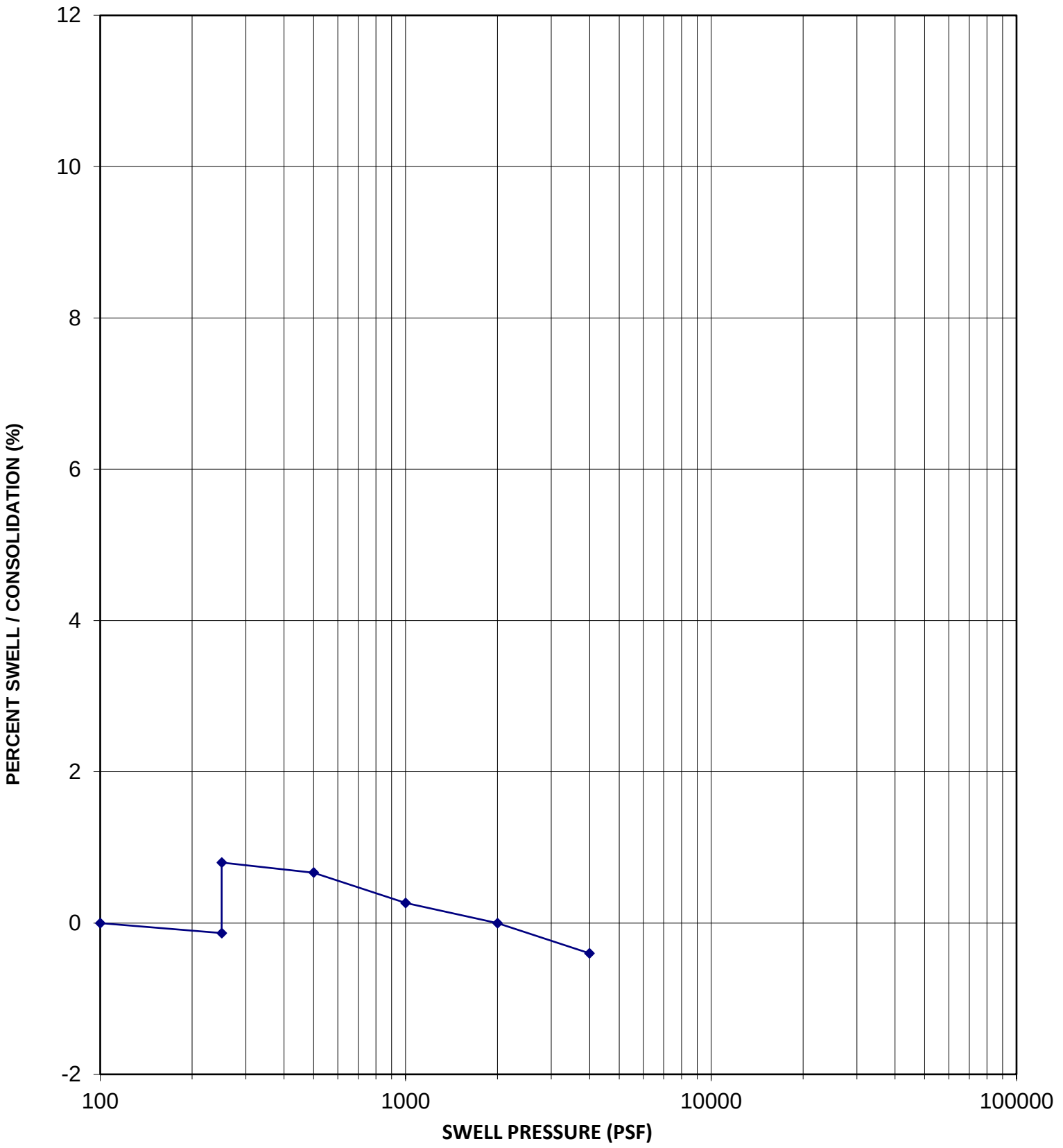


Sample Location	B4
Sample Depth	10 feet
Sample Description	Bedrock
USCS Classification	

Dry Density	101 pcf
In-Situ Moisture Content	24.0 %
Volume Change	1.6 %
Swell Pressure	5,300 psf

intertek psi	**Kairoi - Yarrow**	**JOB NO.**	**5322170**
	SWELL - CONSOLIDATION TEST	**FIGURE NO.**	**A8**

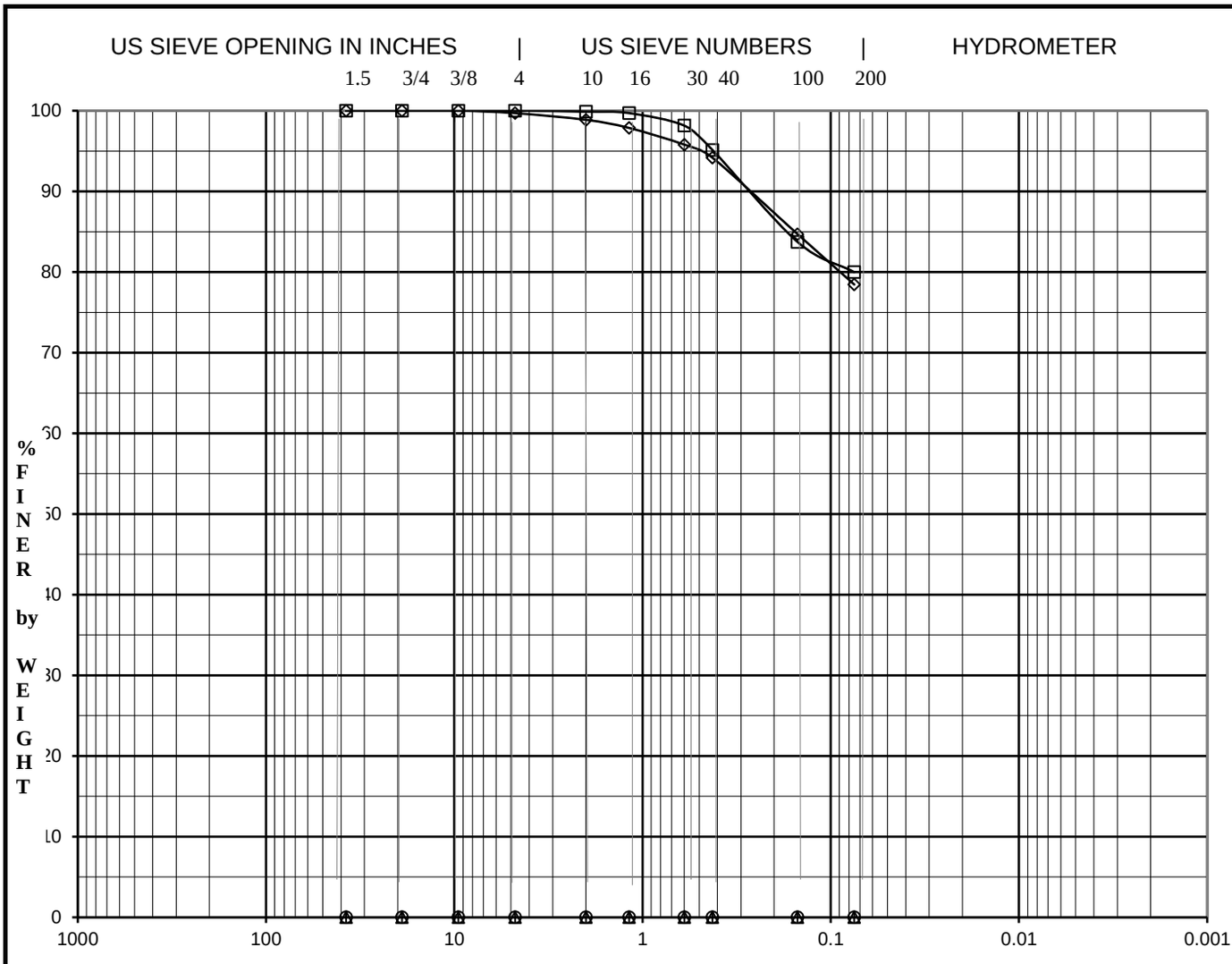
SWELL-CONSOLIDATION TEST



Sample Location	B5
Sample Depth	2.5 feet
Sample Description	Bedrock
USCS Classification	

Dry Density	95 pcf
In-Situ Moisture Content	26.0 %
Volume Change	0.9 %
Swell Pressure	2,500 psf

intertek psi	**Kairoi - Yarrow**	**JOB NO.**	**5322170**
	SWELL - CONSOLIDATION TEST	**FIGURE NO.**	**A9**



Specimen I.D.	Description	USCS	AASHTO	Group Index	LL	PI	PL
◇ B3 @ 2.5 FEET	High Plasticity Clay	CH	A-7-6	36	67	44	23
□ B6 @ 5 FEET	High Plasticity Clay	CH	A-7-6	37	67	44	23
△							
○							
+							

Specimen I.D.	D100	D60	D30	D10	Cc	Cu	%Gravel	%Sand	%Silt&Clay
◇ B3 @ 2.5 FEET	9.50						0	21	78
□ B6 @ 5 FEET	4.75						0	20	80
△									
○									
+									

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Kairioi - Yarrow

JOB NO. 05322170

GRADATION CURVES

FIGURE NO. A10

Information To Build On
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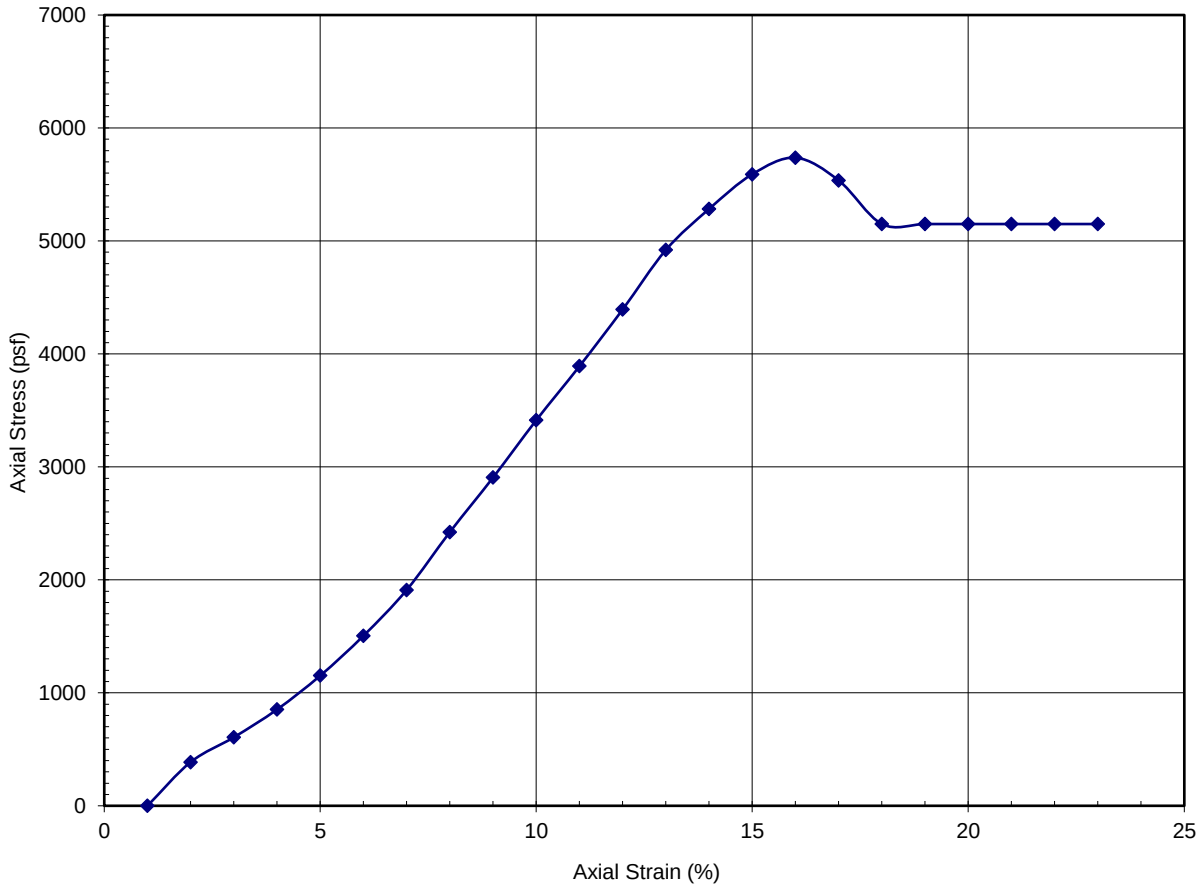
UNCONFINED COMPRESSION REPORT

Tested For: Kairoi Residential

Project Name: Kairoi Multifamily - Yarrow

Sample Date: February 16, 2021
Project No. 5322170
Sample No. B1
Depth 7.5

UNCONFINED COMPRESSION TEST: ASTM D2166



Wet Density (pcf)	113.5	**Initial Height (in)**	4.05
Dry Density (pcf)	84.6	**Initial Diameter (in)**	1.92
Moisture Content (%)	34.2	**Relative Compaction (%)**	N/A
Compressive Strength (psf)	5,700	**Deviation From OMC (%)**	N/A

Remarks:

Respectfully Submitted,
Professional Service Industries, Inc.

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Information To Build On
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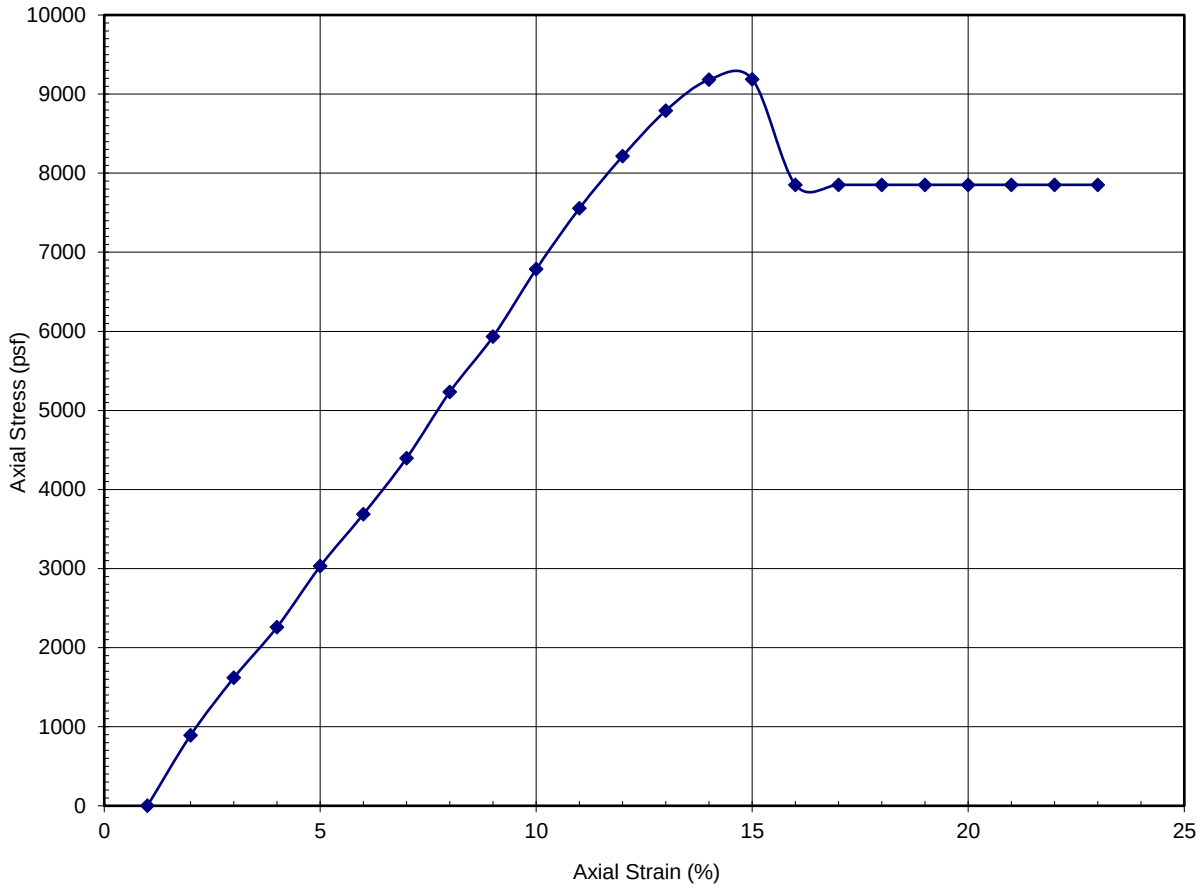
UNCONFINED COMPRESSION REPORT

Tested For: Kairoi Residential

Project Name: Kairoi Multifamily - Yarrow

Sample Date: February 16, 2021
Project No. 5322170
Sample No. B4
Depth 15

UNCONFINED COMPRESSION TEST: ASTM D2166



Wet Density (pcf)	117.5	**Initial Height (in)**	3.34
Dry Density (pcf)	91.6	**Initial Diameter (in)**	1.94
Moisture Content (%)	28.3	**Relative Compaction (%)**	N/A
Compressive Strength (psf)	9,200	**Deviation From OMC (%)**	N/A

Remarks:

Respectfully Submitted,
Professional Service Industries, Inc.

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