

SOIL MECHANICS DRILLING CORP.

3770 MERRICK ROAD • SEAFORD, L. I., NEW YORK 11783
(516) 221-2333 • FAX (516) 221-0254

February 23, 2023

Monadnock Development LLC
155 3rd Street
Brooklyn, N.Y. 11231
Attn: Dean Oliver

Re: Kingsbrook Estates-Final Report
26A
Brooklyn, New York
Our Job 21-214

Gentlemen:

Forwarded herewith are our findings and recommendations associated with the Geotechnical Investigation we conducted at the referenced site, including Sheets 1 through 4 of our Drawing #21L214A-27.

The study was comprised of drilling twenty-seven (27) test borings, digging one (1) test pit and conducting two (2) permeability (infiltration) tests, at the locations shown on the attached drawings. The physical field work began in November, 2021, and was not completed until January, 2023. This was due to scheduling restrictions imposed by the Operating Facilities Management team, as well as the need to locate and identify the many public and private utilities that service the existing buildings which currently occupy a significant portion of the proposed buildings footprints.

The purpose of the subsurface investigation was to determine the nature and extent of the underlying soil deposits, as well as their engineering characteristics to satisfy the NYC Building Code and structural engineer's requirements for geotechnical data and recommendations needed to design the proposed three (3) new buildings. They are named The Graviola, The Naseberry and The Tamarind. The first two of which will have full cellars. The northern half (approximately) of The Tamarind will have a full cellar while the southern portion will have a crawl space. The buildings range in height from five to six stories.

The borings were performed in accordance with the procedure described in ASTM D-1586. Sample recovery for borings B-1 through B-8, B-12 through B-21 and B-23 and B-24 were obtained using a Central Mine (CME) truck mounted drill rig, hollow stem augers, CME auto trip hammer and a standard 2 inch O.D. split spoon sampler. Sample recovery for borings B-9 through B-11, B-22 and B-25 through B-27, on the other hand, used portable drilling equipment including a motorized cathead, 140 pound drop hammer and a standard 2 inch split spoon sampler. Please note: the CME auto trip hammer operates with an efficiency of approximately 90%. The original conventional use of rope, cathead and 140 lb. drop hammer to advance the standard 2 inch O.D. split spoon sampler operates with an average efficiency of about 60%. As a consequence, the Standard Penetration Test (SPT) results obtained using the CME trip hammer, i.e. recorded number of blows of the hammer to advance the sample spoon each 6 inch increment

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is about 2/3rds of the value that would have been obtained had the original rope and cathead method been used. This is significant if one uses design charts for soil strength based on historical data associated with the rope and cathead method whose results are now referred to a "N₆₀". If so, one should adjust the auto trip hammer data accordingly.

Ground surface depths across the site are relatively level, varying from elevation 30.0 to 34.6 based on NAVD 88 Datum shown on the topographic drawing provided to us.

Ground water depths encountered at each borehole at the time it was drilled were recorded and are shown on each boring log. The ground water elevations so noted range from a high of 11.2 at B-6 to a low of 7.7 at B-25.

The soil profiles generated by this investigation are described below for each building and best fit that of Site Class "D" utilizing the SPT values method (N) as shown in Table 1613.5.5 (2014 BC).

Based on these profiles and associated ground water table elevations, liquefaction is not likely and is, therefore, not a design consideration.

All exterior building foundations, i.e. footings or pile caps, whichever is applicable, must be founded a minimum of four (4) feet below outside grade to provide frost protection per Code. Exterior grade beams must be founded a minimum of eighteen (18) inches below outside grade per Code.

The structural design of the proposed building should be based on, among other considerations, the following seismic classification; Site Class "D":

1. Mapped maximum considered spectral response for; short periods (S_s) shall be $0.281g$ and at one second period (S_1) shall be $0.073g$.
2. Values of Site Coefficients; $F_a=1.57$; $F_v=2.40$

The twenty-seven (27) borings drilled to date were distributed throughout the site as follows:

Borings B-1 through B-4, B-22 through B-25 and B-27 (a total of 9 test borings) were located within the footprint area of The Graviola.

Borings B-5 through B-9 (a total of 5 test borings) were located within the footprint area of The Naseberry. Borings B-10 through B-17, B-19 and B-20 (a total of 10 test borings) were located within the footprint area of The Tamarind.

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Borings B-18, B-21 and B-26 were site borings with B-18 and B-21 also serving as the locations for the percolation (infiltration) tests.

The Graviola:

Accordingly, the footprint area of this proposed building has existing surface elevations at the borehole locations ranging from 30.0 to 32.0. Those areas are blanketed by from 4 to 20 feet of fill, overlying a moderately dense to dense sand formation extending down to the deepest depths drilled. Ground water elevations at these locations ranged from elevation 7.7 to 11.0 at the time they were drilled. The finished cellar floor elevation is noted as 17.42.

The Naseberry:

Accordingly, the footprint area of this proposed building has existing surface elevations at the borehole locations ranging from 30.9 to 31.2. Those areas are blanketed by from 18 to 23 feet of fill, overlying a moderately dense to dense sand formation extending down to the deepest depths drilled. Ground water elevations at these locations ranged from elevation 8.8 to 11.2 at the time they were drilled. The finished cellar floor elevation is noted as 18.25.

The Tamarind:

Accordingly, the footprint area of this proposed building has existing surface elevations at the borehole locations ranging from 31.5 to 34.6. Those areas are blanketed by from 9.5 to 23.3 feet of fill, overlying a moderately dense to dense sand formation extending down to the deepest depths drilled. Ground water elevations at these locations ranging from elevation 8.5 to 10.7 at the time the borings were drilled. The finished cellar floor elevation is noted as 19.67 for the northern half (approximately) of the building. The remaining southern portion of the building as a crawl space with a noted elevation of 26.67.

Infiltration/Drainage site borings (B-18, B-21 and B-26) were drilled from existing grade elevations of 32.2, 32.8 and 32.5 respectively. Those areas are blanketed by from 18 to 23.3 feet of fill, overlying a moderately dense to dense sand formation extending down to the deepest depths drilled. Ground water elevations at these locations ranged from elevation 8.9 to 10.2 at the time they were drilled. Infiltration tests (P-1 and P-2) were conducted in the immediate vicinity of borings B-18 and B-21 respectively. Each location is underlain by approximately 23 feet of fill. The 4" I.D. Pipe casing was driven as directed to a depth of 15 feet at each of the two locations, washed out and filled with water to perform the pre-soak. Upon returning the following day it was noted that the water had not fully discharged. We were then instructed to advance the casing at each location another 5 feet, clean them out and initiate another pre-soak. Upon our return the next day we again noted that the casing still contained significant amounts of water. At that point, we were instructed to withdraw the casings and backfill each hole. These efforts suggest that the "fill" at both locations had poor drainage characteristics. The natural sand formation located below it, on the other hand, has only trace amounts of fines and, therefore, is expected to have good drainage qualities.

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Three (3) Test Pits were designated to be dug at the locations shown on our drawings. TP-1 and TP-2 were not dug due to either being inaccessible or unsafe. TP-3 was dug and then supplemented by TP-3A to better identify the conditions found. See our Drawing 21L214A-27, Sheet 2 of 2 for details which, in effect, confirms that the existing building is pile supported.

The soil subgrade data presented above was compiled from the twenty-seven (27) borings that we drilled and the two (2) test pits that we dug at the site. All of that work was performed outside the building footprints of the three (3) relatively large buildings that currently occupy the subject property and, therefore, we have no definitive soil data within those footprint areas. We were provided a copy of the Foundation Plan (circa 1972 +/-) for the Rutland Nursing Home which is just south of the proposed Graviola Building. That drawing indicates that that building has a cellar floor elevation of 14 +/- which is likely based on the old Brooklyn datum which is equal to NAVD 88 elevation 15.5 +/- . The drawing also illustrates the presence of pile caps within the footprint of the building to its North. Test Pits TP-3 and TP-3A revealed the presence of a pile cap and grade beams, again indicating that that existing building is also pile supported. That building also occupies a significant portion of the Southern wing of "The Tamarind" which itself will only have a crawl space at elevation 26.67.

The "fill" material encountered at the borehole locations varies in composition and density across the site and, therefore, is not considered suitable as a bearing material for shallow foundations, ie., footings or mats. The natural underlying sand formation, while suitable in composition, has a bearing capacity of 2-1/2 tons per square foot and at many areas of the proposed buildings footprints is located well below its cellar level. We, therefore, do not consider shallow foundations a viable option for support of any proposed buildings.

We recommend, based on our study of all of the data collected during this Geotechnical Investigation that all three (3) of the proposed buildings be supported on deep foundation elements (piles). Driven piles were eliminated from consideration based on the noise and vibration levels associated with their installation, which when factoring in the site's environs and surrounding use, is very undesirable. Therefore, we recommend auger cast concrete piles (also known as hollow stem auger or HSA piles) 14" diameter installed and reinforced to accommodate design working loads of 60 tons in compression, 21 tons in tension at designated locations and 5 tons in lateral capacity. The concrete (grout) should have a 28-day compressive strength of 5,000 psi. NYC Building Code requires a minimum of two (2) successful load tests at each building for each type of loading. The tests should be performed in accordance with ASTM Procedures D-1143, D-3689 and D-3966 for compression, tension and lateral design loads respectively.

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Note that HSA's can be installed as either a displacement pile or a non-displacement pile. The displacement version generates less spoil in that the auger is designed to push the soil it is drilling through laterally to the side into the surrounding formation, densifying it which increases its friction value resulting not only in less spoil to dispose of but also a potentially shorter pile. In either case, the installation of this type of pile generates a wet working environment due to spoil and/or grout spillage. The installation should be performed by a specialty contractor with five or more years of experience.

The soil profiles generated by this investigation indicates that the natural soil and/or fill below the proposed buildings cellar level is moderately dense and, therefore, generally suitable for a slab-on-grade cellar floor, which would satisfactorily support a live load of 100 psf and a dead load of 88 psf. However, due to the absence of boring data in much of the footprint areas of the proposed new buildings due to the presence of existing buildings, additional shallow borings or test pits should be performed to investigate the viability of the assumption voiced above. This should be done as soon as possible along with the drilling of at least three (3) additional deep test borings in the footprint area of the Southern most wing of The Tamarind. These deep borings are needed to determine the minimum required length for piles in this area.

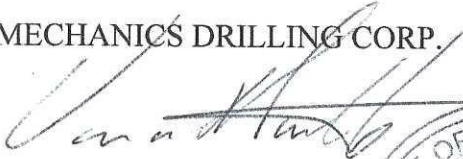
Finally, we recommend that since available information suggests that at least some of the existing buildings are pile supported, an effort should be made to survey the locations of all existing piles that are located in close proximity of the new piles to be installed so conflicts can be anticipated and dealt with prior to the start of foundation construction.

TR-1 and TR-4 forms will be provided upon receipt of the formal address of each of the three proposed buildings.

If you have any question, please don't hesitate to contact me.

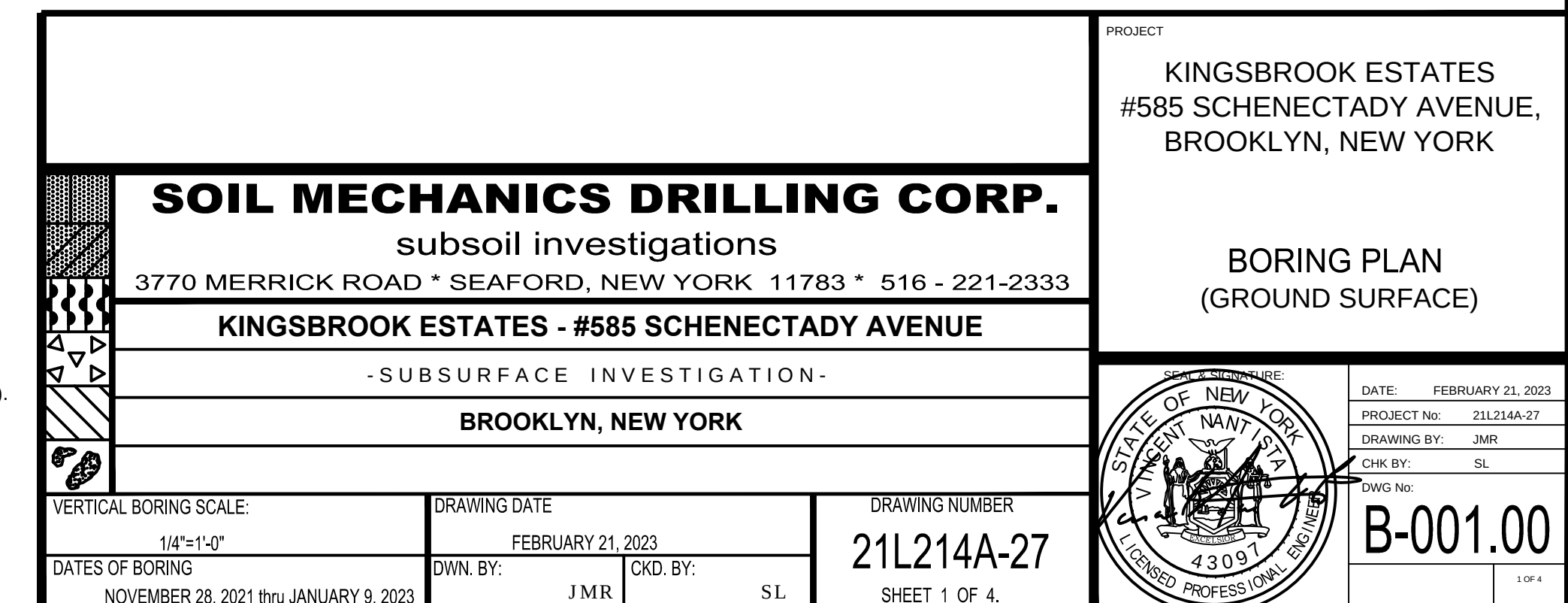
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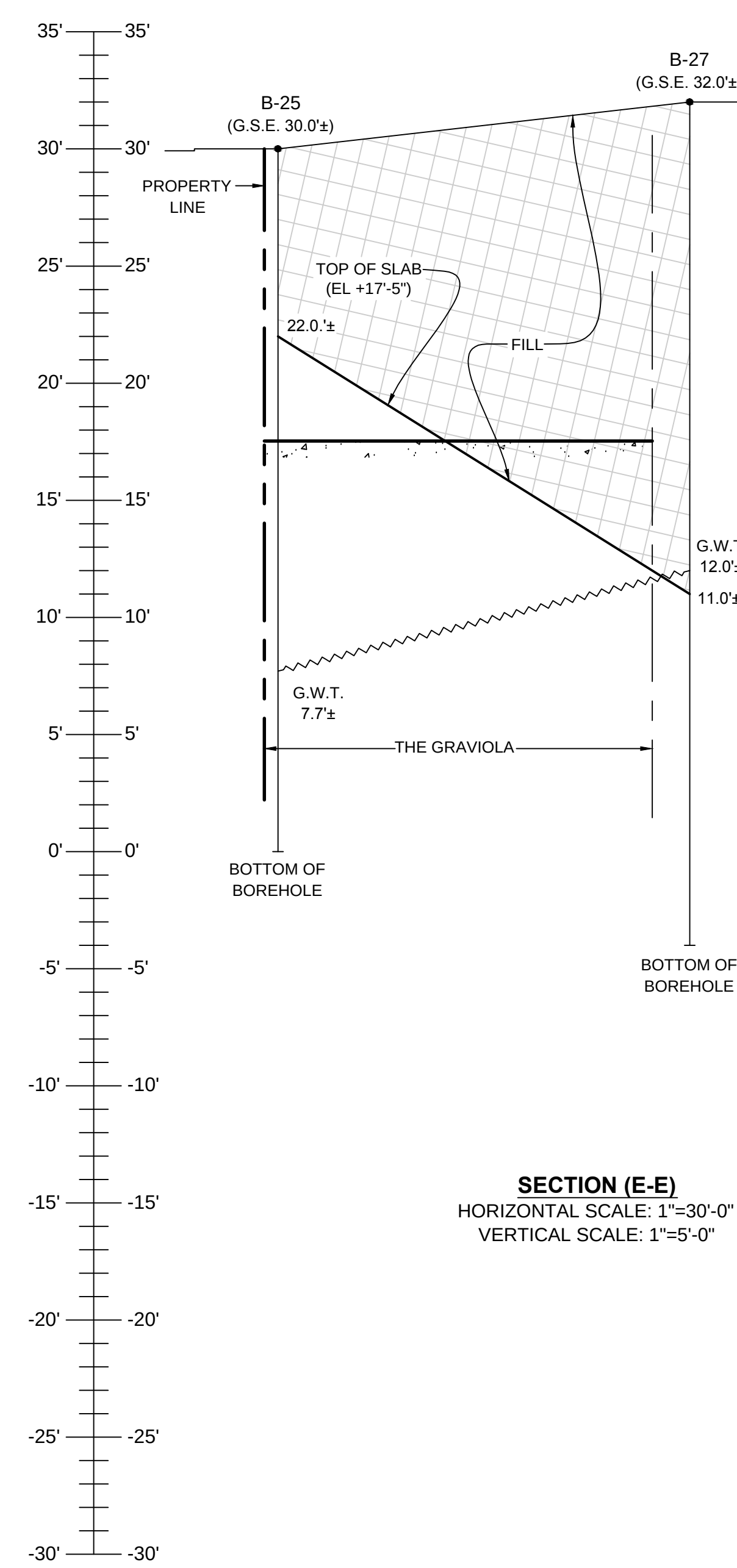
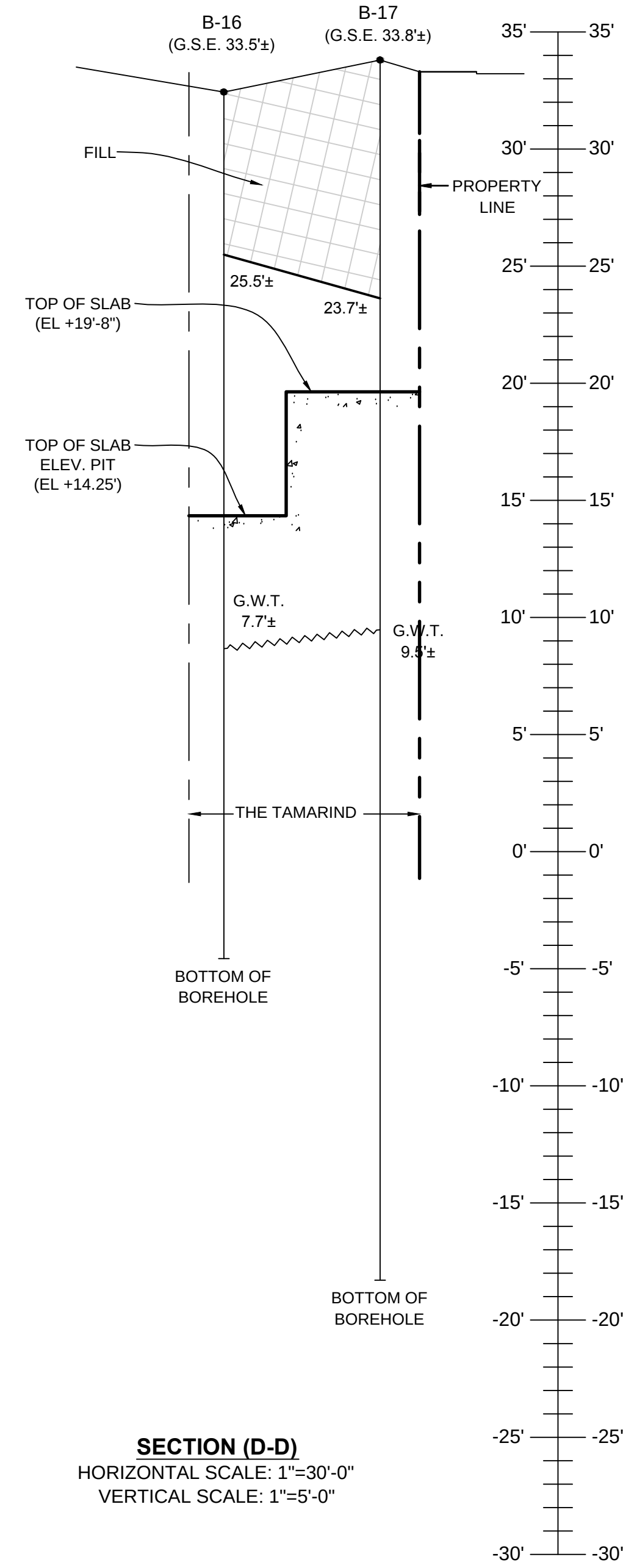
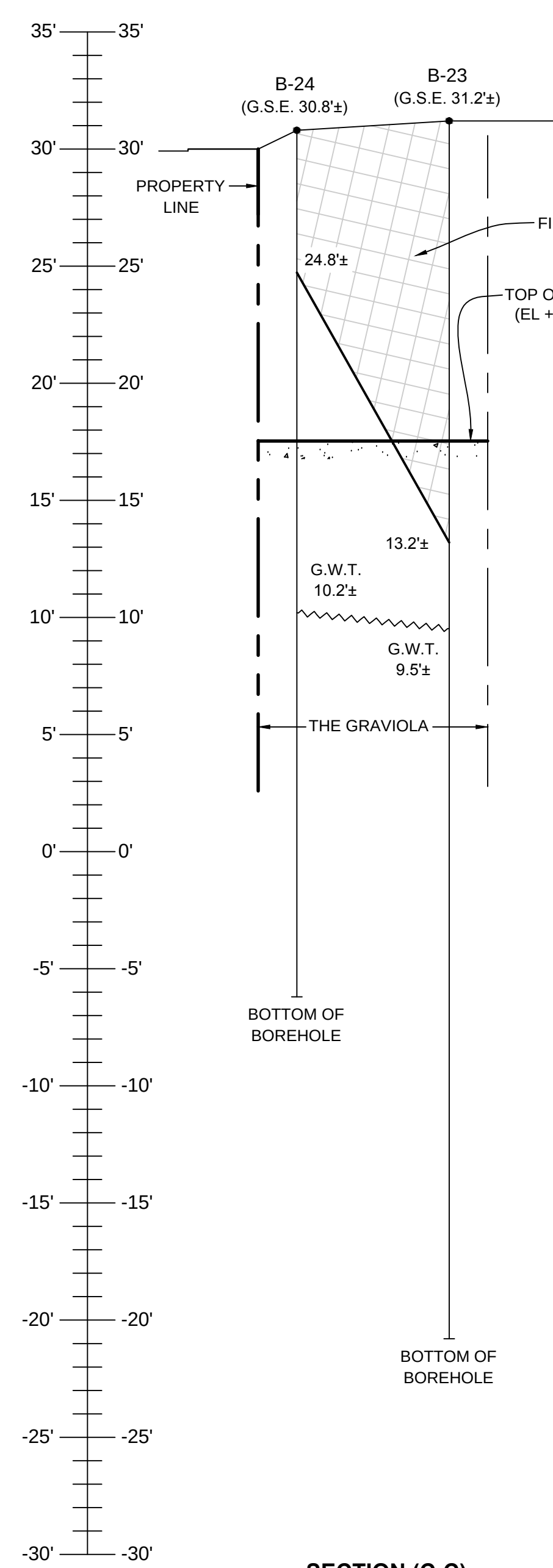
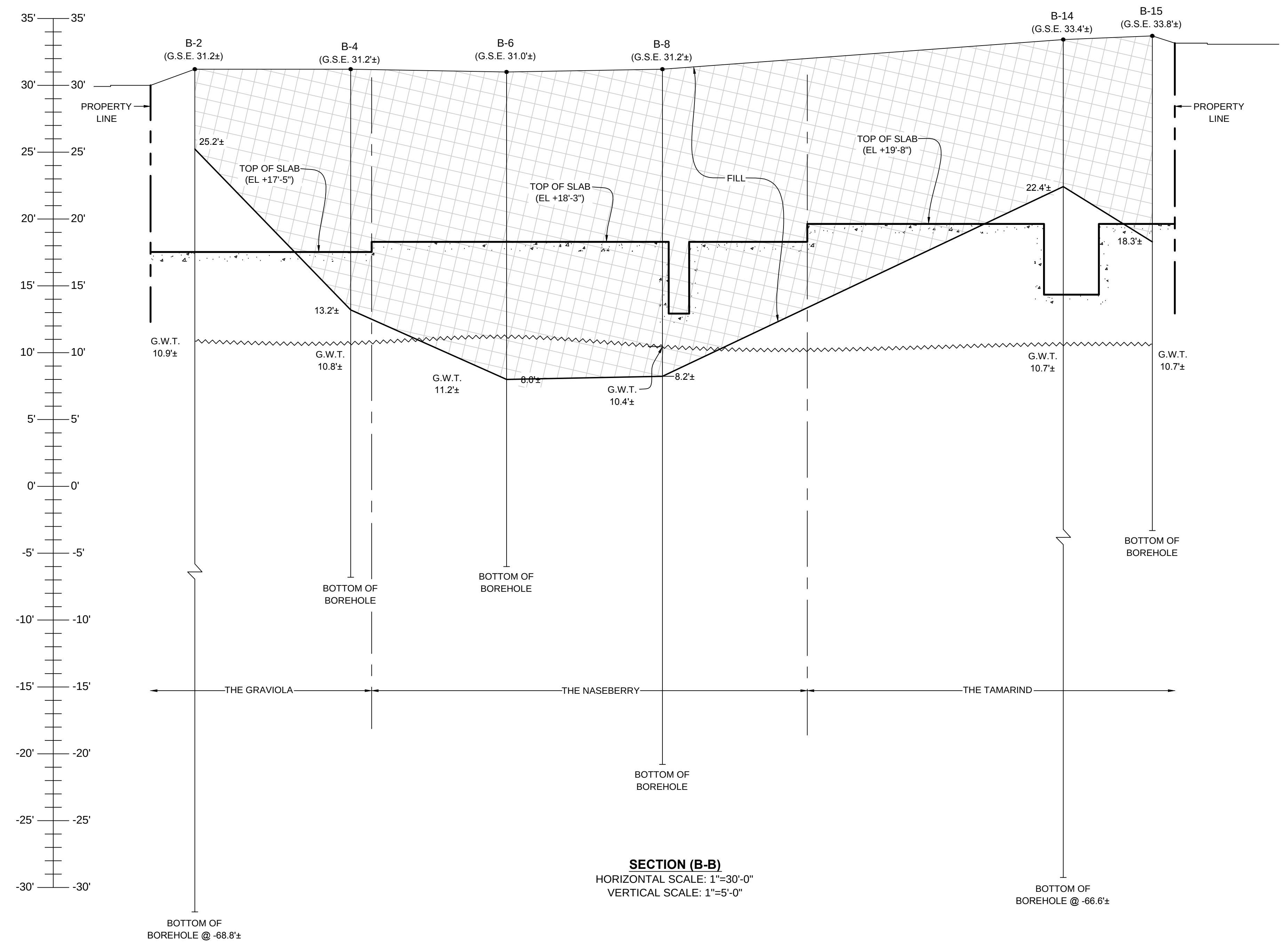
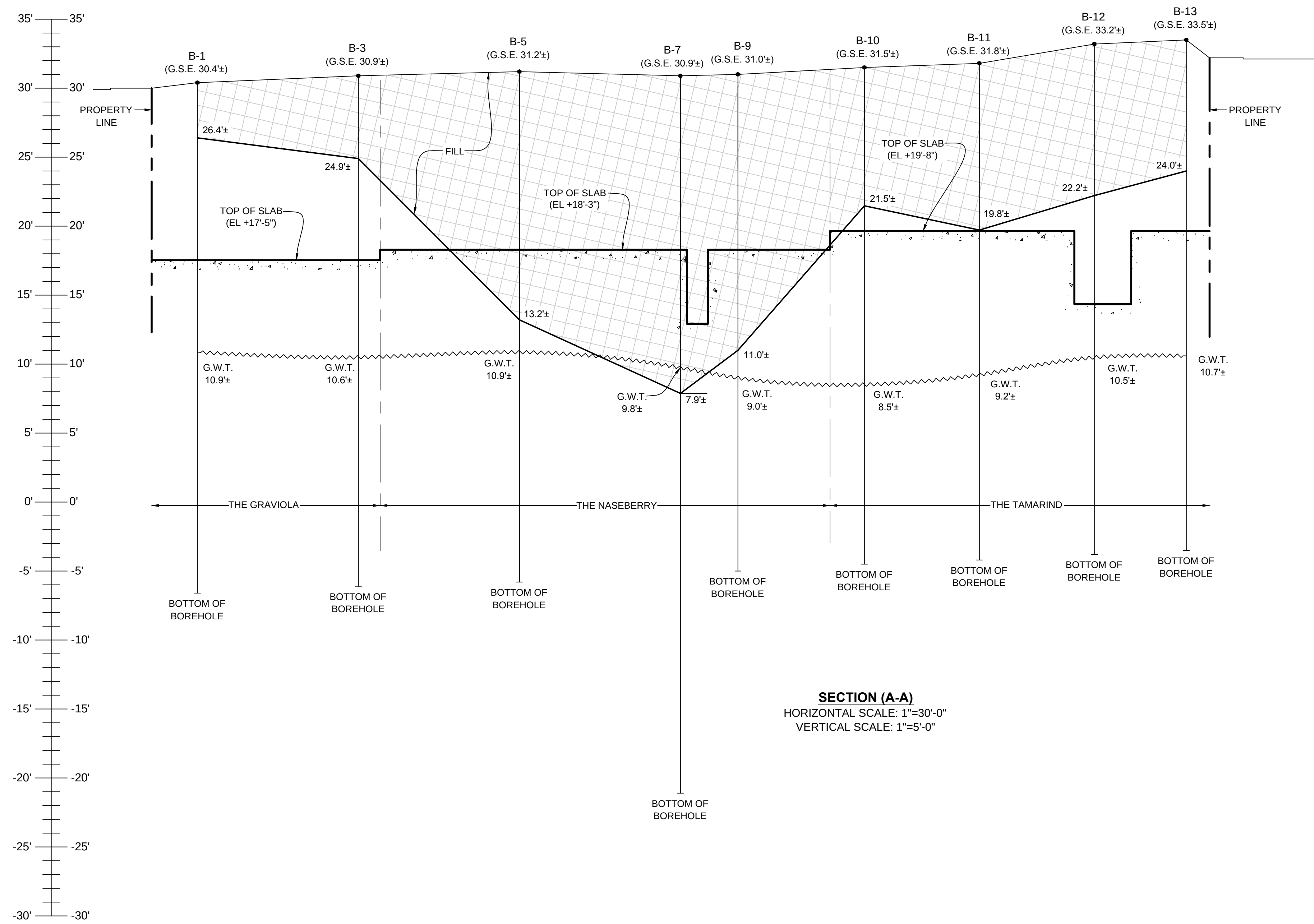
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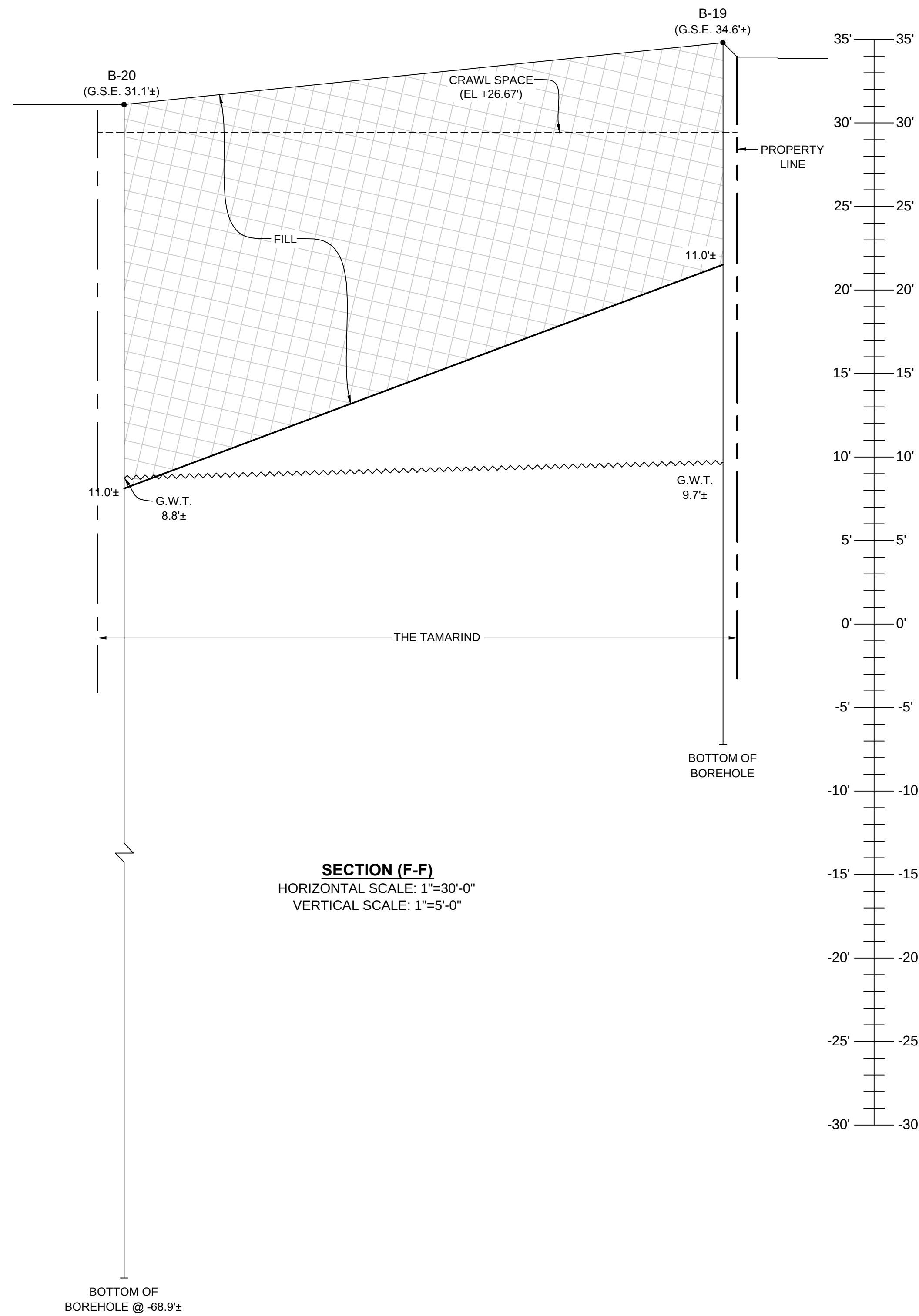
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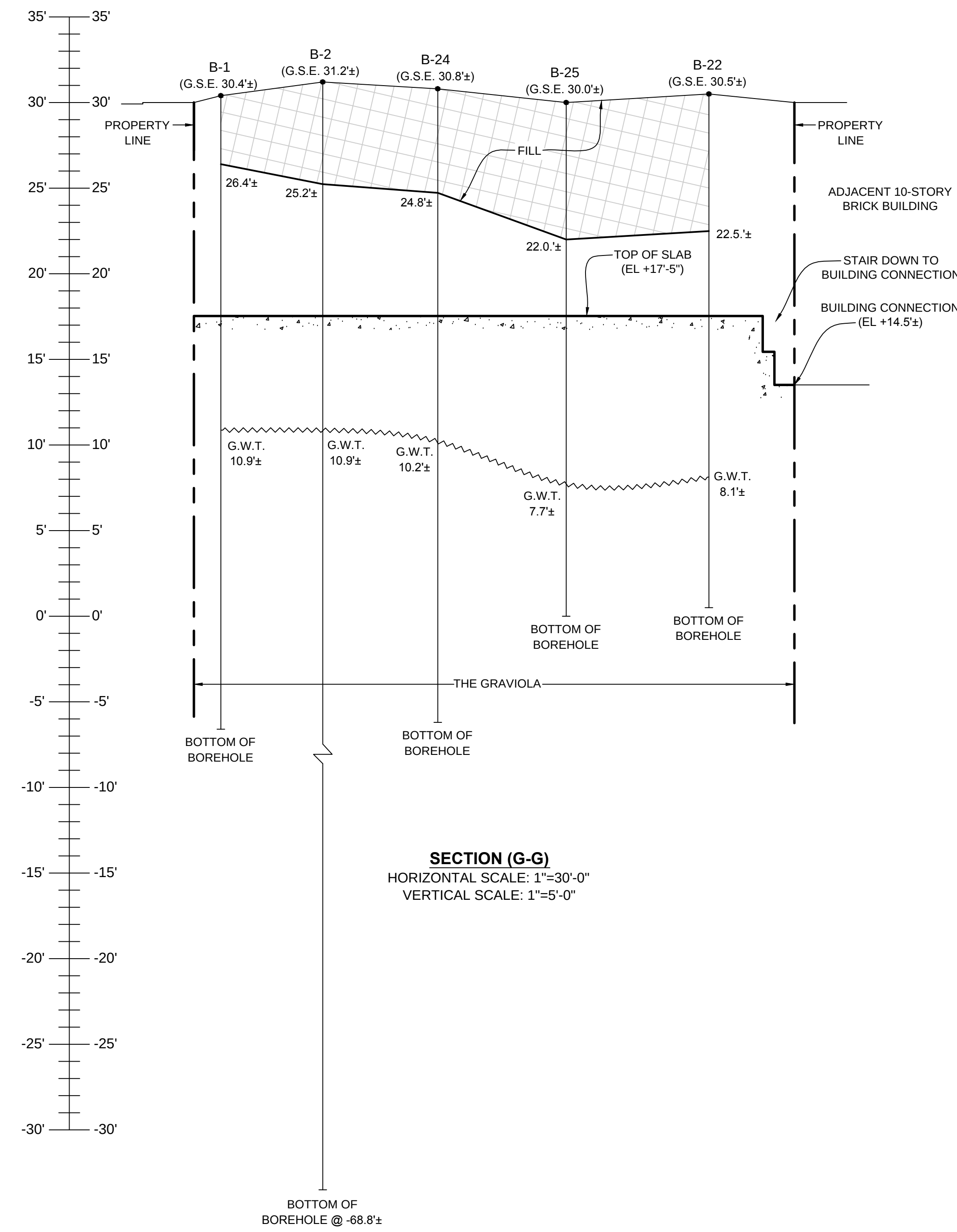
NOTE:
PROFILES SHOWN WERE GENERATED BASED ON THE ASSUMPTION THAT THE FILL DEPTH VARIES LINEARLY FROM BOREHOLE TO BOREHOLE. THIS MAY NOT REFLECT THE ACTUAL FIELD CONDITIONS THAT EXIST OR MAY BE ENCOUNTERED

SOIL MECHANICS DRILLING CORP. subsoil investigations 3770 MERRICK ROAD • SEAFORD, NEW YORK 11783 • 516 - 221-2333 KINGSBROOK ESTATES - #585 SCHENECTADY AVENUE - SUBSURFACE INVESTIGATION - BROOKLYN, NEW YORK		PROJECT KINGSBROOK ESTATES #585 SCHENECTADY AVENUE, BROOKLYN, NEW YORK SECTION PLAN (GROUND SURFACE)
SECTION SCALE(S): H: 1"=30'-0" V: 1"=5'-0" DATES OF BORING: NOVEMBER 2021-DECEMBER 2022	SITE PLAN SCALE: 1"=50'-0" DRAWING DATE: FEBRUARY 21, 2023 DWN. BY: JMR	DRAWINGS NUMBER: 21L214A-27 SHEET 3 OF 4

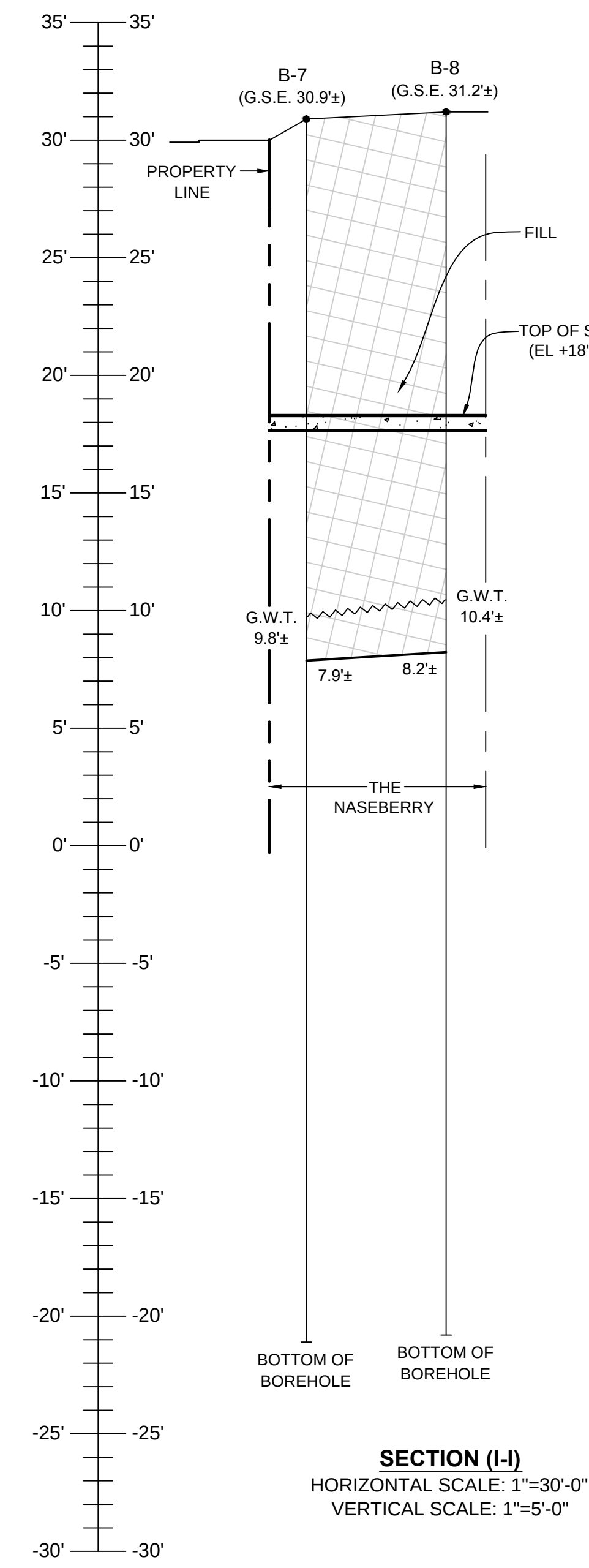


SECTION (F-F)
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VERTICAL SCALE: 1"=5'-0"

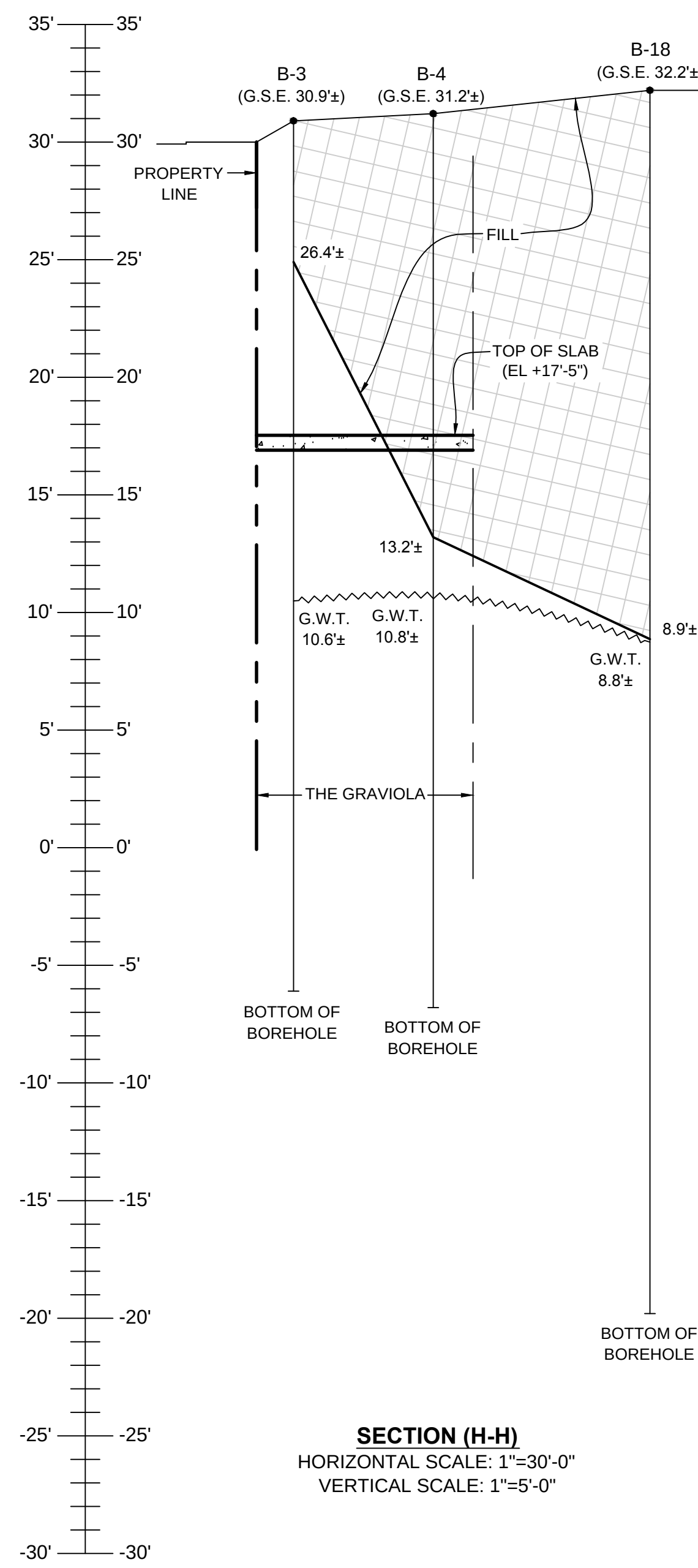
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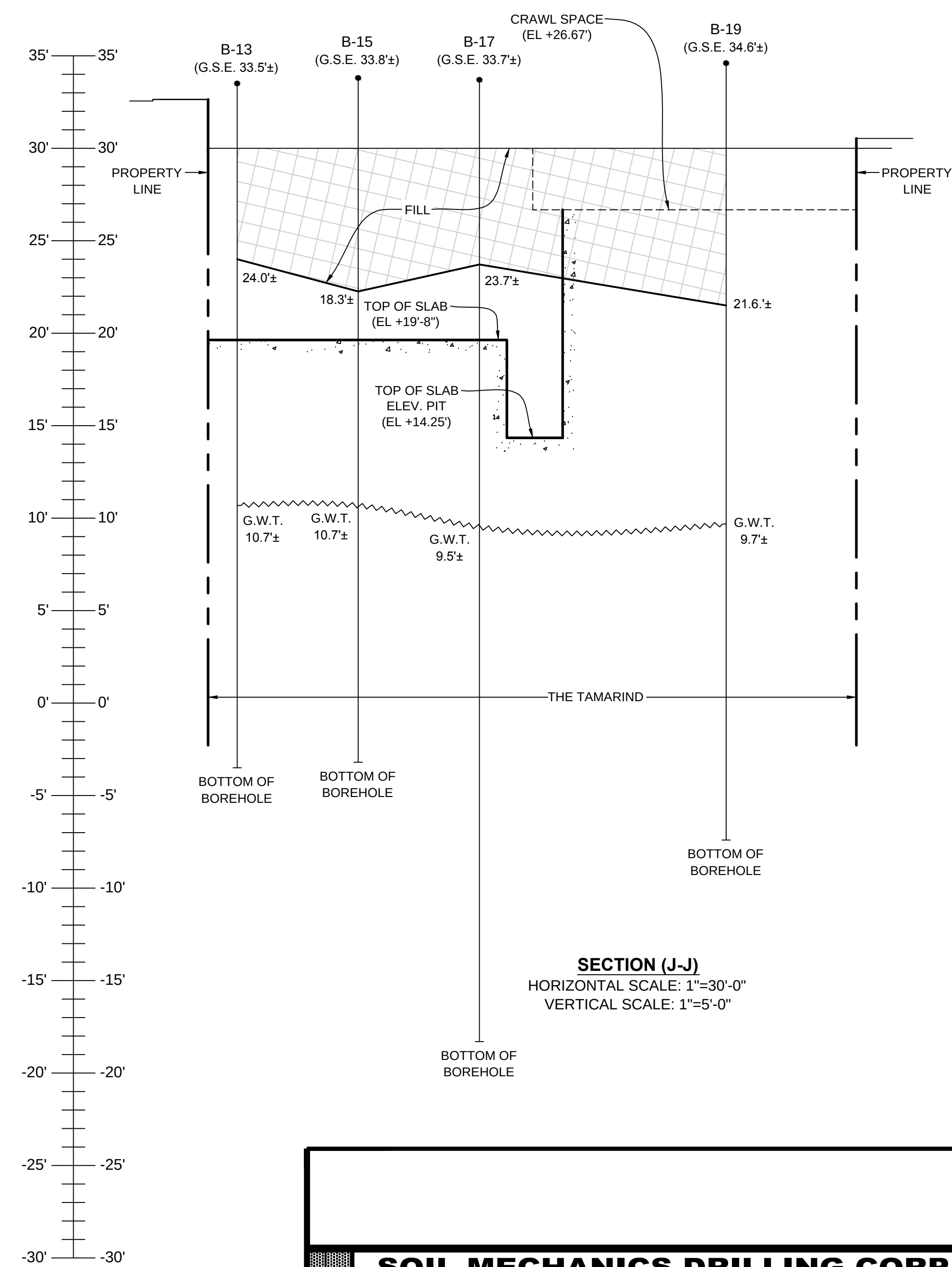
SECTION (G-G)
HORIZONTAL SCALE: 1"=30'-0"
VERTICAL SCALE: 1"=5'-0"



SECTION (I-I)
HORIZONTAL SCALE: 1"=30'-0"
VERTICAL SCALE: 1"=5'-0"



SECTION (H-H)
HORIZONTAL SCALE: 1"=30'-0"
VERTICAL SCALE: 1"=5'-0"



SECTION (J-J)
HORIZONTAL SCALE: 1"=30'-0"
VERTICAL SCALE: 1"=5'-0"

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