St. Johns River Water Management District
Michael A. Register, P.E., Executive Director
4049 Reid Street • P.O. Box 1429 • Palatka, FL 32178-1429 • 386-329-4500 • www.sjrwmd.com

DATE: April 19, 2023

TO: Prospective Respondents

FROM: Amy Lucey, Contracts Administrator

SUBJECT: Addendum #2 to Request for Qualifications # 38616, Taylor Creek Reservoir Imppprovement Project at S-164

The following clarifications/changes are provided for your information. Please make all appropriate changes to your bid documents. Note: changes are reflected with original language shown with strike-through and new language is underlined.

Q1: Is the report – "Subsurface Soil Exploration and Geotechnical Engineering Evaluation, Taylor Creek Reservoir Improvements," dated June 18, 2021/revised July 21, 2021 (Ardaman File Number 20-6426)" – available for us to review?
A1: The requested report is attached.

Attachment:
Ardaman & Associates, Inc. Subsurface Soil Exploration and Geotechnical Evaluation Taylor Creek Reservoir Improvements Orange and Osceola Counties dated 6/18/21.

NOTE: The Proposal Opening **remains** 2:00 p.m., **Thursday, May 11, 2023**

Please acknowledge receipt of this Addendum on the **SUBMITTAL** FORM provided in the proposal package.

If you have any questions, please e-mail me at alucey@sjrwmd.com.

Subsurface Soil Exploration and
Geotechnical Engineering Evaluation
Taylor Creek Reservoir Improvements
Orange and Osceola Counties

Ardaman & Associates, Inc.

CORPORATE HEADQUARTERS

8008 S. Orange Avenue, Orlando, FL 32809 - Phone: (407) 855-3860 Fax: (407) 859-8121

Branch Office Locations

Florida: Bartow, Cocoa, Fort Myers, Miami, Orlando, Port St. Lucie, Sarasota, Tallahassee, Tampa, West Palm Beach
Louisiana: Baton Rouge, Monroe, New Orleans, Shreveport

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

June 18, 2021
File No. 20-6426
Revised July 21, 2021

St. Johns River Water Management District
4049 Reid Street
Palatka, Florida 32718-1429

Attention: Ms. Gretchen Kelley, P.E.

Subject: Subsurface Soil Exploration and
Geotechnical Engineering Evaluation
Taylor Creek Reservoir Improvements
Orange and Osceola Counties

Dear Ms. Kelley:

As requested and authorized, we have completed a subsurface soil exploration and geotechnical engineering evaluation for the subject project. The purpose was to analyze seepage and slope stability of levee cross sections under normal and flood conditions for the Taylor Creek Reservoir. This report documents our exploration and our engineering evaluation.

Please note that this report does not include a recommendation for the toe drain that may be the desired alternative for cross sections C4-1 and C4-2. Please also note that adding a toe drain at the locations of C5-1 and C5-2 does not result in adequate factors of safety for these cross sections. We recommend a meeting with representatives of SJRWMD to discuss alternatives for these sections.

We are pleased to be of assistance to you on this phase of the project. When we may be of further service to you or should you have any questions, please contact us.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.
Certificate of Authorization No. 5950

Charles H. Cunningham, P.E.
Orlando Branch Manager
Florida License No. 38189

for Colin T. Jewsbury, P.E.
Senior Engineer
Florida License No. 58074

Zan C. Bates, P.E.
Senior Engineer
Florida License No. 49917

ZAN C. BATES
LICENSE
No. 49917
STATE OF
FLORIDA
PROFESSIONAL ENGINEER
7/21/21

CHC/ZCB/CTJ/lr
20-6426 SFRWMD Taylor Creek Reservoir Improvements 7-21-21.docx

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1.0 SITE LOCATION AND DESCRIPTION

The site for the proposed improvements along Levee L-73 is located in Orange and Osceola Counties, Florida (Sections 30, 31 and 32, Township 24S, Range 34 E and Sections 5, 8, 9, 16, 21, 28 and 29, Township 25S, Range 34 E). The general site location is shown superimposed on the Lake Poinsett SW, Florida U.S.G.S. quadrangle map presented on Figure 1.

The site is currently developed with the existing Levee L-73 which provides impoundment for the Taylor Creek Reservoir.

2.0 PROPOSED CONSTRUCTION

It is our understanding that the proposed improvements to Levee L-73 will consist of increasing the height to maximum crest elevations of +57.0 feet NAVD (Stations 0+00 to 290+00) and +58.0 feet NAVD (Station 290+00 to 457+58) to accommodate a Probable Maximum Flood (PMF) which is estimated to reach an elevation of +52.6 feet NAVD. The increase in height will also incorporate a corresponding increase in width with the levee widening to the left of the current baseline (ie; downstream side of the levee) typically using an outside slope of 3 horizontal to 1 vertical (3h:1v). No significant changes to the inside slope of the existing levee are anticipated. As an exception, portions of the levee adjacent to and near each side of the outlet structure are not planned to be modified other than adding a wall to the crest to increase the height.

3.0 REVIEW OF AVAILABLE INFORMATION

As part of our investigation, Ardaman & Associates reviewed the following documents relative to the project provided by SJRWMD:

- Preliminary Levee Cross Sections, Taylor Creek Reservoir Improvement Project, prepared by SJRWMD, dated March 23, 2021.
- Geotechnical Engineering Report, Taylor Creek Reservoir Improvement Project, prepared by Dunkelberger Engineering and Testing, Inc. dated February 27, 2014.
- Addendum to Geotechnical Engineering Report, Taylor Creek Reservoir Improvement Project, prepared by Dunkelberger Engineering and Testing, Inc. dated March 31, 2014.
- USACE Inspection Report for Levee L-73 Section 1 dated November 19, 2019.
- Central and Southern Florida Project, As-Built Plans for Construction of Levee 73, Section 1, Structure 164 and Cox Creek Irrigation Structure, USACE, 1967.
- Central and Southern Florida Project, Part III Upper St. Johns River Basin and Related Areas, Supplement 6 – Detailed Design Memorandum, USACE, December 1963.

4.0 FIELD EXPLORATION PROGRAM

4.1 SPT Borings

The field exploration program included performing thirteen (13) Standard Penetration Test (SPT) borings. The SPT borings were advanced to depths raging between 35 and 85 feet below the ground surface using the methodology outlined in ASTM D-1586. A summary of this field procedure is included in Appendix I. Split-spoon soil samples recovered during performance of the borings were visually classified in the field and representative portions of the samples were transported to our laboratory in sealed sample jars.

An attempt was made to measure the groundwater level at each of the boring locations during drilling. The borings were grouted with cement-bentonite slurry upon completion.

4.2 Test Locations

The approximate locations of the borings are schematically illustrated on the Boring Location Plan on Figure 2. The boring locations were staked in the field by Ardaman and Associates Engineer, Mr. Charles Cunningham, P.E. These locations were later surveyed by representatives of SJRWMD. Boring locations should be considered accurate only to the degree implied by the method of locating used.

5.0 LABORATORY TESTING PROGRAM

5.1 Visual Examination and Classification Testing

Representative soil samples obtained during our field sampling operation were packaged and transferred to our laboratory for further visual examination and classification. The soil samples were visually classified in general accordance with the Unified Soil Classification System (ASTM D-2488). The resulting soil descriptions are shown on the soil boring profiles presented on Figures 3 through 6.

In addition, we conducted sieve analysis tests (ASTM D1140), percent fines analyses (ASTM D1140), organic content tests (ASTM D2974-87), natural moisture content tests (ASTM D2216), and Atterberg limits test (ASTM D4318) on selected soil samples obtained from the borings. The results of these tests are presented adjacent to the sample depth on the boring profiles on Figures 3 through 6.

6.0 GENERAL SUBSURFACE CONDITIONS

6.1 General Soil Profile

The results of the field exploration and laboratory programs are graphically summarized on the soil boring profiles presented on Figures 3 through 6. The stratification of the boring profiles represents our interpretation of the field boring logs and the results of laboratory examinations of the recovered samples. The stratification lines represent the approximate boundary between soil types. The actual transitions may be more gradual than implied. Please refer to Figures 3 through 6 for soil profile details.

6.2 Groundwater Level

An attempt was made to measure the groundwater level in the boreholes during drilling. As shown on Figures 3 through 6, groundwater was not encountered within the top 10.5 feet and could not be measured below a depth of 10.5 feet due to the mudded condition of the boreholes (referenced "GNM" on Figures 3 through 6). However, this does not necessarily mean that groundwater would not be encountered within the top 10.5 feet at some other time.

Fluctuation in groundwater levels should be anticipated throughout the year primarily due to the water level in the reservoir, seasonal variations in rainfall and other factors that may vary from the time the borings were conducted.

7.0 ENGINEERING EVALUATION AND RECOMMENDATIONS

7.1 General

As requested, we analyzed a total of thirteen (13) cross sections of the levee provided by SJRWMD. The proposed new levee geometry and existing geometry were provided in the Taylor Creek Reservoir Improvements plan set dated March 23, 2021. A copy of the plan set is included in Appendix II. The designations of the cross sections analyzed and their locations along the levee alignment are as follows:

Section Designation	Section Location
C3-1	70+00
C3-2	110+00
C3-3	150+00
C4-1	185+50
C4-2	186+87
C5-1	189+27
C5-2	191+00
C6-1	226+00
C6-2	270+00
C7-1	310+00
C7-2	400+00
C8-1	419+00
C8-2	440+00

Review of the US Army Corps of Engineers (USACE) Slope Stability manual (EM 1110-2-1902) indicates that a minimum factor of safety of 1.5 is required for long-term steady state conditions such as those existing when the water level in the reservoir is at the maximum storage level. A minimum factor of safety of 1.4 is required for transient conditions involving the Maximum Surcharge Pool such as when flood conditions raise the water level to the PMF. The factor of safety against internal erosion caused by seepage (ie. piping failure) is recommended to be a minimum of 2.5 to 3.0 as stated in the USACE manual for Seepage Analysis and Control for Dams (EM 1110-2-1901).

Our initial analyses were based on the results of seepage and stability analyses provided in the Geotechnical Engineering Report (Project No. HD148003, dated February 27, 2014) submitted by Dunkelberger Engineering and Testing. Cross sections analyzed by Dunkelberger in close proximity to the sections that are the subject of this report were modeled in-house by Ardaman & Associates for calibration purposes using the same soil parameters and subsurface profiles used by Dunkelberger in their analyses. The subsurface soil profiles and soil parameters from these models were then used in preparing models for the cross sections which are the focus of this report. The soil borings performed by Ardaman & Associates (Figures 3 through 6) were reviewed and soil parameters were revised where deemed necessary to reflect the conditions encountered by Ardaman & Associates during our exploration.

7.1.1 Seepage Analyses

Seepage analyses were performed using the computer program SEEP/W by Geostudios. This program uses two-dimensional finite element methodology to model both steady-state and transient conditions. For each of the cross sections, the steady-state condition using the normal operating reservoir pool elevation of +44.7 feet NAVD was first analyzed. In addition, starting at the normal operating pool elevation of +44.7 feet NAVD, a transient condition was analyzed where the water elevation rose to the PMF of +52.6 feet before receding back to +44.7 feet. Based on information provided by SJRWMD, the initial rise in water occurred over a period of approximately one day, and subsequently, the water level will lower to approximately +46.3 feet over 10 days before lowering to +44.7 feet over an additional 10 days.

7.1.2 Slope Stability Analyses

The slope stability analyses were performed using the computer program Slope/W. Circular arc type failure modes using the Morgenstern-Price method of slices were analyzed. The analysis was performed utilizing the soil conditions discussed above and water pressures imported into the model using output from SEEP/W. A search feature of the program locates the surface that represented the minimum factor of safety.

7.1.3 Results

The results of our analyses indicate that all the cross sections provided by SJRWMD meet the required factors of safety for both the steady-state condition representing the normal reservoir storage condition as well as the Maximum Surcharge Pool when the water level has risen to the PMF with the exception of the cross sections in the vicinity of the spillway structure (Sections C4-1, C4-2. C5-1 and C5-2). The factors of safety for each of the cross sections analyzed are presented on Table 1. Computer output from the SEEP/W and SLOPE/W analyses are presented in Appendix III.

The options analyzed to increase the stability of the cross sections which did not meet the minimum factors of safety included flattening the outside slope of the levee and installing a toe drain at the base of the slope.

One cross section (C5-1) was analyzed using outside slopes of 4h:1v and 5h:1v to determine if the required factors of safety could be obtained by flattening the outside slope. We note that the 5h:1v slope did provide the necessary factors of safety at section C5-1. If this is determined to be the best solution, additional analyses can be performed for sections C4-1, C4-2 and C5-2 if changes to the outside slope are feasible.

Toe drains were modeled at the four cross sections which did not meet the required factors of safety. The toe drains used in our models consisted of triangular sections located near the toe of the outside slope and function to intercept groundwater flow through the levee. The intended purposes of the toe drains are to prevent seepage from daylighting on the slope face as well as reducing the head gradient which can act as a driving force causing slope instability. The results of the analyses indicated that the use of toe drains at sections C4-1 and C4-2 improved the stability of the slope enough to meet the required factors of safety. However, at section C5-1, factors of safety of 1.3 and 1.1 were calculated for the steady state and transient conditions, respectively, and at section C5-2, a factor of safety of 1.3 was calculated for the transient condition. Therefore, the toe drains at sections C5-1 and C5-2 did not result in adequate factors of safety. In addition, we caution that the integrity of toe drains can be difficult to maintain. We do not recommend relying solely on toe drains for levee stability on this site.

Additional analyses have been discussed in which the existing sheet pile walls adjacent to the spillway structure would be extended to reduce seepage. Further review of the this proposed geometry indicates that the 2-dimensional analysis performed as part of this report submittal will not be sufficient to adequately model the conditions adjacent to the spillway structure. Numerous considerations come into play at these locations including seepage both beneath and around the sides of the sheet pile and cutoff walls, as well as seepage from beneath the spillway itself. Because of this, it is our recommendation that a 3-dimensional model using finite element analysis be performed. A 3-dimensional model will allow us to better assess the critical seepage paths that occur as a result of the existing and the proposed structure/levee geometries. We note that it should be expected that the determination of a final solution to provide stability will be an iterative design process.

7.2 Stripping and Grubbing

Areas of the existing levee where fill will be placed plus a minimum margin of five feet, should be stripped of all surface vegetation, stumps, debris, organic topsoil, muck or other deleterious materials, as encountered. Buried utilities should be removed or plugged to eliminate conduits into which surrounding soils could erode.

After stripping, the site should be grubbed or root-raked such that roots with a diameter greater than ½ inch, stumps, or small roots in a dense state, are completely removed. The actual depth(s) of stripping and grubbing must be determined by visual observation and judgment during the earthwork operation.

7.3 Proof-rolling

We recommend proof-rolling the cleared surface to locate any unforeseen soft areas or unsuitable surface or near-surface soils, to increase the density of the upper soils, and to prepare the existing surface for the addition of the fill soils (as required). Proof-rolling should consist of at least 3 passes of a compactor capable of achieving the density requirements described in the next paragraph.

Each pass should overlap the preceding pass by 30 percent to achieve complete coverage. If deemed necessary, in areas that continue to “yield”, remove all deleterious material and replace with clean, compacted sand backfill. The proof-rolling should occur after cutting and before filling.

A density equivalent to or greater than 95 percent of the modified Proctor (ASTM D-1557) maximum dry density value for a depth of 1 foot must be achieved beneath the stripped and grubbed ground surface. Additional passes and/or overexcavation and recompaction may be required if these minimum density requirements are not achieved. The soil moisture should be adjusted as necessary during compaction.

Due to the potential for relatively high groundwater level at this site, proof-rolling may cause upward movement or “pumping” of the groundwater. However, we recommend that the existing surface be level and firm prior to the addition of fill soils. Proof-rolling with a front-end loader may help achieve the desired surface and compaction condition before adding the fill soils. The site should be dewatered as necessary.

Care should be exercised to avoid damaging any neighboring structures while the compaction operation is underway. Prior to commencing compaction, occupants of adjacent structures should be notified and the existing condition (i.e. cracks) of the structures documented with photographs and survey (if deemed necessary). Compaction should cease if deemed detrimental to adjacent structures, and Ardaman & Associates should be notified immediately. Heavy vibratory compaction should not be used within 150 feet of existing structures without prior approval of a structural engineer.

7.4 Suitable fill Material and Compaction of Fill Soils

All fill materials should be free of organic materials, such as roots and vegetation. Fill should consist of material having an in situ permeability rate of between 10 and 30 feet/day. Soils with a percent fines content of between 2 and 8 percent will likely provide a suitable permeability rate, however, the rate will need to be confirmed prior to and during placement.

All fill should be placed in level lifts not to exceed 12 inches in uncompacted thickness. Each lift should be compacted to at least 95 percent of the modified Proctor (ASTM D-1557) maximum dry density value. The filling and compaction operations should continue in lifts until the desired elevations(s) is achieved. If hand-held compaction equipment is used, the lift thickness should be reduced to not more than 6 inches.

The fill soil should be of a homogenous nature such that a layer(s) of relatively permeable soil is not placed beneath relatively low permeable soils. This could create undesirable preferential seepage paths through the levee that could cause stability problems.

We recommend establishing erosion control on the graded slopes as soon as possible using grass, sod and/or other material. If seeding rather than sodding is preferred, then additional temporary erosion control will likely be required until the grass becomes well established.

Where fill will be placed adjacent to existing slopes equal to or steeper than 3H:1V, the existing slope should be benched to reduce the inclusion of potential failure planes, and then cut back to achieve final grade.

A designated representative from Ardaman & Associates, Inc. should observe and test all prepared and compacted areas to verify that the fill is prepared and compacted in accordance with the aforementioned specifications.

7.5 Dewatering

The control of the groundwater and surface water will be required to construct the toe drains and chimney drains achieve the necessary depths of excavation and subsequent construction and backfilling and compaction requirements presented in the following sections. The actual method(s) of dewatering should be determined by the Contractor, however, regardless of the method(s) used, we suggest drawing down the water table sufficiently; say 2 to 3 feet, below the bottom of excavation(s) and compaction surfaces to preclude "pumping" and/or compaction-related problems with the foundation soils.

8.0 QUALITY ASSURANCE

We recommend establishing a comprehensive quality assurance program to verify that all site preparation, fill placement and construction of drains is conducted in accordance with the appropriate plans and specifications. Materials testing and inspection services should be provided by Ardaman & Associates.

As a minimum, an on-site engineering technician should monitor all stripping and grubbing to verify that all deleterious materials have been removed and should observe the proof-rolling operation to verify that the appropriate number of passes are applied to the subgrade. In-situ density tests should be conducted during filling activities to verify that the required densities have been achieved. In-situ density values should be compared to laboratory Proctor moisture-density results for each of the different natural and fill soils encountered. Permeability testing should be performed on potential fill sources to verify that they meet the permeability rate requirements. Additional permeability testing should be performed during construction as well.

9.0 CLOSURE

The analyses and recommendations submitted herein are based on the data obtained from the soil borings presented on Figures 3 through 6. This report does not reflect any variations which may occur adjacent to or between the borings. The nature and extent of the variations between the borings may not become evident until during construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations presented in this report after performing on-site observations during the construction period and noting the characteristics of the variations.

Additional stability analyses should be performed for cross sections C5-1 and C5-2 after consideration is given to alternatives to increase the factors of safety at these cross sections. We suggest a meeting with representatives of SJRWMD to discuss alternatives for these cross sections.

In the event any changes occur in the design of the proposed levee improvements, we should review the applicability of conclusions and recommendations in this report. We recommend a general review of final design and specifications by our office to verify that recommendations are properly interpreted and implemented in the design specifications. Ardaman and Associates should attend the pre-bid and preconstruction meetings to verify that the bidders/contractor understand the recommendations contained in this report.

This study is based on a relatively shallow exploration and is not intended to be an evaluation for sinkhole potential. This study does not include an evaluation of the environmental (ecological or hazardous/toxic material related) condition of the site and subsurface.

This report has been prepared for the exclusive use of St. Johns River Water Management District in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

TABLE 1

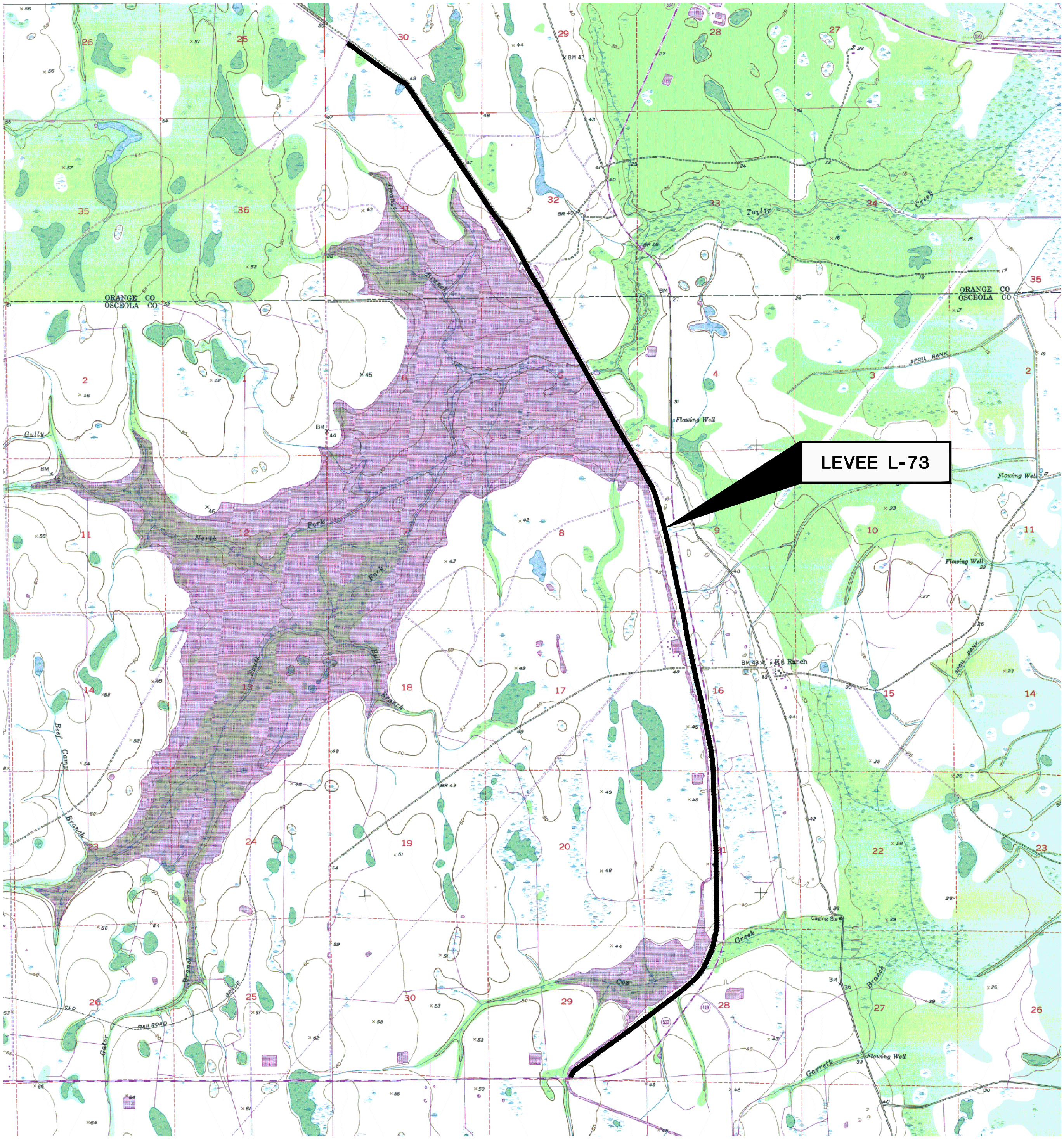
Calucated Factors of Safety
Taylor Creek Reservoir Improvements
Orange and Osceola Counties, Florida

Section Designation	Section Location	Steady State Condition (at +44.7')			Transient Condition (+44.7' to +52.6')			Comments
			Factors of Safety			Factors of Safety		
		Maximum Seepage Exit Gradient	Seepage	Slope Stability	Maximum Seepage Exit Gradient	Seepage	Slope Stability	
C3-1	70+00	0	n/a	2.0	0.25	4.0	1.6	
C3-2	110+00	0	n/a	2.0	0.18	5.6	1.6	
C3-3	150+00	0.22	4.5	1.6	0.36	2.8	1.4	
C4-1	185+50	0.44	**2.3**	**1.4**	0.49	**2.0**	**1.3**	Factor of safety inadequate w/o modification
		0.26	3.8	1.5	0.28	3.6	1.5	Stable with toe drain at base of slope
C4-2	186+87	0.33	3.0	**1.4**	0.33	3.0	**1.2**	Factor of safety inadequate w/o modification
		0.26	3.8	1.5	0.26	3.8	1.4	Stable with toe drain at base of slope
C5-1	189+27	0.41	**2.4**	**1.2**	0.41	**2.4**	**1.0**	Factor of safety inadequate w/o modification
		--	--	--	0.28	3.6	**1.1**	4:1 outside slope is not adequate
		--	--	--	0.26	3.8	1.4	5:1 outside slope is stable
		0.30	3.3	**1.3**	0.30	3.3	**1.1**	Toe drain at base of slope is not adequate
C5-2	191+00	0.35	2.9	1.5	0.38	**2.6**	**1.2**	Factor of safety inadequate w/o modification
		--	--	--	0.21	4.8	**1.3**	Toe drain at base of slope is not adequate
C6-1	226+00	0.21	4.8	1.6	0.26	3.8	1.5	
C6-2	270+00	0.25	4.0	1.7	0.32	3.1	1.5	
C7-1	310+00	0.06	16.7	1.8	0.22	4.5	1.5	
C7-2	400+00	0.20	5.0	1.6	0.21	4.8	1.5	
C8-1	419+00	0.19	5.3	1.7	0.28	3.6	1.6	
C8-2	440+00	0	n/a	1.9	0.13	7.7	1.7	

Notes 1. USACE (Army Corps of Engineers) minimum required factors of safety.

Seepage	2.5 to 3.0
Steady State Slope Stability	1.5
Transient Slope Stability	1.4

2. Highlighted factors of safety do not meet minimum required factors of safety.



SECTIONS 5, 8, 9, 16, 21, 28, 29, 30, 31 & 32
TOWNSHIPS 24 & 25 SOUTH
RANGE 35 EAST

OBTAINED FROM U.S.G.S. QUAD MAP: LAKE POINSETT SW, FLORIDA 1953
(PHOTOREVISED 1972)

N

0 2500 5000
SCALE: (FEET)

QUADRANGLE LOCATION

SITE LOCATION MAP

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

SUBSURFACE SOIL EXPLORATION
TAYLOR CREEK RESERVOIR IMPROVEMENTS
ORANGE AND OSCEOLA COUNTIES, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 05/18/21
FILE NO. 20-6426	APPROVED BY:	FIGURE: 1

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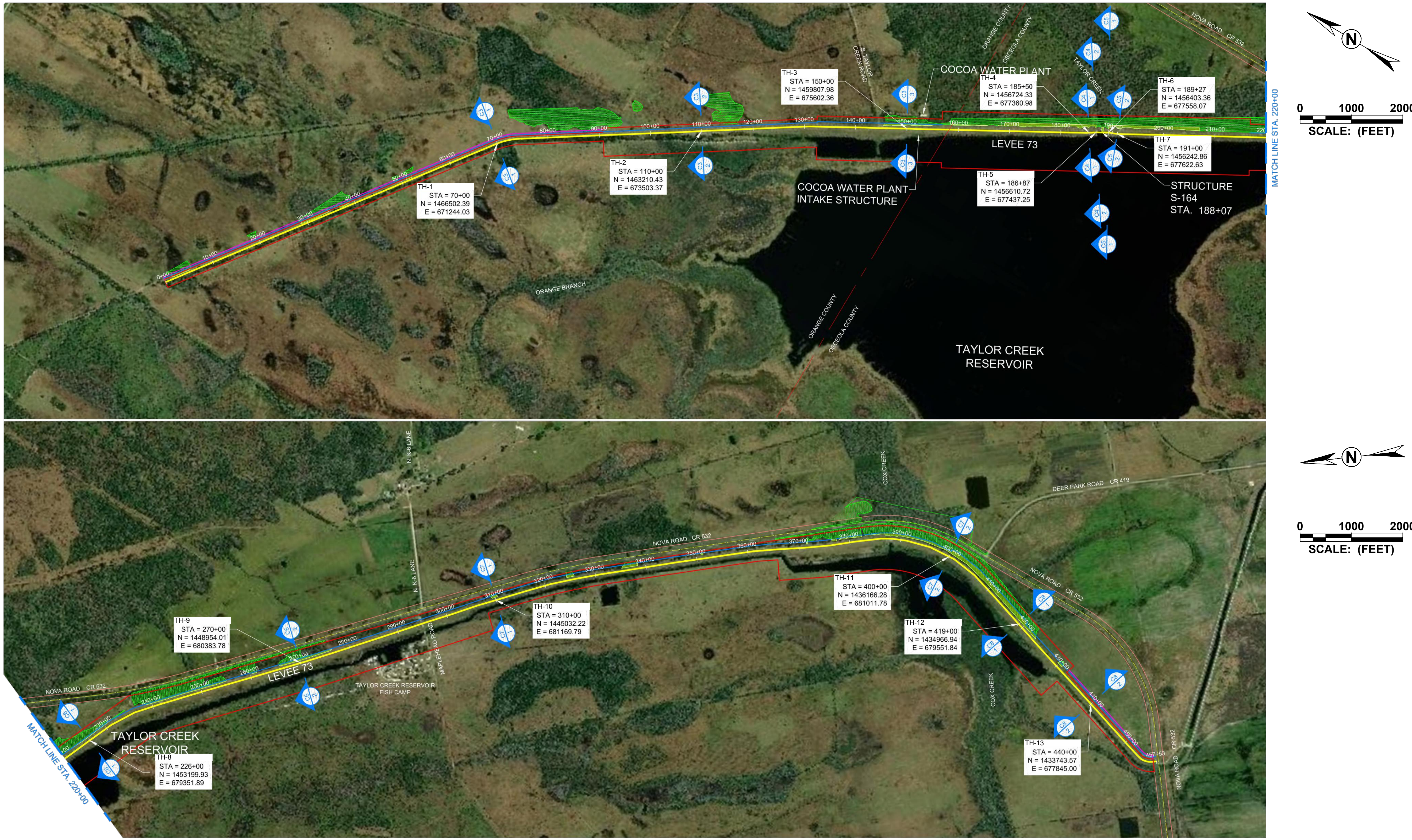

LEGEND

TH STANDARD PENETRATION TEST (SPT) BORING LOCATION

NOTE: THE BASE MAP FOR THE BORING LOCATION PLAN IS THE OVERALL SITE PLAN DATED OCTOBER 8, 2020 PROVIDED BY ST. JOHNS RIVER WATER MANAGEMENT DISTRICT.

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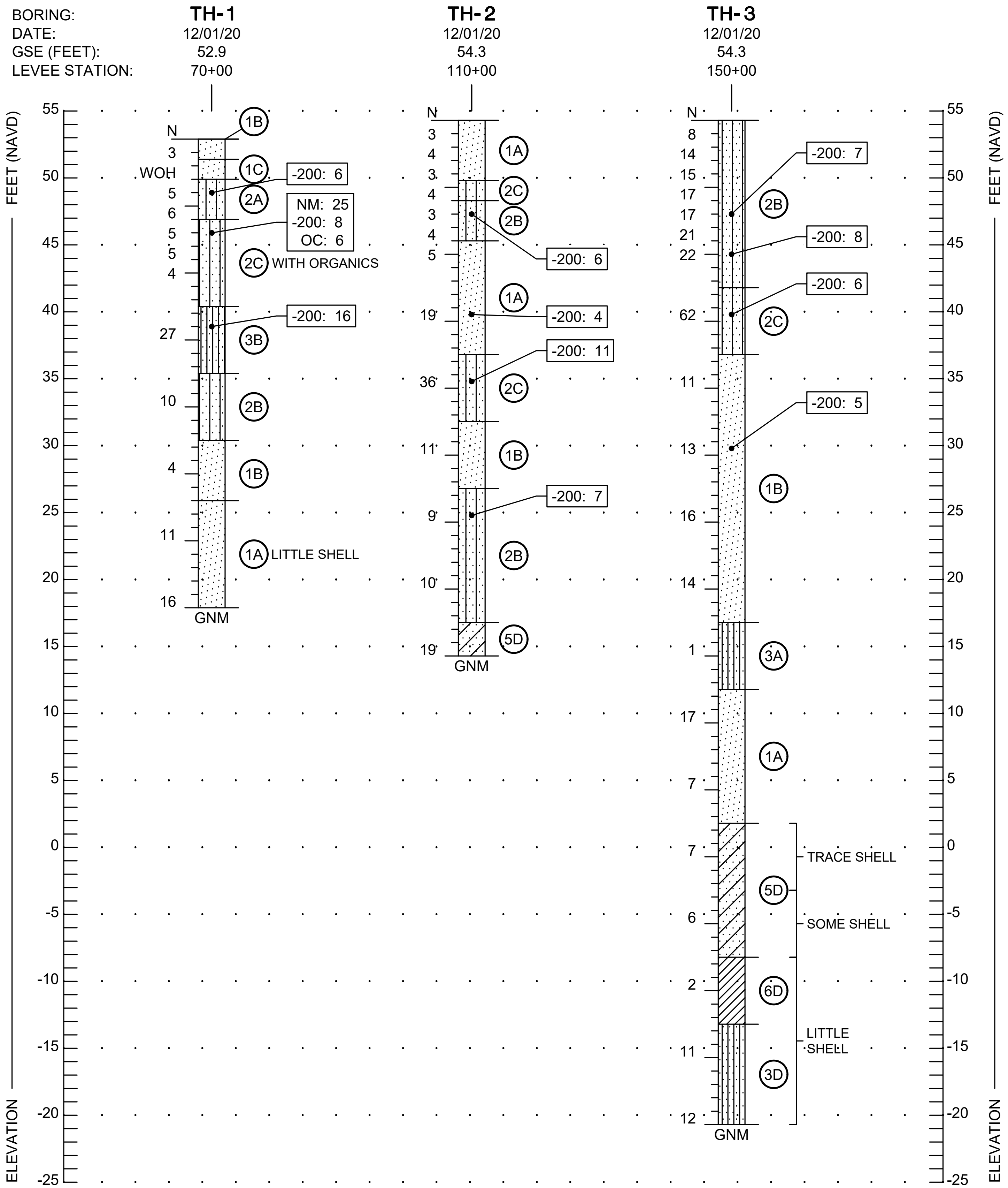
BORING LOCATION PLAN		
Ardaman & Associates, Inc. Geotechnical, Environmental and Materials Consultants		
SUBSURFACE SOIL EXPLORATION TAYLOR CREEK RESERVOIR IMPROVEMENTS ORANGE AND OSCEOLA COUNTIES, FLORIDA		
DRAWN BY: CD	CHECKED BY:	DATE: 02/03/21
FILE NO. 20-6426	APPROVED BY:	FIGURE: 2



LEGEND

SOIL DESCRIPTIONS

1. FINE SAND (SP)
2. FINE SAND WITH SILT (SP-SM)
3. SILTY FINE SAND (SM)
4. FINE SAND WITH CLAY (SP-SC)
5. CLAYEY FINE SAND (SC)
6. SANDY CLAY TO CLAY (CH)
7. ORGANIC CLAYEY SAND TO CLAY
8. SHELL AND SAND

COLORS

- A GRAY BROWN
- B LIGHT BROWN TO BROWN
- C DARK BROWN
- D GREEN GRAY
- E VERY DARK GRAY OR VERY DARK BROWN

TH	STANDARD PENETRATION TEST (SPT) BORING
N	STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
NM	NATURAL MOISTURE CONTENT IN PERCENT (ASTM D-2216)
-200	PERCENT PASSING NO. 200 SIEVE SIZE (PERCENT FINES)(ASTM D-1140)
OC	ORGANIC CONTENT IN PERCENT (ASTM D-2974)
GSE	SURVEYED GROUND SURFACE ELEVATION
WOH	SAMPLER ADVANCED BY STATIC WEIGHT OF HAMMER AND RODS ONLY
GNM	GROUNDWATER NOT MEASURED (i.e., NOT ENCOUNTERED IN THE TOP 10 FEET AND NOT MEASURED BELOW 10 FEET DUE TO THE MUDDED CONDITION OF THE BOREHOLE)
SP,SP-SM SM,SC,CH	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	<4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	<2
SOFT	1/4 TO 1/2	2 TO 4
FIRM	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED.

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2. ALL BORINGS WERE PERFORMED IN THE MIDDLE OF THE LEVEE CREST ROAD.

SOIL BORING PROFILES

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

SUBSURFACE SOIL EXPLORATION
TAYLOR CREEK RESERVOIR IMPROVEMENTS
ORANGE AND OSCEOLA COUNTIES, FLORIDA

DRAWN BY: CD | CHECKED BY: | DATE: 12/24/20
FILE NO. 20-6426 | APPROVED BY: | FIGURE: 3

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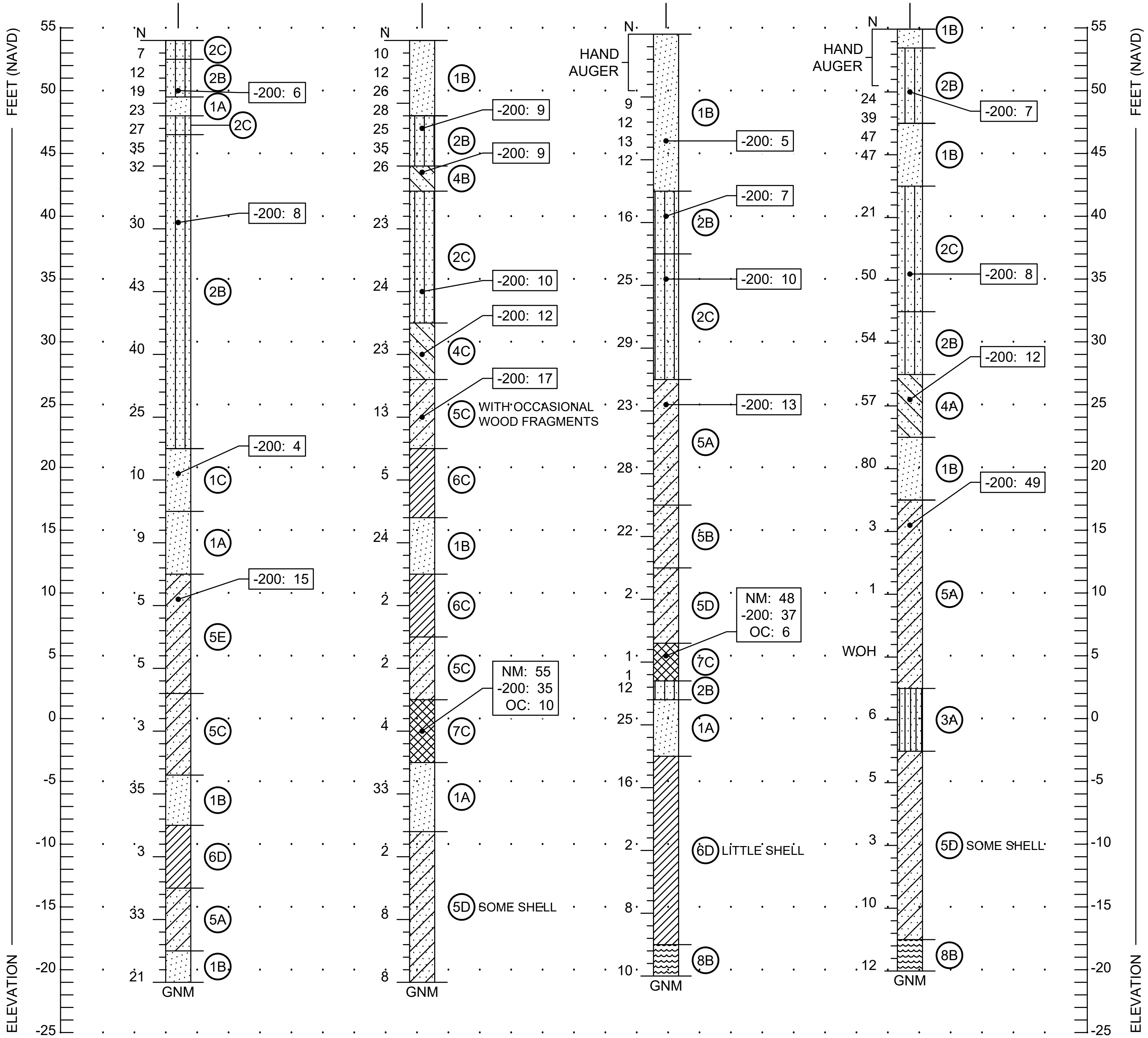
BORING:	TH-4	TH-5	TH-6	TH-7
DATE:	12/02/20	12/02/20	12/03/20	12/03/20
GSE (FEET):	54.0	54.0	54.5	54.9
LEVEE STATION:	185+00	186+87	189+27	191+00



LEGEND

SOIL DESCRIPTIONS

1. FINE SAND (SP)
2. FINE SAND WITH SILT (SP-SM)
3. SILTY FINE SAND (SM)
4. FINE SAND WITH CLAY (SP-SC)
5. CLAYEY FINE SAND (SC)
6. SANDY CLAY TO CLAY (CH)
7. ORGANIC CLAYEY SAND TO CLAY
8. SHELL AND SAND

COLORS

- (A) GRAY BROWN
- (B) LIGHT BROWN TO BROWN
- (C) DARK BROWN
- (D) GREEN GRAY
- (E) VERY DARK GRAY OR VERY DARK BROWN

TH	STANDARD PENETRATION TEST (SPT) BORING
N	STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
NM	NATURAL MOISTURE CONTENT IN PERCENT (ASTM D-2216)
-200	PERCENT PASSING NO. 200 SIEVE SIZE (PERCENT FINES)(ASTM D-1140)
OC	ORGANIC CONTENT IN PERCENT (ASTM D-2974)
GSE	SURVEYED GROUND SURFACE ELEVATION
WOH	SAMPLER ADVANCED BY STATIC WEIGHT OF HAMMER AND RODS ONLY
GNM	GROUNDWATER NOT MEASURED (i.e., NOT ENCOUNTERED IN THE TOP 10 FEET AND NOT MEASURED BELOW 10 FEET DUE TO THE MUDDED CONDITION OF THE BOREHOLE)
SP,SP-SM SM,SC,CH	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

ENGINEERING CLASSIFICATION

I COHESIONLESS SOILS

DESCRIPTION	BLOW COUNT "N"
VERY LOOSE	<4
LOOSE	4 TO 10
MEDIUM DENSE	10 TO 30
DENSE	30 TO 50
VERY DENSE	>50

II COHESIVE SOILS

DESCRIPTION	UNCONFINED COMPRESSIVE STRENGTH, QU, TSF	BLOW COUNT "N"
VERY SOFT	<1/4	<2
SOFT	1/4 TO 1/2	2 TO 4
FIRM	1/2 TO 1	4 TO 8
STIFF	1 TO 2	8 TO 15
VERY STIFF	2 TO 4	15 TO 30
HARD	>4	>30

WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATIONS ON THE PARTICULAR DATE DRILLED.

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SOIL BORING PROFILES

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

SUBSURFACE SOIL EXPLORATION
TAYLOR CREEK RESERVOIR IMPROVEMENTS
ORANGE AND OSCEOLA COUNTIES, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 12/24/20
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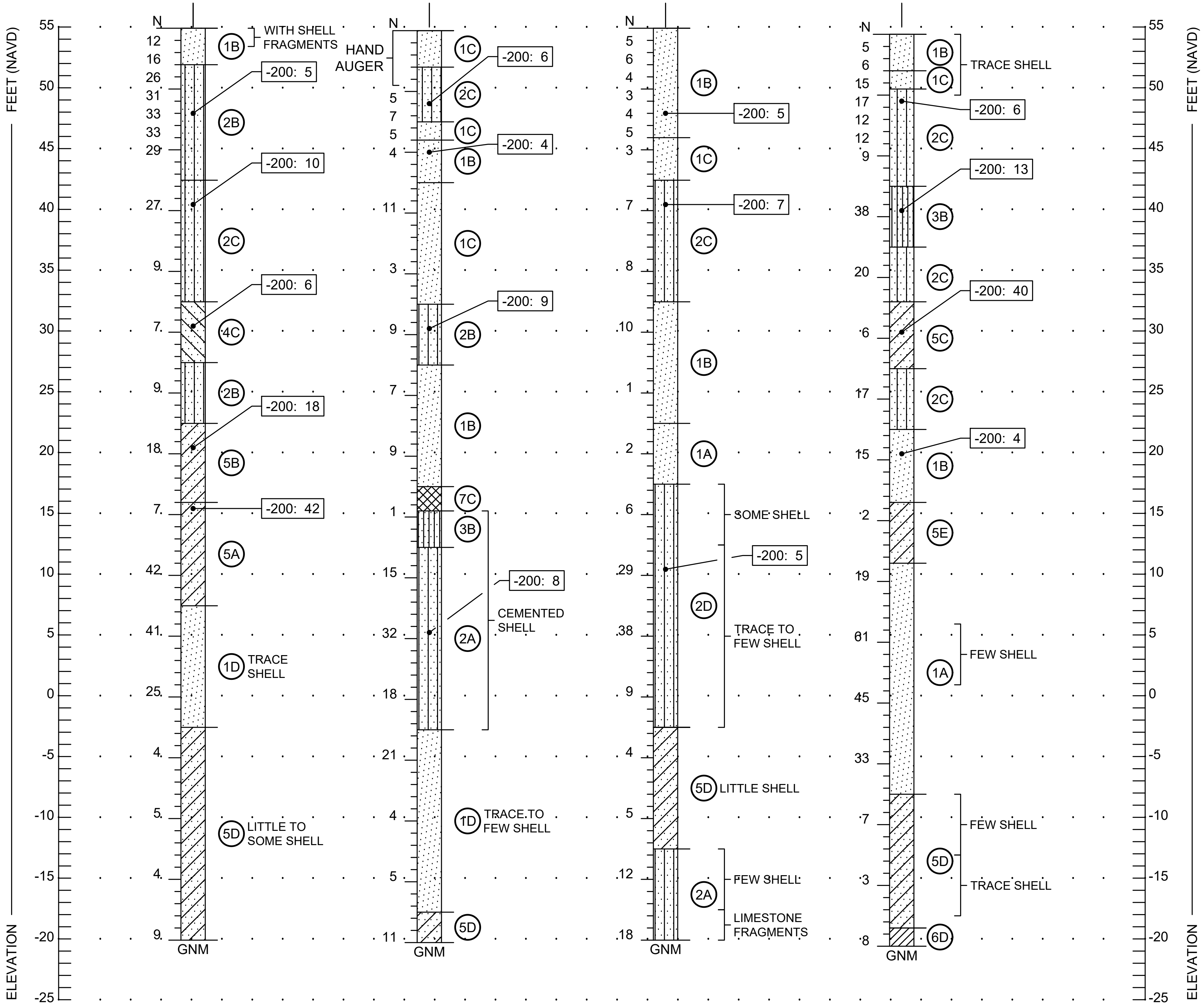
BORING:	TH-8	TH-9	TH-10	TH-11
DATE:	12/04/20	12/04/20	12/08/20	12/08/20
GSE (FEET):	54.9	54.7	54.9	54.4
LEVEE STATION:	226+00	270+00	310+00	400+00



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SUBSURFACE SOIL EXPLORATION
TAYLOR CREEK RESERVOIR IMPROVEMENTS
ORANGE AND OSCEOLA COUNTIES, FLORIDA

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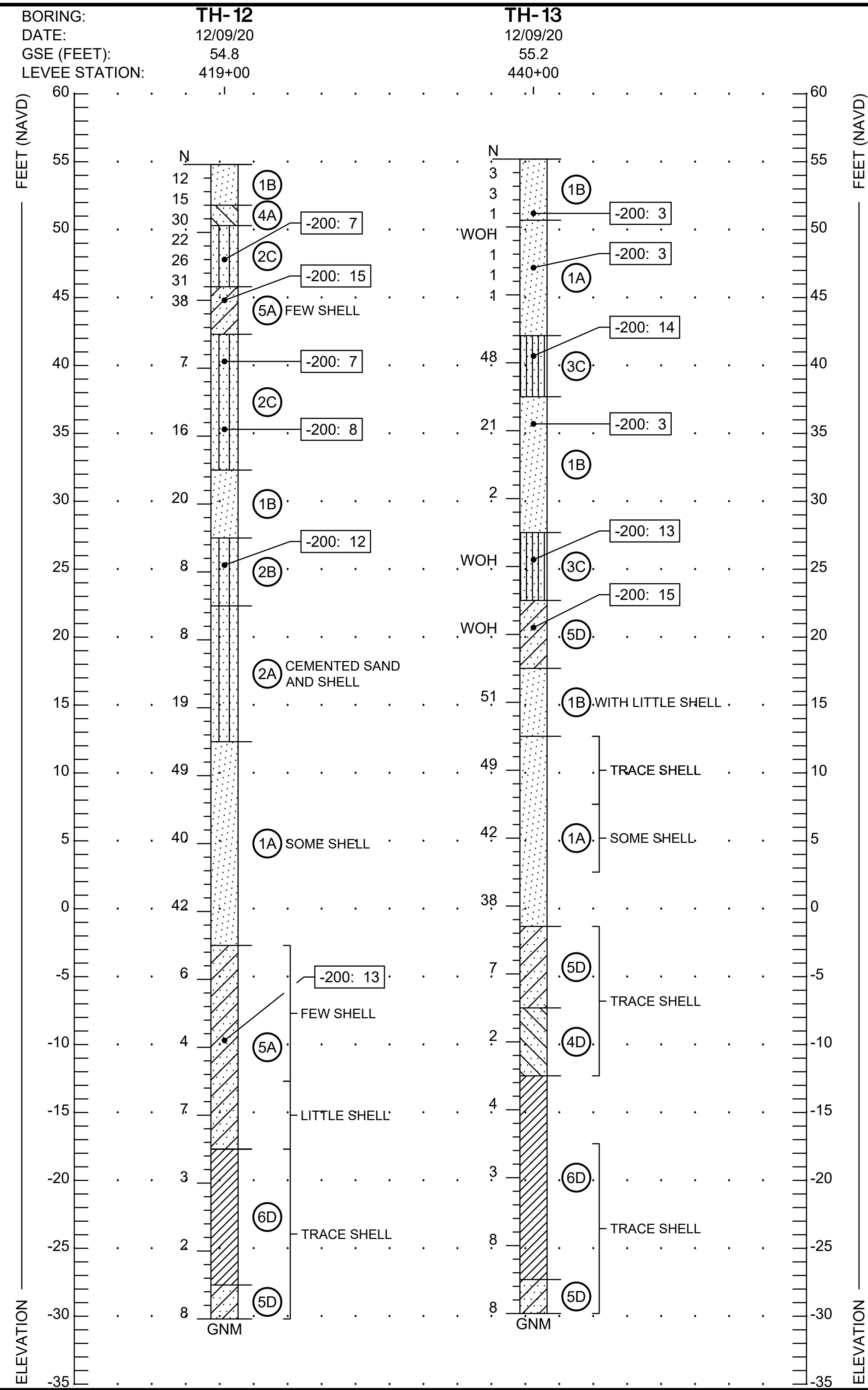

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SUBSURFACE SOIL EXPLORATION
TAYLOR CREEK RESERVOIR IMPROVEMENTS
ORANGE AND OSCEOLA COUNTIES, FLORIDA

DRAWN BY: CD	CHECKED BY:	DATE: 12/24/20
FILE NO. 20-6426	APPROVED BY:	FIGURE: 6

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APPENDIX I

Standard Penetration Test (SPT) Boring Procedure

STANDARD PENETRATION TEST

The standard penetration test is a widely accepted test method of *in situ* testing of foundation soils (ASTM D 1586). A 2-foot long, 2-inch O.D. split-barrel sampler attached to the end of a string of drilling rods is driven 18 inches into the ground by successive blows of a 140-pound hammer freely dropping 30 inches. The number of blows needed for each 6 inches of penetration is recorded. The sum of the blows required for penetration of the second and third 6-inch increments of penetration constitutes the test result or N-value. After the test, the sampler is extracted from the ground and opened to allow visual examination and classification of the retained soil sample. The N-value has been empirically correlated with various soil properties allowing a conservative estimate of the behavior of soils under load.

The tests are usually performed at 5-foot intervals. The test holes are advanced to the test elevations by rotary drilling with a cutting bit, using circulating fluid to remove the cuttings and hold the fine grains in suspension. The circulating fluid, which is a bentonitic drilling mud, is also used to keep the hole open below the water table by maintaining an excess hydrostatic pressure inside the hole. In some soil deposits, particularly highly pervious ones, NX-size flush-coupled casing must be driven to just above the testing depth to keep the hole open and/or prevent the loss of circulating fluid.

Representative split-spoon samples from the soils are brought to our laboratory in air-tight jars for further evaluation and testing, if necessary. Samples not used in testing are stored for 30 days prior to being discarded.

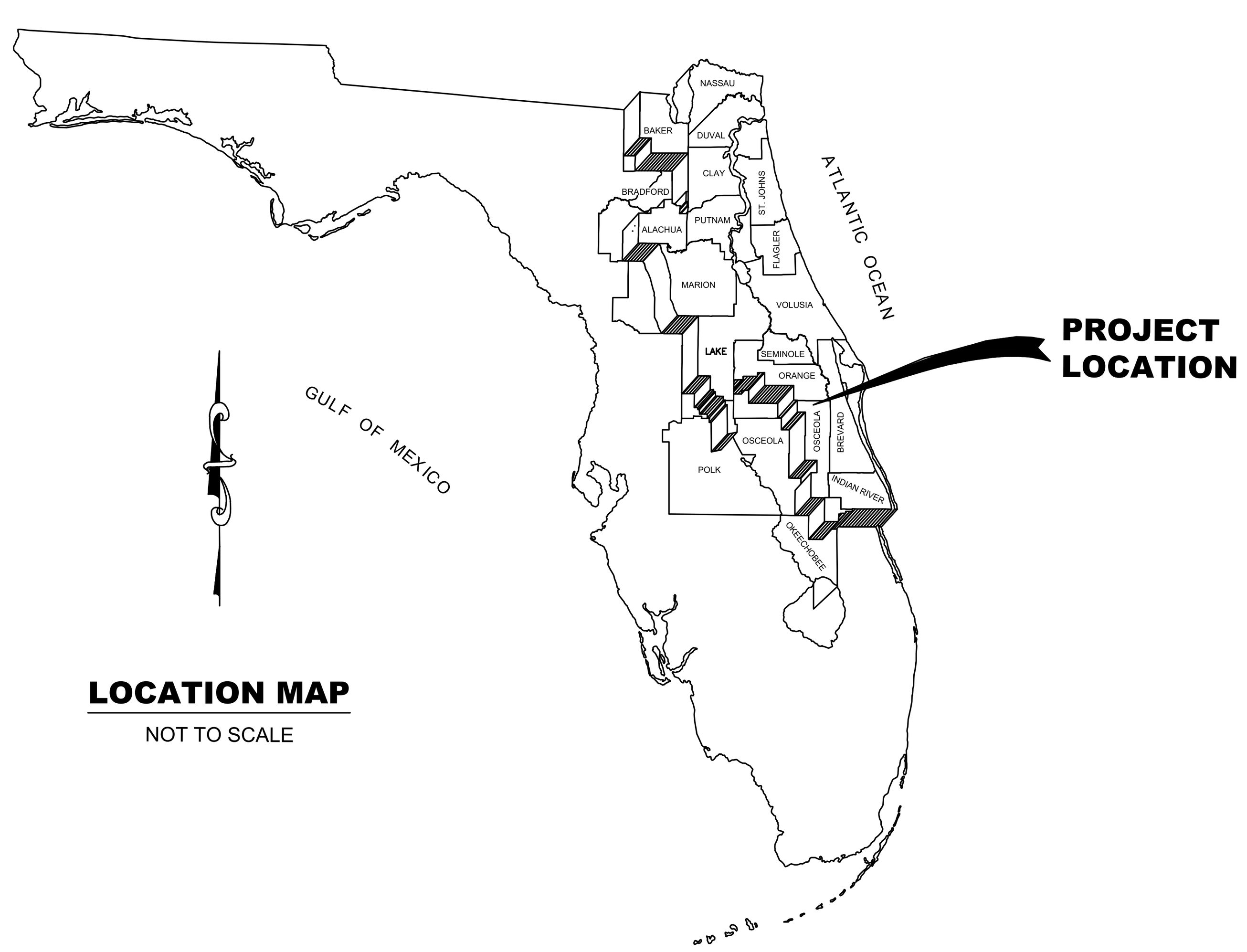
APPENDIX II

Taylor Creek Reservoir Improvements Preliminary Plans (dated March 23, 2021)

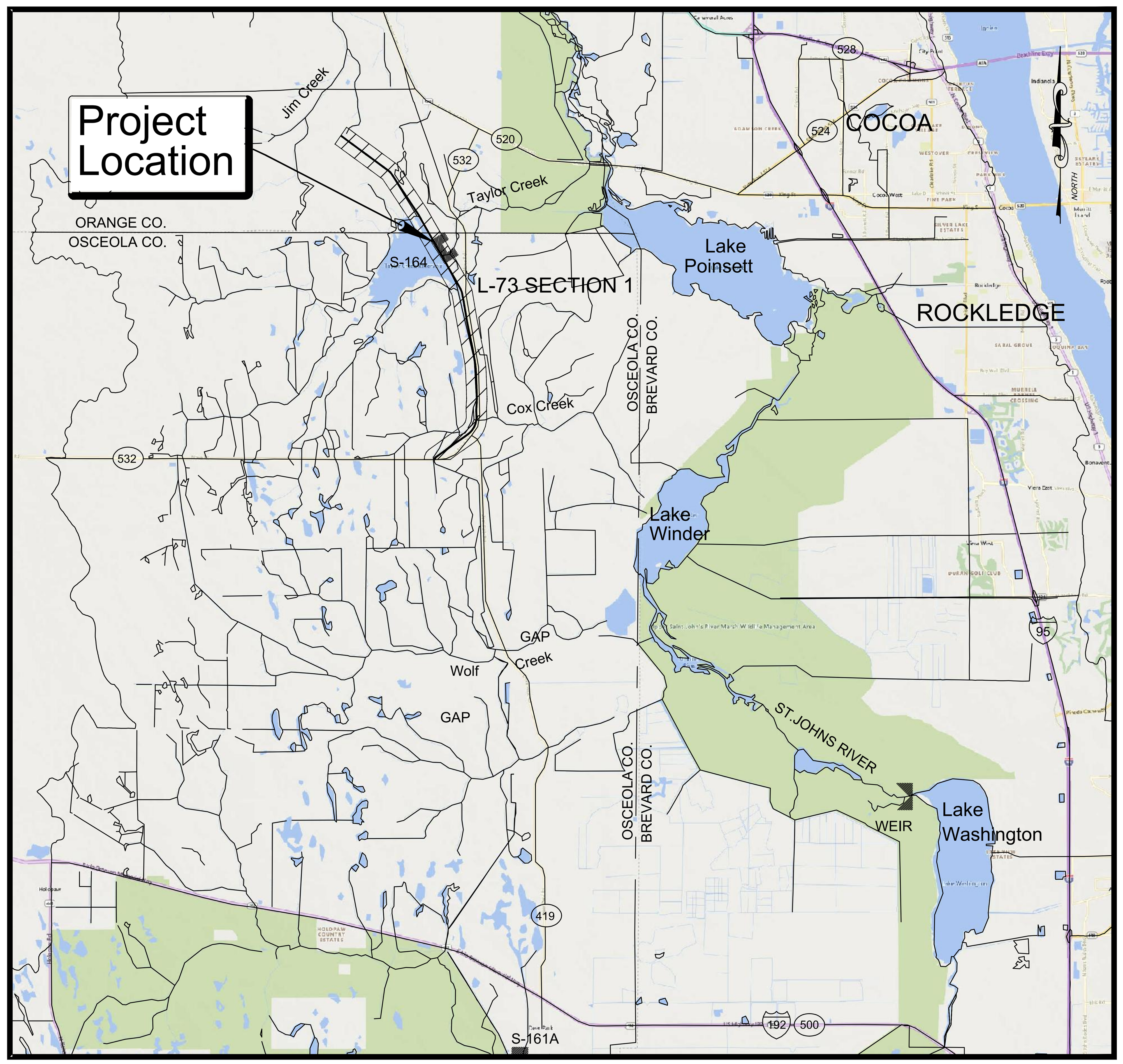
ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
UPPER ST. JOHNS RIVER BASIN
TAYLOR CREEK RESERVOIR IMPROVEMENTS
ORANGE COUNTY AND OSCEOLA COUNTY, FLORIDA

NAVD 1988

ALL ELEVATIONS DEPICTED HEREIN REFERENCE NAVD 1988 UNLESS OTHERWISE NOTED. THE CONVERSION FACTOR TO NGVD 1929 IS +1.26.



LOCATION MAP
NOT TO SCALE



VICINITY MAP

INDEX OF PLANS

SHEET NO.	SHEET TITLE
C1	COVER SHEET
C2	OVERALL SITE PLAN
C3	LEVEE SECTION STA. 70+00, 110+00, AND 150+00
C4	LEVEE SECTION STA. 185+50 AND 186+87
C5	LEVEE SECTION STA. 189+27 AND 191+00
C6	LEVEE SECTION STA. 226+00 AND 270+00
C7	LEVEE SECTION STA. 310+00 AND 400+00
C8	LEVEE SECTION STA. 419+00 AND 440+00

ENGINEER'S NOTES:

1. These drawings are prepared for the sole and exclusive use of the St. Johns River Water Management District and shall not be relied upon by any other entity or individual.
2. Reproductions of these drawings are "NOT VALID WITHOUT THE SIGNATURE AND THE ORIGINAL SEAL OF A FLORIDA LICENSED ENGINEER."

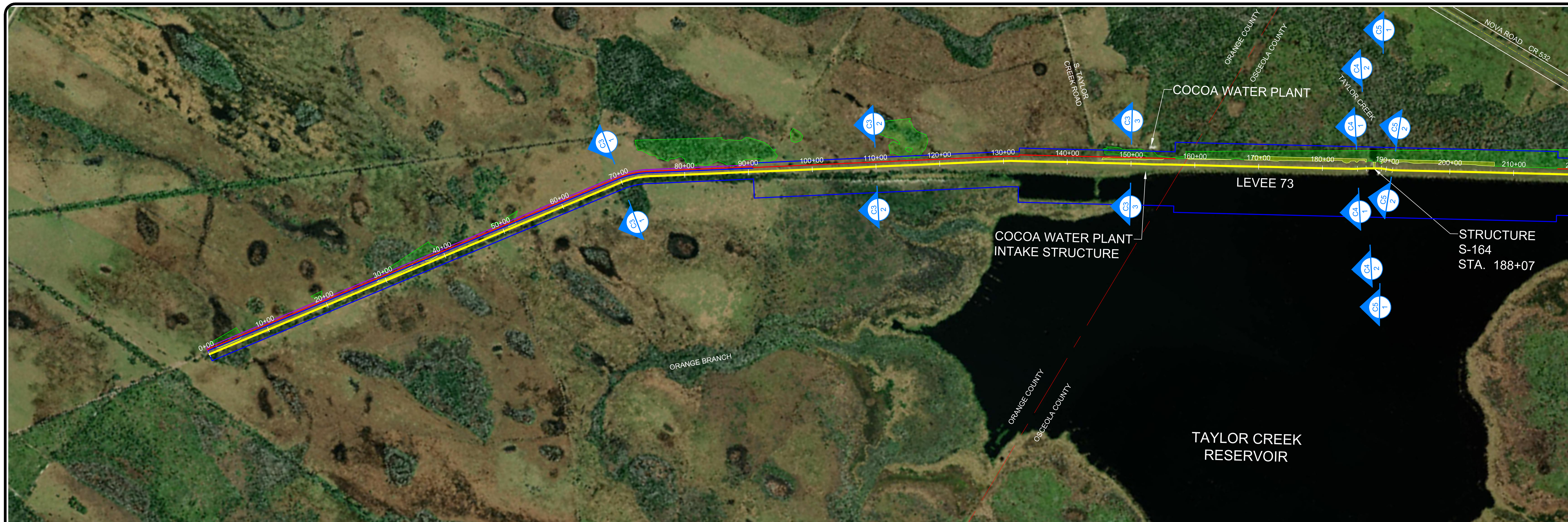
CALL 2 WORKING DAYS BEFORE YOU DIG
IT'S THE LAW! DIAL 811
811 Know what's below. Call before you dig.
SUNSHINE STATE ONE CALL OF FLORIDA, INC.

NO.	REVISION	BY	DATE	APPROVED	DATE

PRELIMINARY

CERTIFICATION:
WILLIAM R. COTE
P.E. NUMBER: 53746
DATE: MARCH 23, 2021

DRAWING FILENAME: TCR 2020 COVER.dwg
SHEET: C1



HORIZONTAL SCALE 1" = 800'
INTENDED DISPLAY SCALE
0 800' 1600'

LEGEND:

- EXISTING L-73 BL 8.66 MILES
- EXISTING NOVA ROAD CR-532 R/W
- EXISTING L-73 R/W
- PROPOSED ADDITIONAL L-73 R/W
- EXISTING WETLANDS
- PROPOSED DOWNSTREAM LEVEE TOE
- AFFECTED WETLANDS (11.23 ACRES)
- SHEET NUMBER
- SECTION NUMBER

HORIZONTAL SCALE 1" = 800'
INTENDED DISPLAY SCALE
0 800' 1600'

PRELIMINARY

NO.	REVISION	BY	DATE	APPROVED	DATE

UPPER ST. JOHNS RIVER BASIN
TAYLOR CREEK RESERVOIR IMPROVEMENTS
ORANGE COUNTY AND OSCEOLA COUNTY, FLORIDA

ST. JOHNS RIVER
WATER MANAGEMENT DISTRICT
P.O. BOX 1429 PALATKA, FLORIDA

DRAWN: N.J.G. DATE: MARCH 23, 2021 REVIEWER: W.R.C.
SCALE: 1" = 800' DESIGNER: W.R.C. SECTION CHIEF: W.R.C.

OVERALL SITE PLAN

CERTIFICATION:
WILLIAM R. COTE
P.E. NUMBER: 53746
DATE: MARCH 23, 2021

FILE NAME: TCR 2020 OVERALL.dwg
PROJECT NO.:
SHEET: C2

NO.	REVISION	BY	DATE	APPROVED	DATE

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TAYLOR CREEK RESERVOIR IMPROVEMENTS
ORANGE COUNTY AND OSCEOLA COUNTY, FLORIDA

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
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DRAWN: N.J.G. DATE: MARCH 23, 2021 REVIEWER: W.R.C.
SCALE: AS NOTED DESIGNER: W.R.C. SECTION CHIEF: W.R.C.

LEVEE SECTION STA. 70+00, 110+00, AND 150+00

CERTIFICATION:
WILLIAM R. COTE
P.E. NUMBER: 53746
DATE: MARCH 23, 2021

FILE NAME: TCR 2020 CROSS SECTIONS.dwg
PROJECT NO.:
SHEET: C3

C4 1 LEVEE SECTION STA 185+50

SCALE: HORIZ. 1" = 20'-0"
VERT. 1" = 10'-0"

C4 2 LEVEE SECTION STA 186+87

SCALE: HORIZ. 1" = 20'-0"
VERT. 1" = 10'-0"

LEGEND:

- CUT
- FILL
- EXISTING L-73 R/W
- PROPOSED ADDITIONAL L-73 LEVEE R/W
- ℄ EXIST. LEVEE
- DESIGN GRADE
- EXISTING GRADE
- PROPOSED GRADE
- SURVEY OFFSET

GRAPHIC SCALE IN FEET
0 10 20 40 HORIZONTAL
0 5 10 20 VERTICAL

PRELIMINARY

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DRAWN: N.J.G.	DATE: MARCH 23, 2021	REVIEWER: W.R.C.
SCALE: AS NOTED	DESIGNER: W.R.C.	SECTION CHIEF: W.R.C.

LEVEE SECTION STA. 185+50 AND 186+87

CERTIFICATION:
WILLIAM R. COTE
P.E. NUMBER: 53746
DATE: MARCH 23, 2021

FILE NAME: TCR 2020 CROSS SECTIONS.dwg
PROJECT NO.:
SHEET: C4

C5 1 LEVEE SECTION STA 189+27

SCALE: HORIZ. 1" = 20'-0"
VERT. 1" = 10'-0"

C5 2 LEVEE SECTION STA 191+05

SCALE: HORIZ. 1" = 20'-0"
VERT. 1" = 10'-0"

LEGEND:

CUT	℄ EXIST. LEVEE
FILL	DESIGN GRADE
EXISTING L-73 R/W	EXISTING GRADE
PROPOSED ADDITIONAL L-73 LEVEE R/W	PROPOSED GRADE
SURVEY OFFSET	

GRAPHIC SCALE IN FEET

HORIZONTAL: 0 10 20 40

VERTICAL: 0 5 10 20

PRELIMINARY

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SCALE: AS NOTED DESIGNER: W.R.C. SECTION CHIEF: W.R.C.

LEVEE SECTION STA. 189+27 AND 191+00

CERTIFICATION:
WILLIAM R. COTE
P.E. NUMBER: 53746
DATE: MARCH 23, 2021

FILE NAME: TCR 2020 CROSS SECTIONS.dwg
PROJECT NO.:
SHEET: C5

LEVEE SECTION STA 226+00

SCALE: HORIZ. 1" = 10'-0"
VERT. 1" = 10'-0"

LEVEE SECTION STA 270+00

SCALE: HORIZ. 1" = 10'-0"
VERT. 1" = 10'-0"

LEGEND:

- CUT
- FILL
- EXISTING L-73 R/W
- PROPOSED ADDITIONAL L-73 LEVEE R/W
- ℄ EXIST. LEVEE
- DESIGN GRADE
- EXISTING GRADE
- PROPOSED GRADE
- SURVEY OFFSET

GRAPHIC SCALE IN FEET

HORIZONTAL 0 5 10 20

VERTICAL 0 5 10 20

PRELIMINARY

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LEVEE SECTION STA. 226+00 AND 270+00

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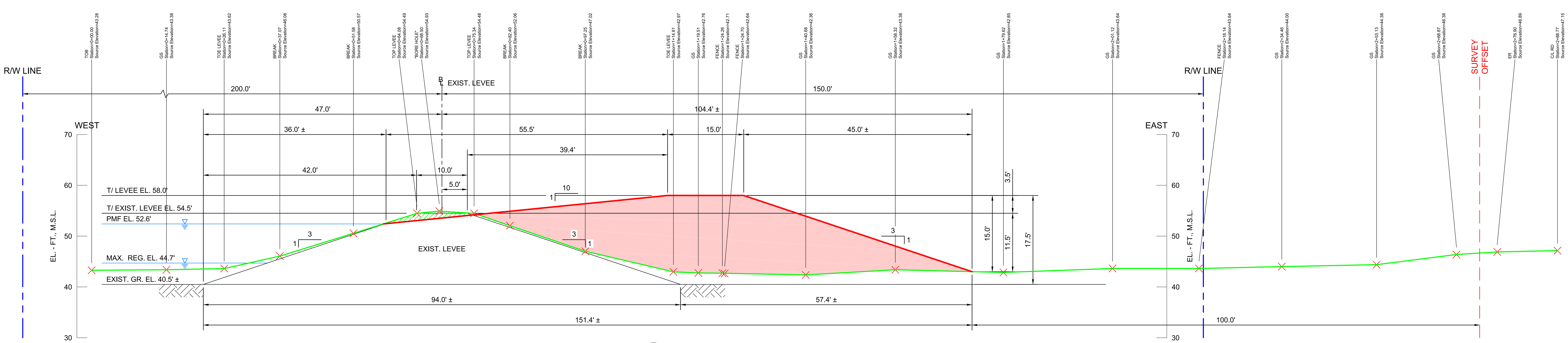
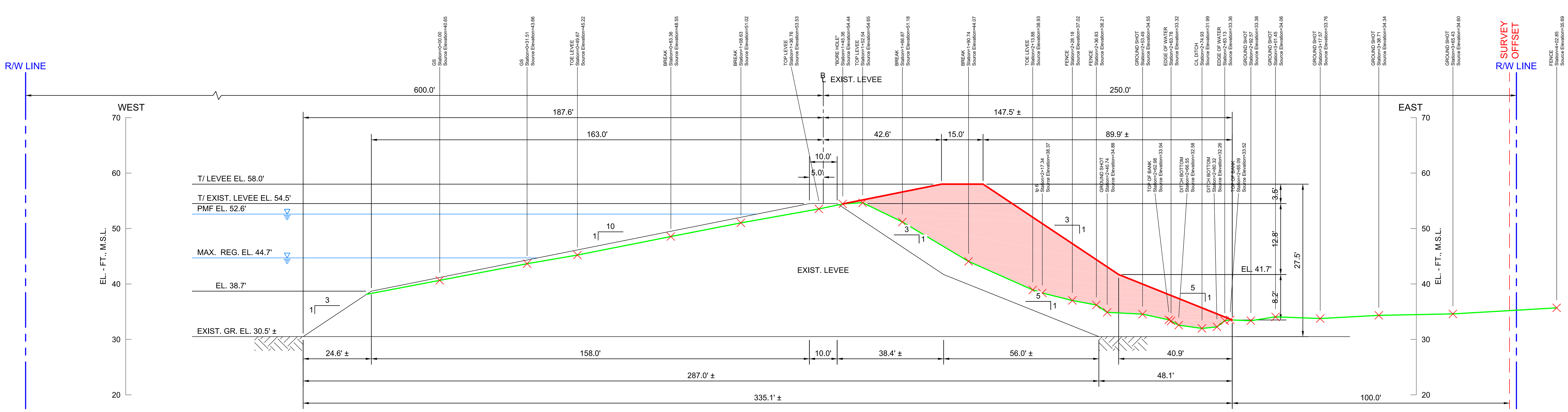
FILE NAME: TCR 2020 CROSS SECTIONS.dwg
PROJECT NO.:
SHEET: C6



C7 1 LEVEE SECTION STA 310+00

SCALE: HORIZ. 1" = 10'-0"
VERT. 1" = 10'-0"

GRAPHIC SCALE IN FEET
HORIZONTAL 0 5 10 20
VERTICAL 0 5 10 20



C7 2 LEVEE SECTION STA 400+00

SCALE: HORIZ. 1" = 20'-0"
VERT. 1" = 10'-0"

LEGEND:

- CUT
- FILL
- EXISTING L-73 R/W
- PROPOSED ADDITIONAL L-73 LEVEE R/W
- ℄ EXIST. LEVEE
- DESIGN GRADE
- EXISTING GRADE
- PROPOSED GRADE
- SURVEY OFFSET

GRAPHIC SCALE IN FEET
HORIZONTAL 0 10 20 40
VERTICAL 0 5 10 20

PRELIMINARY

NO.	REVISION	BY	DATE	APPROVED	DATE

UPPER ST. JOHNS RIVER BASIN
TAYLOR CREEK RESERVOIR IMPROVEMENTS
ORANGE COUNTY AND OSCEOLA COUNTY, FLORIDA

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
P.O. BOX 1429 PALATKA, FLORIDA

DRAWN: N.J.G. DATE: MARCH 23, 2021 REVIEWER: W.R.C.
SCALE: AS NOTED DESIGNER: W.R.C. SECTION CHIEF: W.R.C.

LEVEE SECTION STA. 310+00 AND 400+00

CERTIFICATION:
WILLIAM R. COTE
P.E. NUMBER: 53746
DATE: MARCH 23, 2021

FILE NAME: TCR 2020 CROSS SECTIONS.dwg
PROJECT NO.:
SHEET: C7

C8 1 LEVEE SECTION STA 419+00

SCALE: HORIZ. 1" = 10'-0"
VERT. 1" = 10'-0"

C8 2 LEVEE SECTION STA. 440+00

SCALE: HORIZ. 1" = 10'-0"
VERT. 1" = 10'-0"

LEGEND:

- CUT
- FILL
- EXISTING L-73 R/W
- PROPOSED ADDITIONAL L-73 LEVEE R/W
- EXIST. LEVEE (centerline)
- DESIGN GRADE
- EXISTING GRADE
- PROPOSED GRADE
- SURVEY OFFSET

GRAPHIC SCALE IN FEET
0 5 10 20 HORIZONTAL
0 5 10 20 VERTICAL

PRELIMINARY

NO.	REVISION	BY	DATE	APPROVED	DATE

UPPER ST. JOHNS RIVER BASIN
TAYLOR CREEK RESERVOIR IMPROVEMENTS
ORANGE COUNTY AND OSCEOLA COUNTY, FLORIDA

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT
P.O. BOX 1429 PALATKA, FLORIDA

DRAWN: N.J.G. DATE: MARCH 23, 2021 REVIEWER: W.R.C.
SCALE: AS NOTED DESIGNER: W.R.C. SECTION CHIEF: W.R.C.

LEVEE SECTION STA. 419+00 AND 440+00

CERTIFICATION:
WILLIAM R. COTE
P.E. NUMBER: 53746
DATE: MARCH 23, 2021

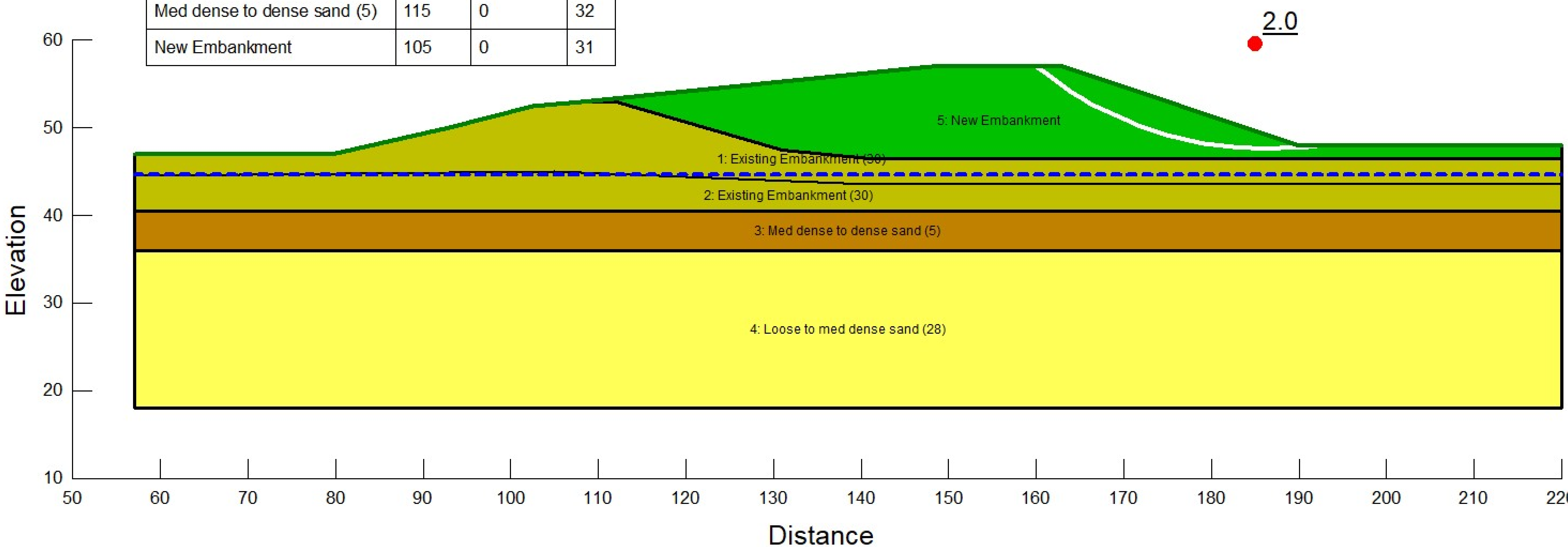
FILE NAME: TCR 2020 CROSS SECTIONS.dwg
PROJECT NO.:
SHEET: C8

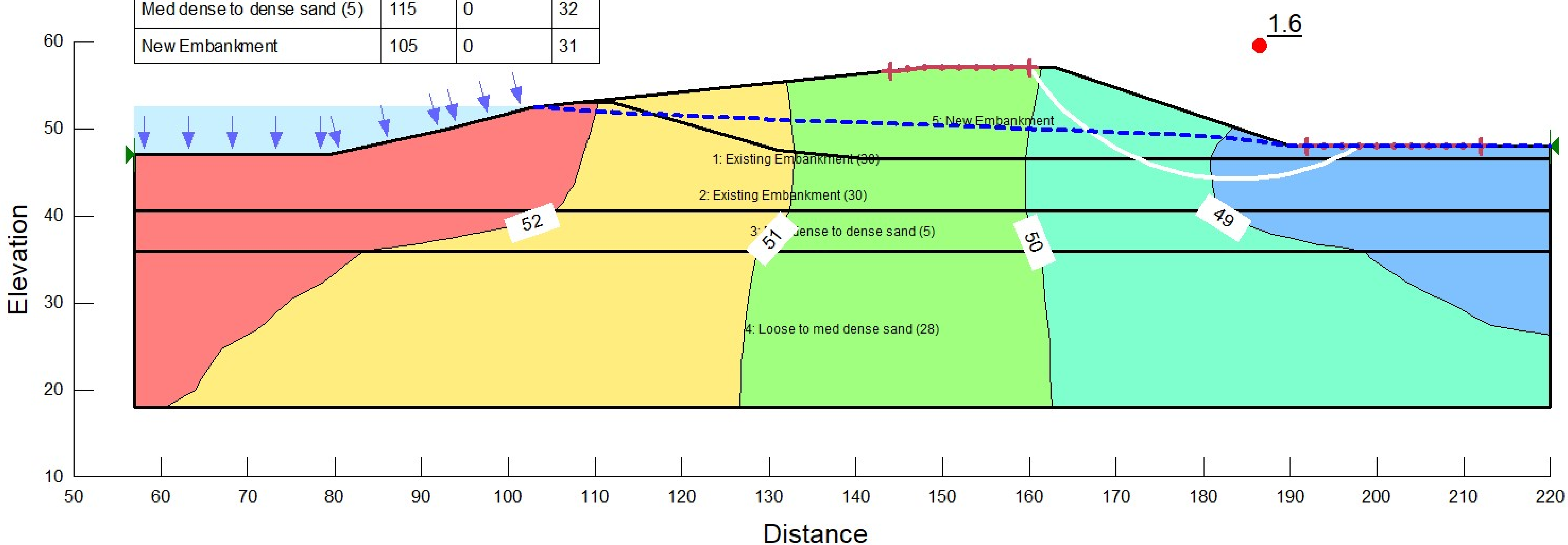
APPENDIX III

Computer Output for SEEP/W and SLOPE/W Analyses

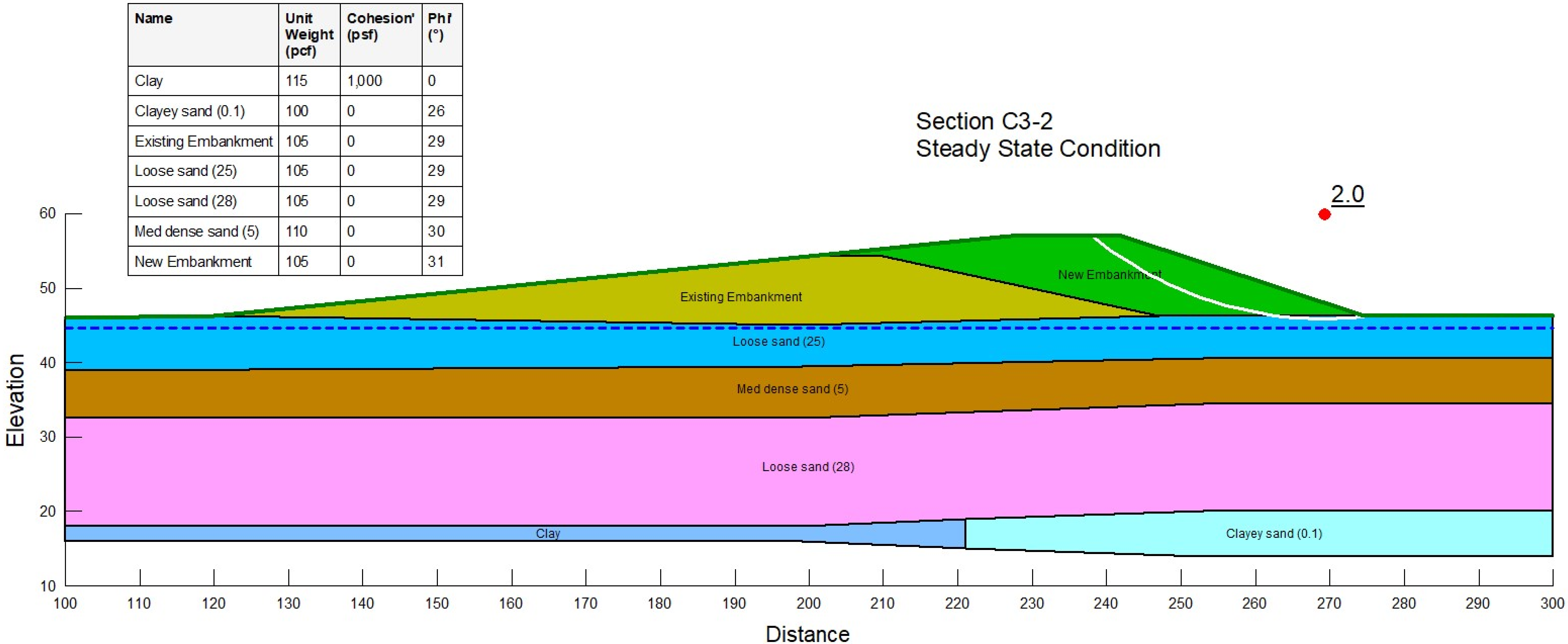
Section C3-1
Steady State Condition

Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Existing Embankment (30)	105	0	29
Loose to med dense sand (28)	110	0	30
Med dense to dense sand (5)	115	0	32
New Embankment	105	0	31



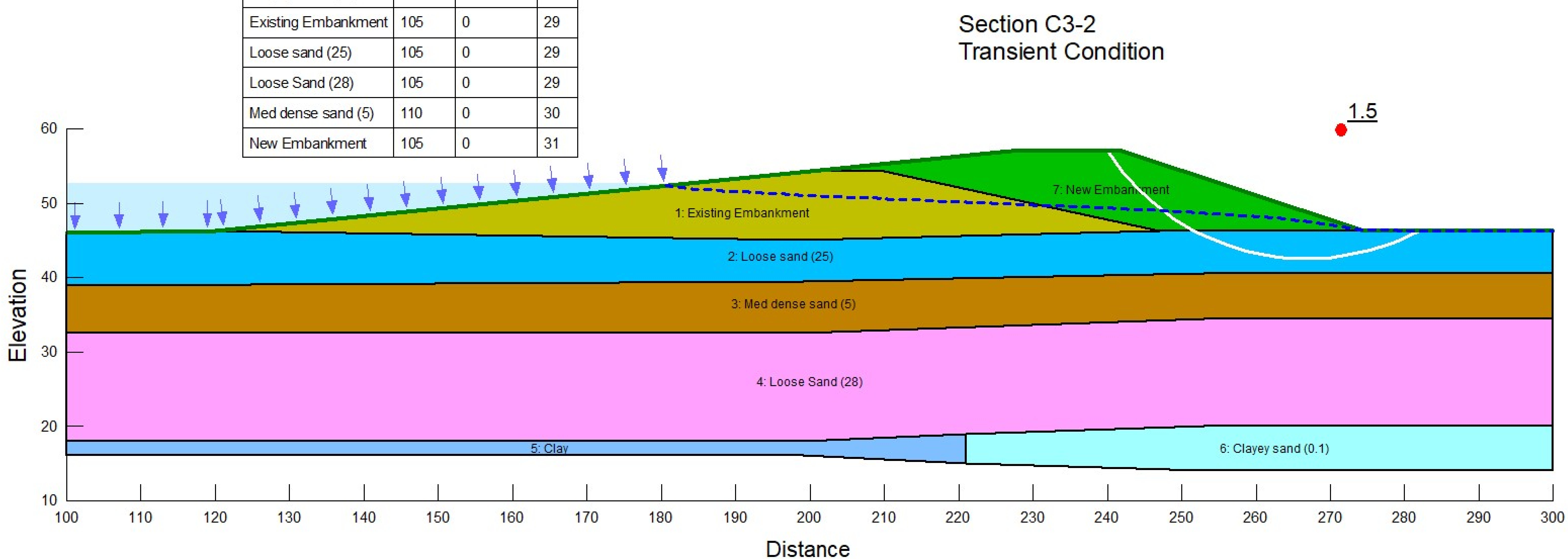


Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Existing Embankment (30)	105	0	29
Loose to med dense sand (28)	110	0	30
Med dense to dense sand (5)	115	0	32
New Embankment	105	0	31

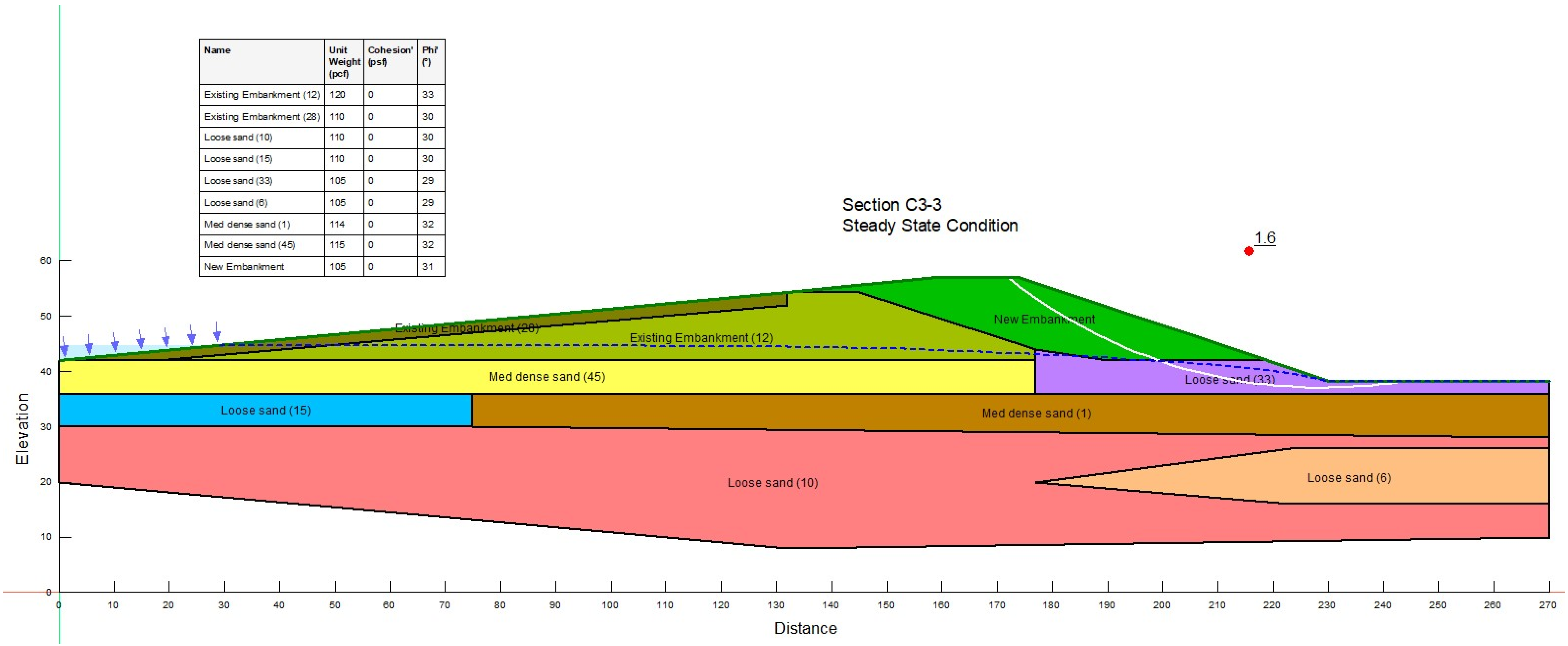


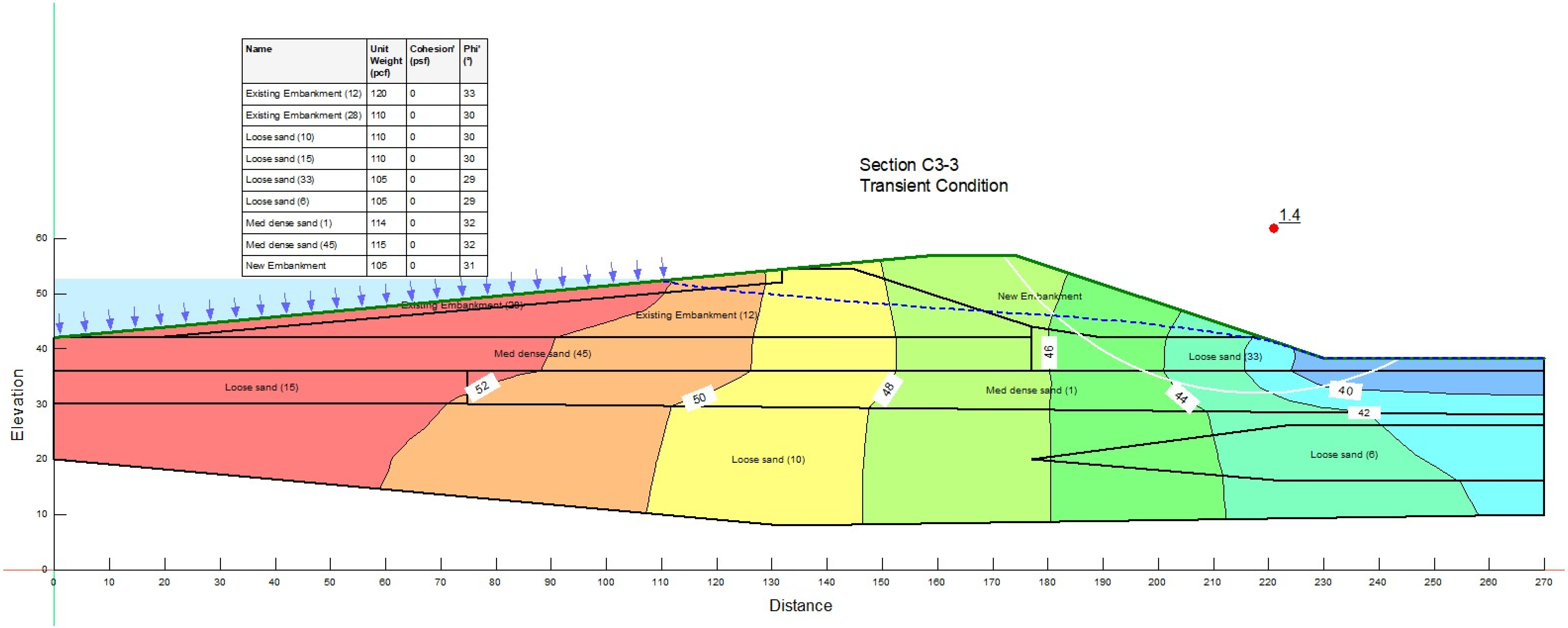
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clay	115	1,000	0
Clayey sand (0.1)	100	0	26
Existing Embankment	105	0	29
Loose sand (25)	105	0	29
Loose sand (28)	105	0	29
Med dense sand (5)	110	0	30
New Embankment	105	0	31

Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clay	115	1,000	0
Clayey sand (0.1)	100	0	26
Existing Embankment	105	0	29
Loose sand (25)	105	0	29
Loose Sand (28)	105	0	29
Med dense sand (5)	110	0	30
New Embankment	105	0	31



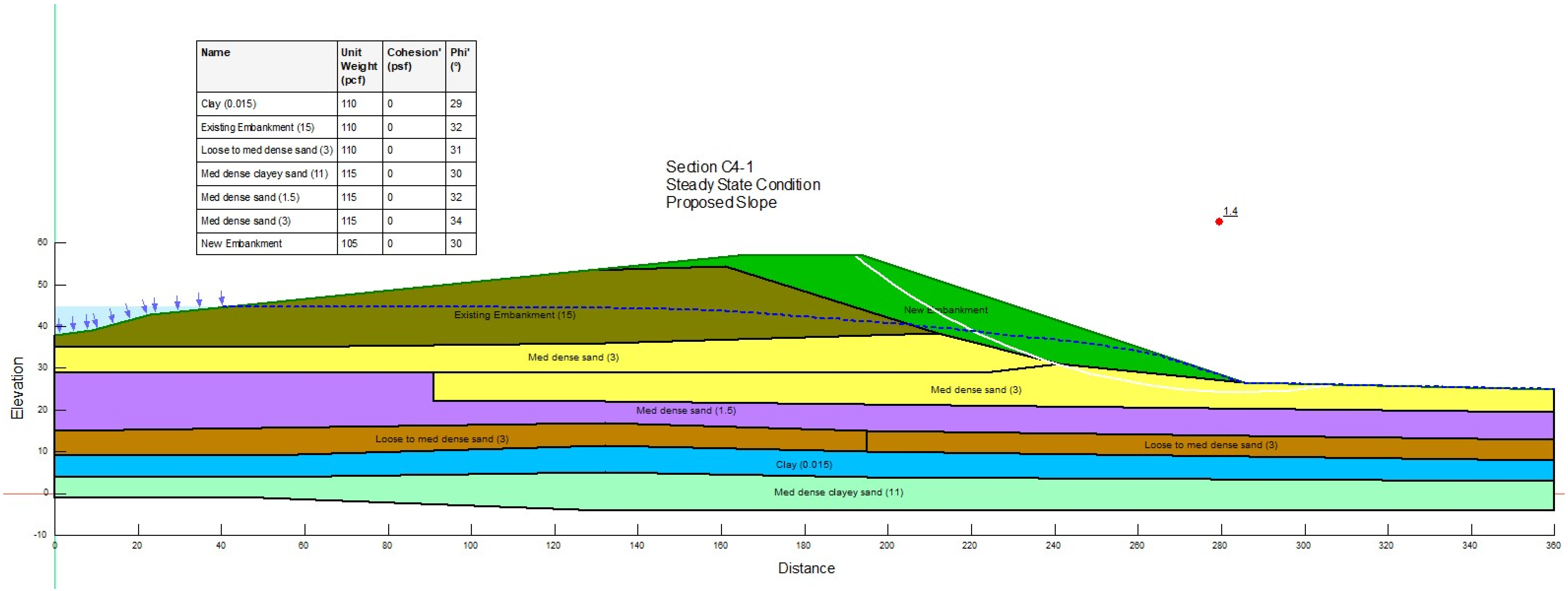
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Existing Embankment (12)	120	0	33
Existing Embankment (28)	110	0	30
Loose sand (10)	110	0	30
Loose sand (15)	110	0	30
Loose sand (33)	105	0	29
Loose sand (6)	105	0	29
Med dense sand (1)	114	0	32
Med dense sand (45)	115	0	32
New Embankment	105	0	31





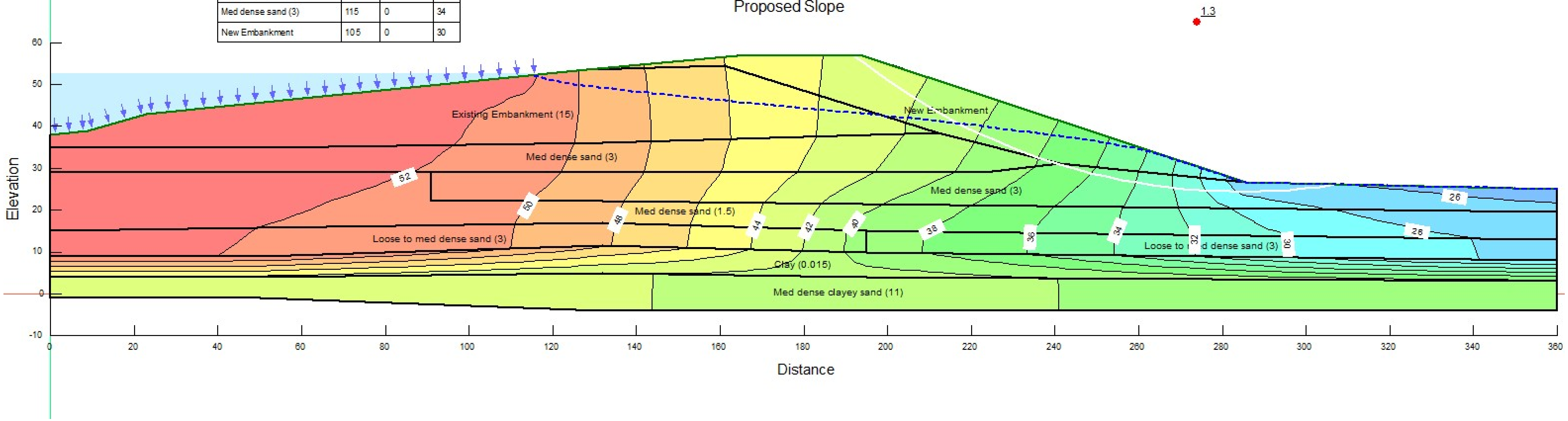
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Existing Embankment (12)	120	0	33
Existing Embankment (28)	110	0	30
Loose sand (10)	110	0	30
Loose sand (15)	110	0	30
Loose sand (33)	105	0	29
Loose sand (6)	105	0	29
Med dense sand (1)	114	0	32
Med dense sand (45)	115	0	32
New Embankment	105	0	31

Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clay (0.015)	110	0	29
Existing Embankment (15)	110	0	32
Loose to med dense sand (3)	110	0	31
Med dense clayey sand (11)	115	0	30
Med dense sand (1.5)	115	0	32
Med dense sand (3)	115	0	34
New Embankment	105	0	30

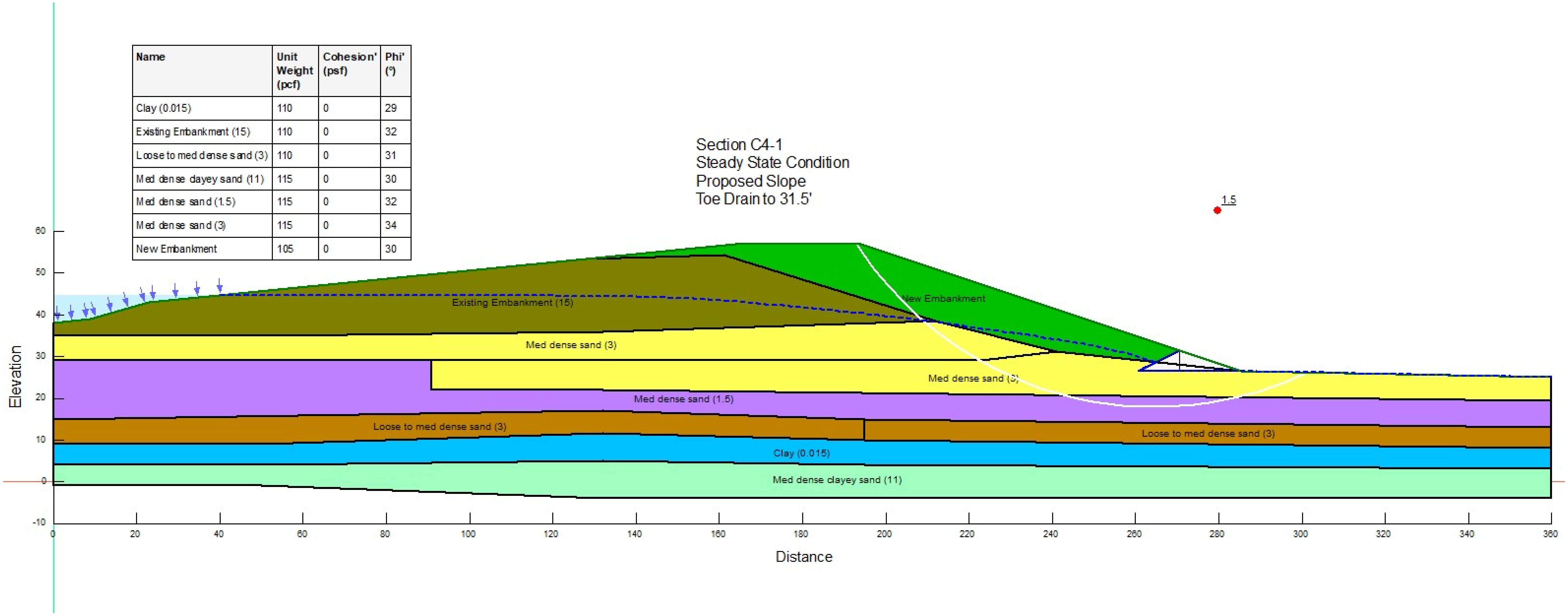


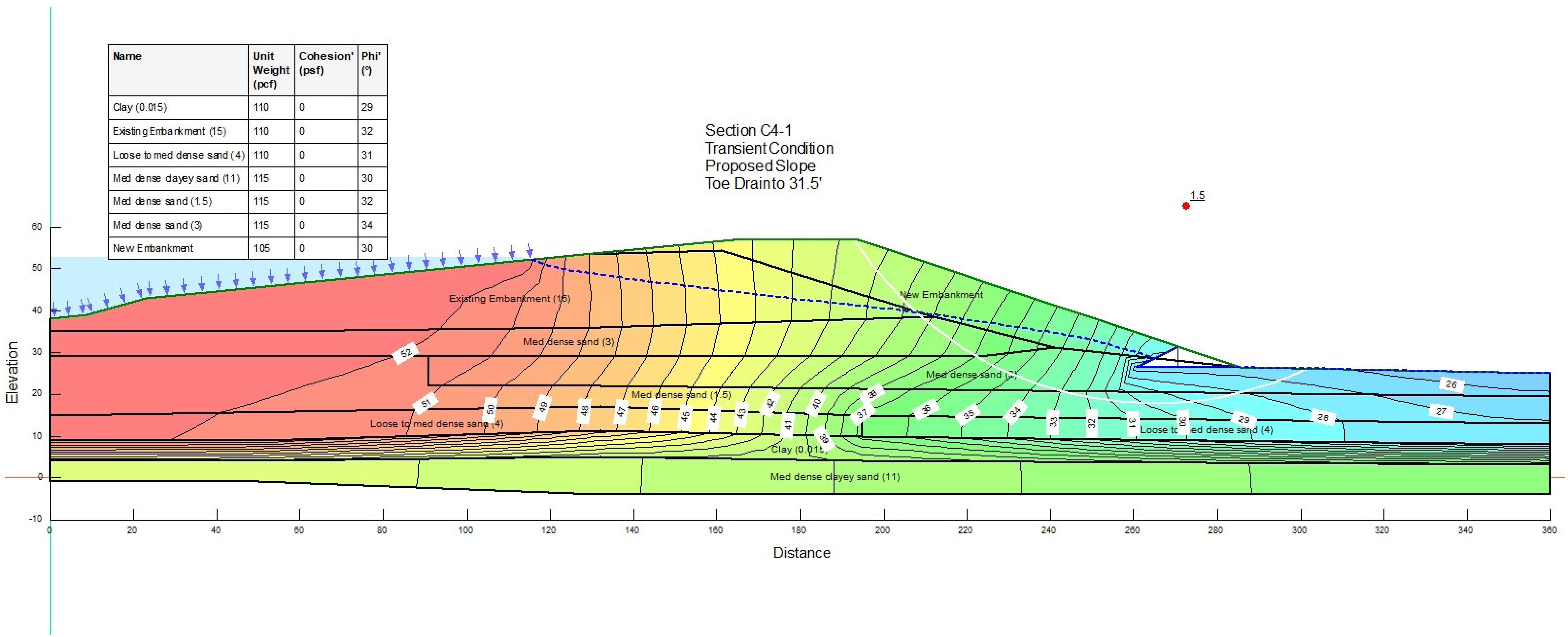
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clay (0.015)	110	0	29
Existing Embankment (15)	110	0	32
Loose to med dense sand (3)	110	0	31
Med dense clayey sand (11)	115	0	30
Med dense sand (1.5)	115	0	32
Med dense sand (3)	115	0	34
New Embankment	105	0	30

Section C4-1
Transient Condition
Proposed Slope



Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clay (0.015)	110	0	29
Existing Embankment (15)	110	0	32
Loose to med dense sand (3)	110	0	31
Med dense clayey sand (11)	115	0	30
Med dense sand (1.5)	115	0	32
Med dense sand (3)	115	0	34
New Embankment	105	0	30

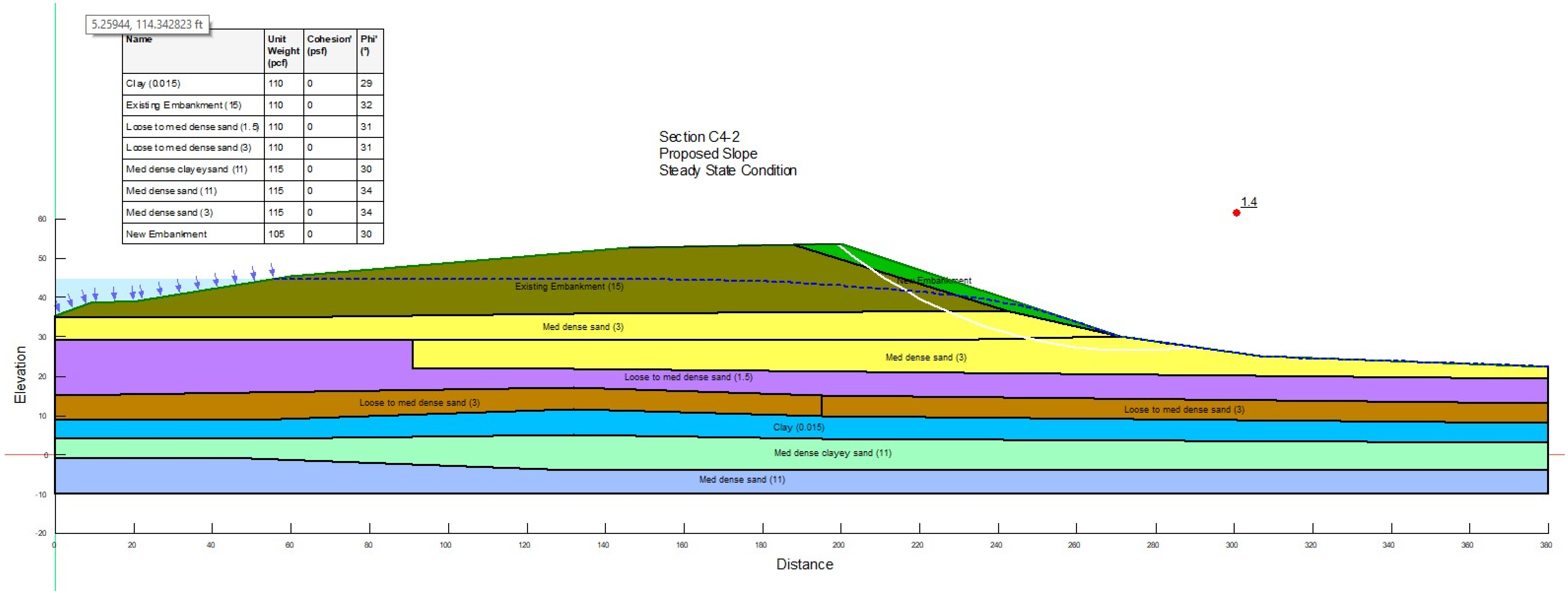




Section C4-1
Transient Condition
Proposed Slope
Toe Drain to 31.5'

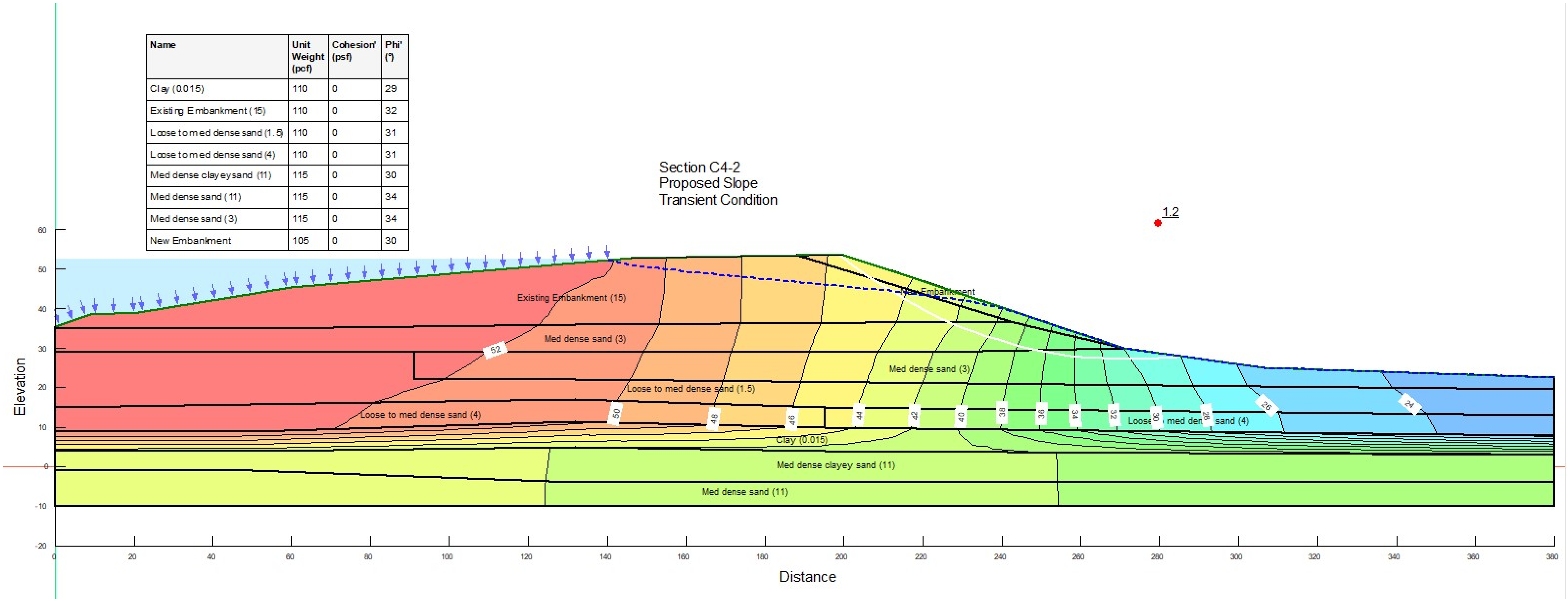
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clay (0.015)	110	0	29
Existing Embankment (15)	110	0	32
Loose to med dense sand (4)	110	0	31
Med dense clayey sand (11)	115	0	30
Med dense sand (1.5)	115	0	32
Med dense sand (3)	115	0	34
New Embankment	105	0	30

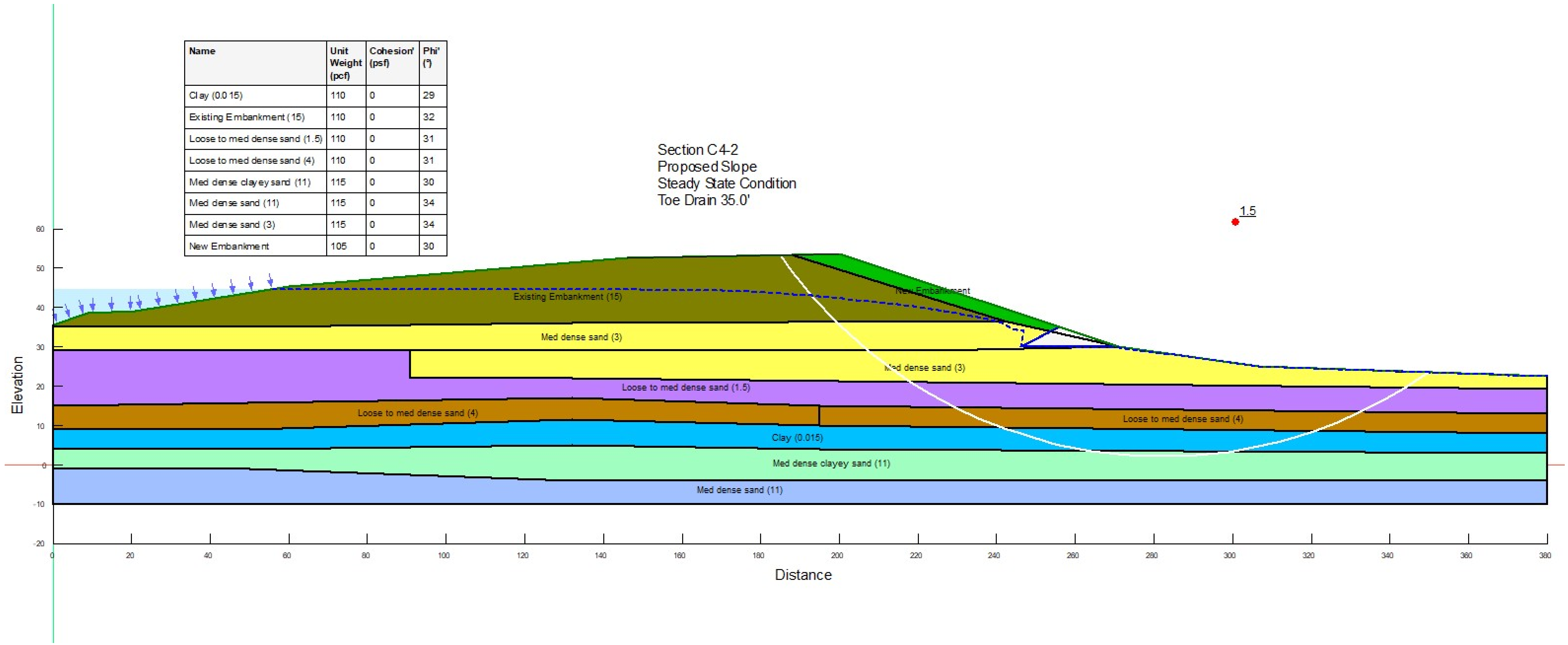
1.5
Existing Embankment (15)
New Embankment
Med dense sand (3)
Med dense sand (1.5)
Loose to med dense sand (4)
Clay (0.015)
Med dense clayey sand (11)
Elevation
Distance



Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clay (0.015)	110	0	29
Existing Embankment (15)	110	0	32
Loose to med dense sand (1.5)	110	0	31
Loose to med dense sand (3)	110	0	31
Med dense clayey sand (11)	115	0	30
Med dense sand (11)	115	0	34
Med dense sand (3)	115	0	34
New Embankment	105	0	30

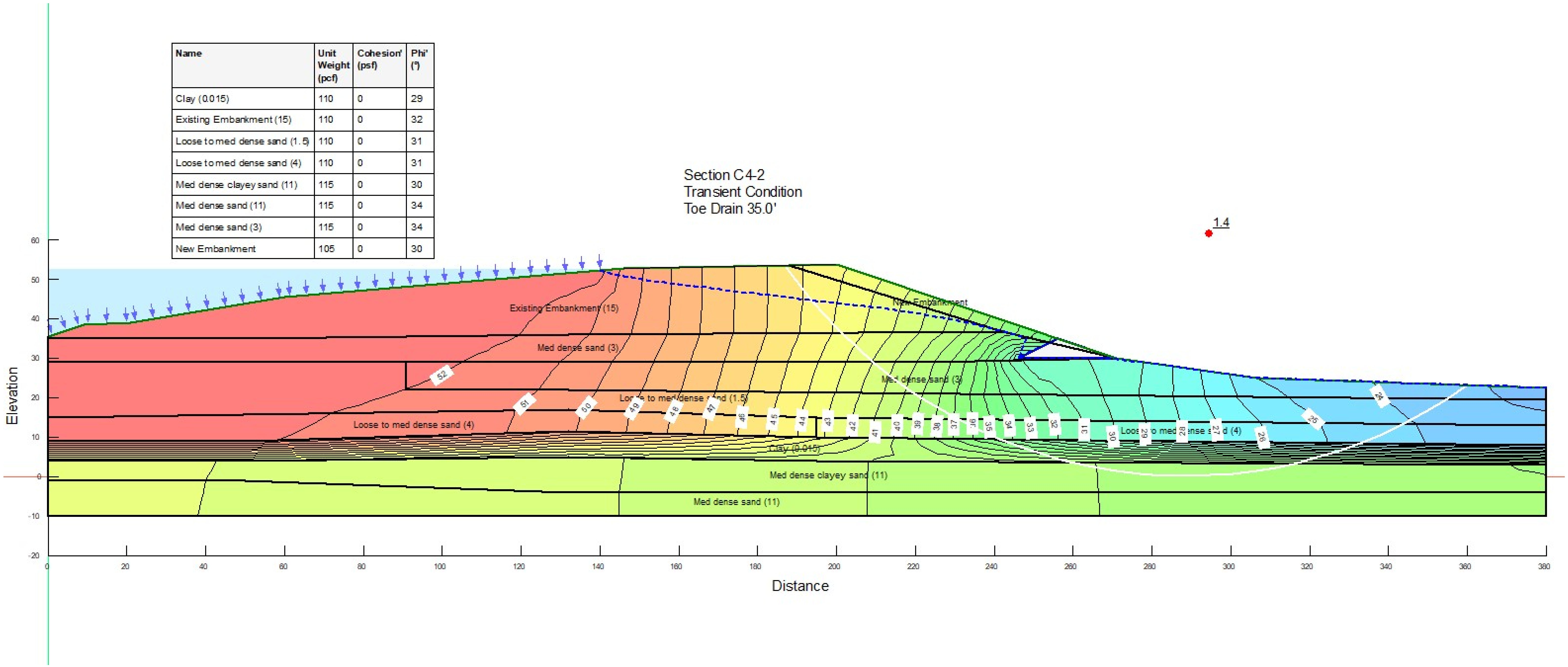
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clay (0.015)	110	0	29
Existing Embankment (15)	110	0	32
Loose to med dense sand (1.5)	110	0	31
Loose to med dense sand (4)	110	0	31
Med dense clayey sand (11)	115	0	30
Med dense sand (11)	115	0	34
Med dense sand (3)	115	0	34
New Embankment	105	0	30





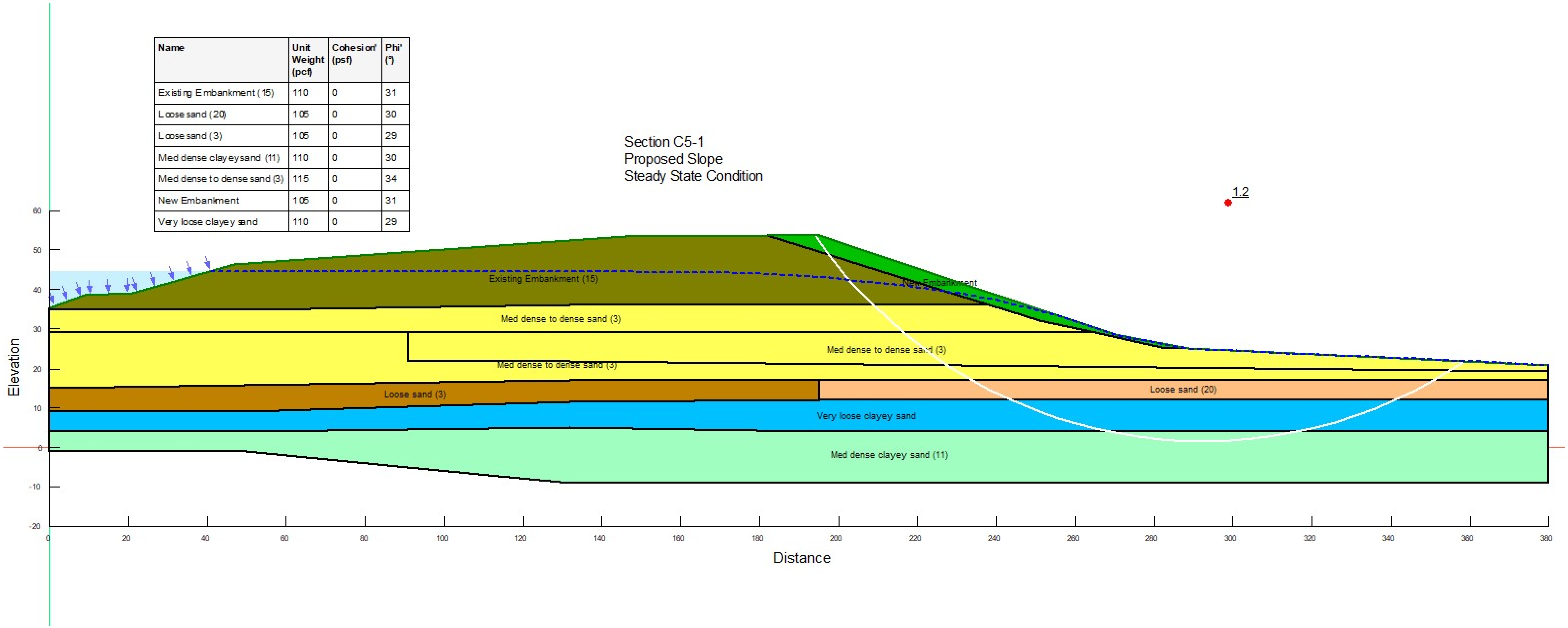
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clay (0.015)	110	0	29
Existing Embankment (15)	110	0	32
Loose to med dense sand (1.5)	110	0	31
Loose to med dense sand (4)	110	0	31
Med dense clayey sand (11)	115	0	30
Med dense sand (11)	115	0	34
Med dense sand (3)	115	0	34
New Embankment	105	0	30

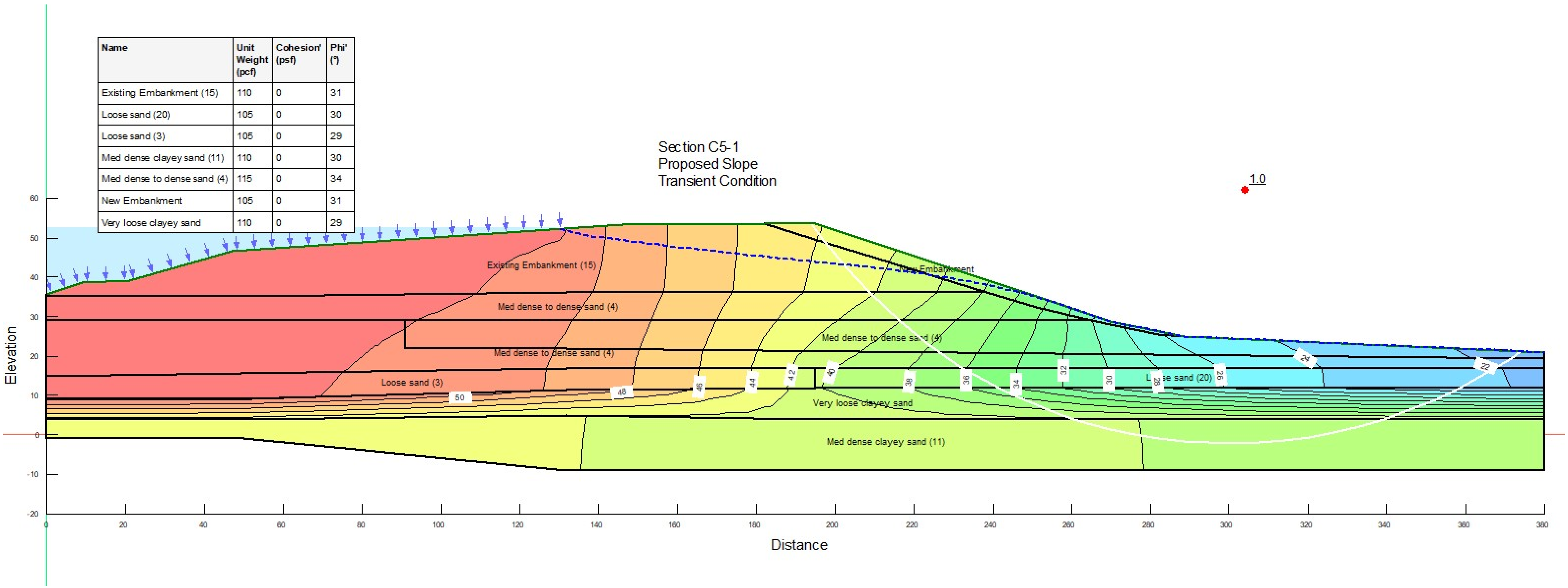
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clay (0.015)	110	0	29
Existing Embankment (15)	110	0	32
Loose to med dense sand (1.5)	110	0	31
Loose to med dense sand (4)	110	0	31
Med dense clayey sand (11)	115	0	30
Med dense sand (11)	115	0	34
Med dense sand (3)	115	0	34
New Embankment	105	0	30



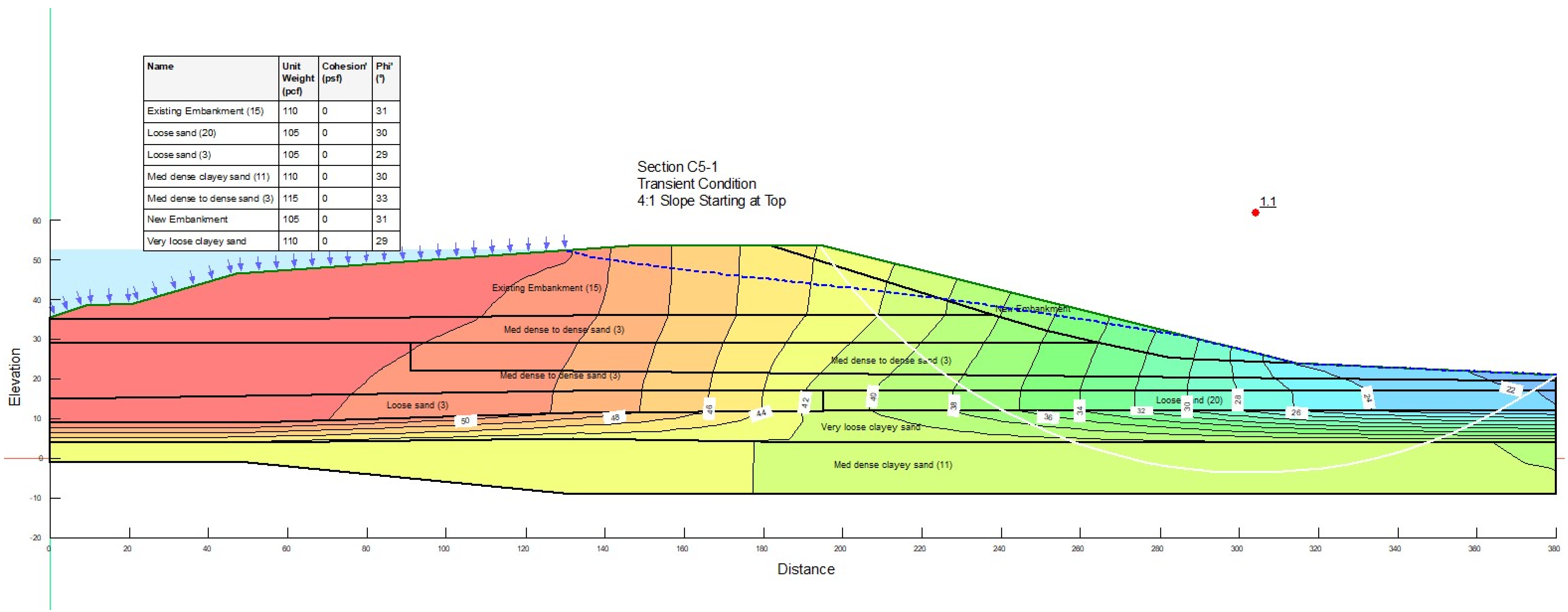
Section C5-1
Proposed Slope
Steady State Condition

Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Existing Embankment (15)	110	0	31
Loose sand (20)	105	0	30
Loose sand (3)	105	0	29
Med dense clayey sand (11)	110	0	30
Med dense to dense sand (3)	115	0	34
New Embankment	105	0	31
Very loose clayey sand	110	0	29



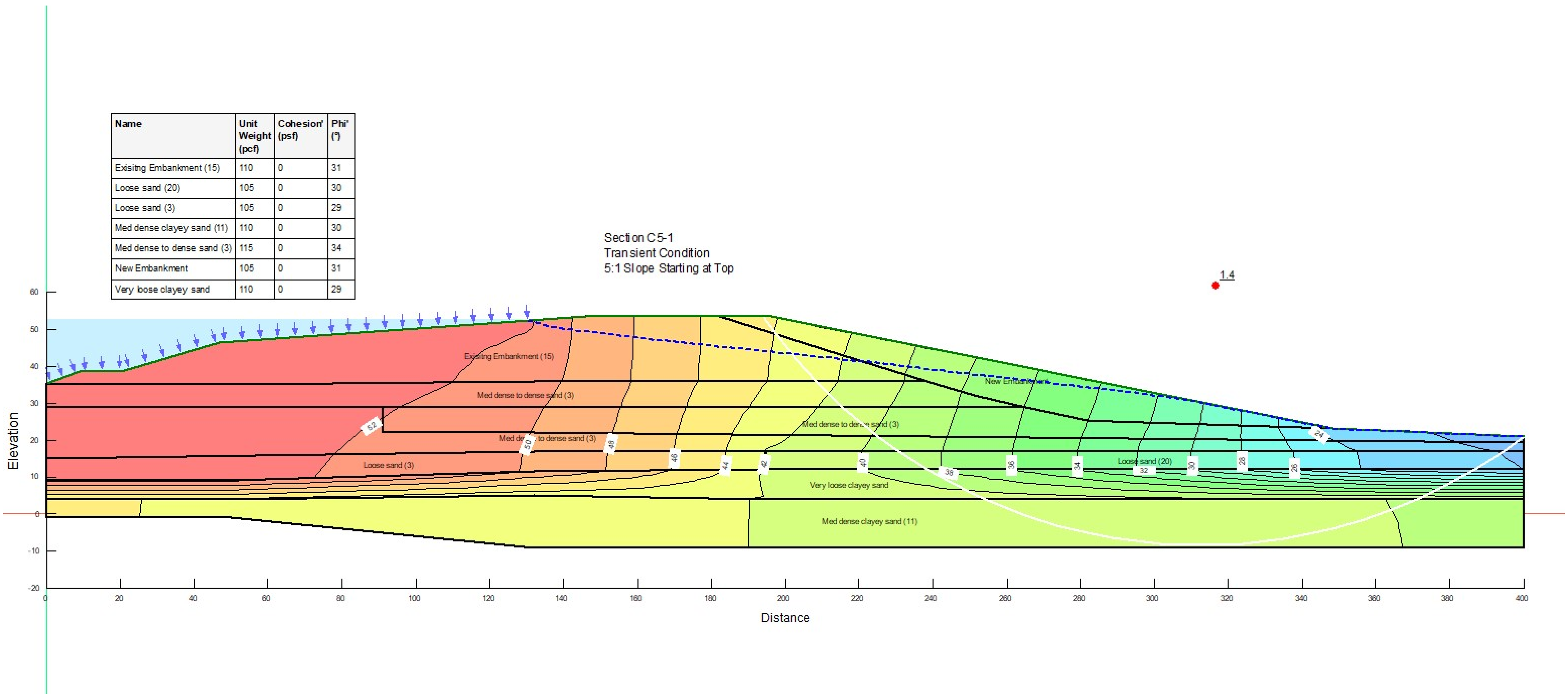


Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Existing Embankment (15)	110	0	31
Loose sand (20)	105	0	30
Loose sand (3)	105	0	29
Med dense clayey sand (11)	110	0	30
Med dense to dense sand (4)	115	0	34
New Embankment	105	0	31
Very loose clayey sand	110	0	29

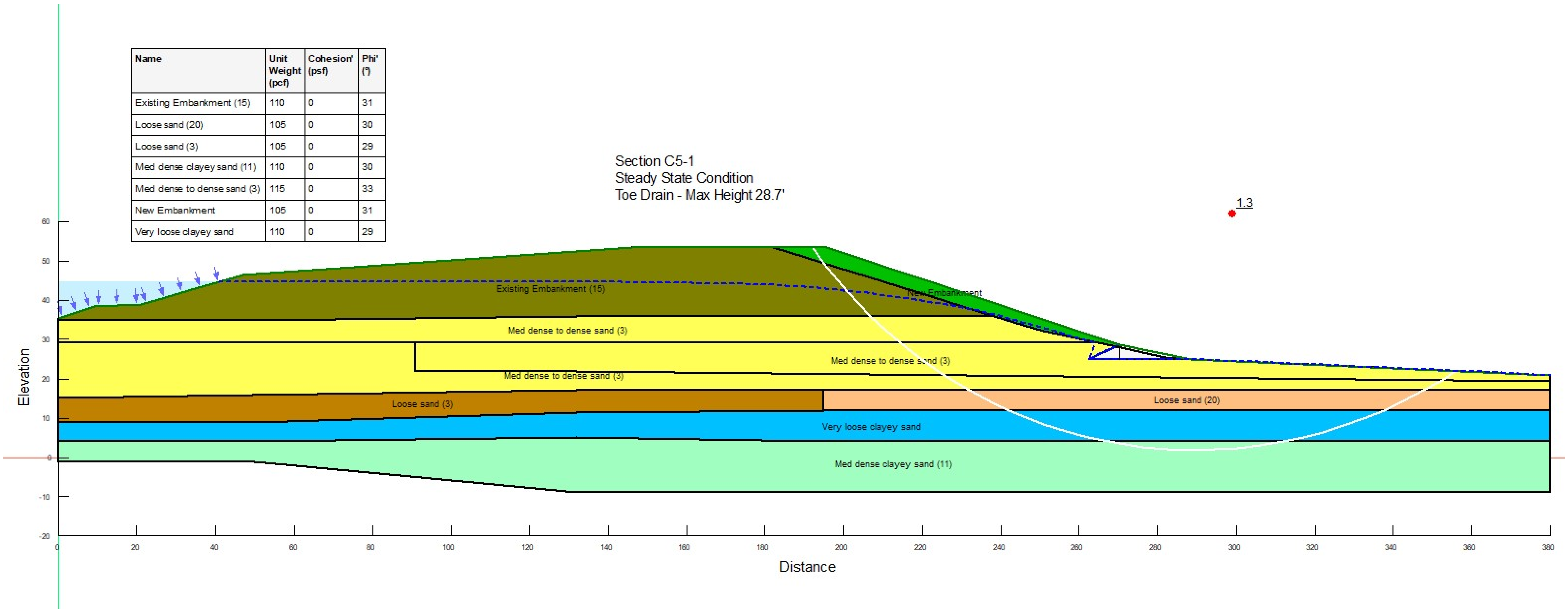


Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Existing Embankment (15)	110	0	31
Loose sand (20)	105	0	30
Loose sand (3)	105	0	29
Med dense clayey sand (11)	110	0	30
Med dense to dense sand (3)	115	0	33
New Embankment	105	0	31
Very loose clayey sand	110	0	29

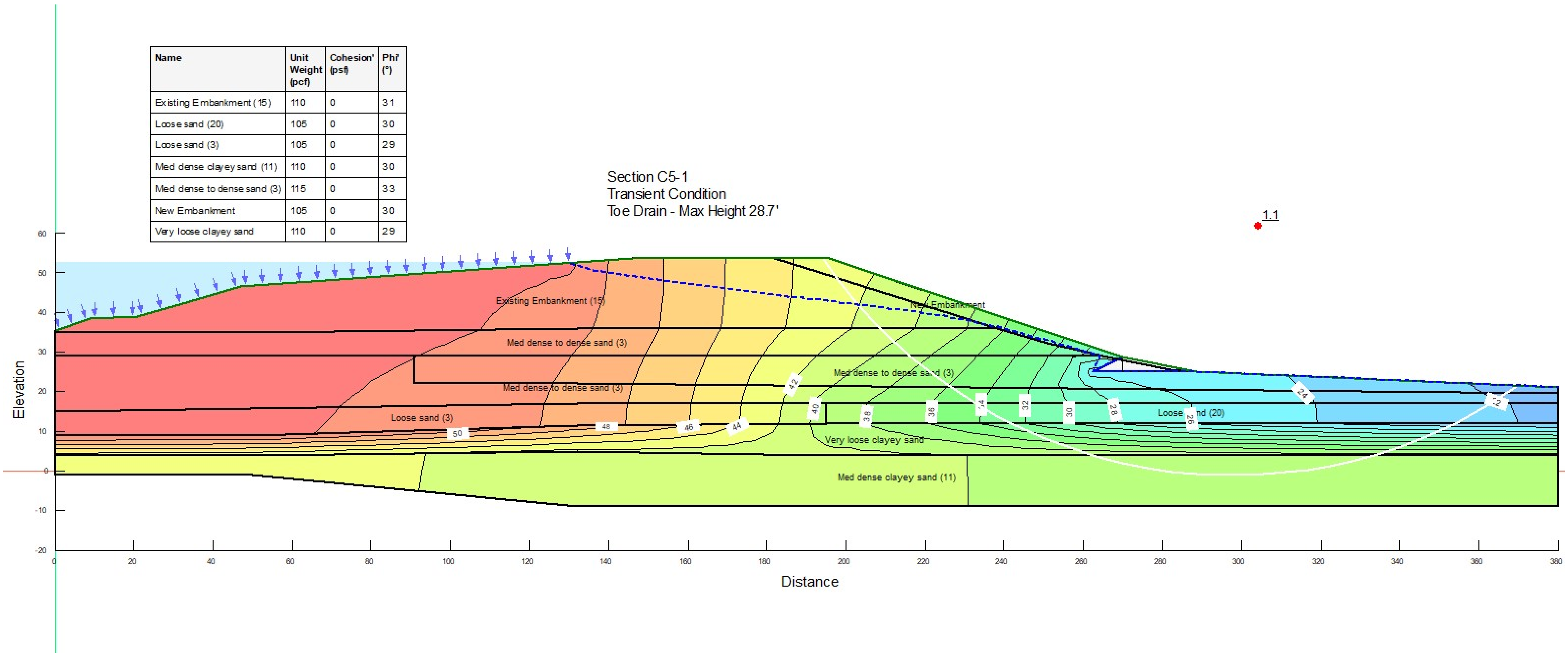
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Exisitng Embankment (15)	110	0	31
Loose sand (20)	105	0	30
Loose sand (3)	105	0	29
Med dense clayey sand (11)	110	0	30
Med dense to dense sand (3)	115	0	34
New Embankment	105	0	31
Very loose clayey sand	110	0	29



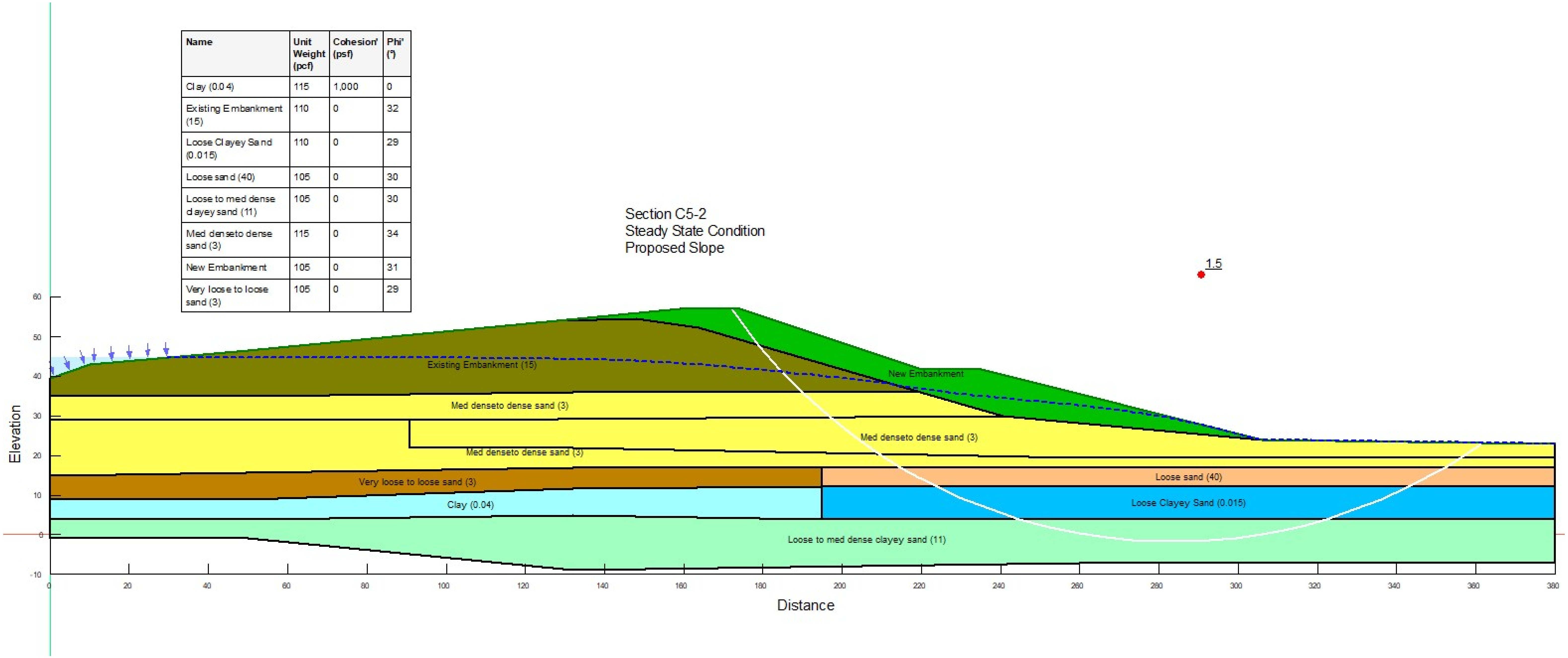
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Existing Embankment (15)	110	0	31
Loose sand (20)	105	0	30
Loose sand (3)	105	0	29
Med dense clayey sand (11)	110	0	30
Med dense to dense sand (3)	115	0	33
New Embankment	105	0	31
Very loose clayey sand	110	0	29



Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Existing Embankment (15)	110	0	31
Loose sand (20)	105	0	30
Loose sand (3)	105	0	29
Med dense clayey sand (11)	110	0	30
Med dense to dense sand (3)	115	0	33
New Embankment	105	0	30
Very loose clayey sand	110	0	29

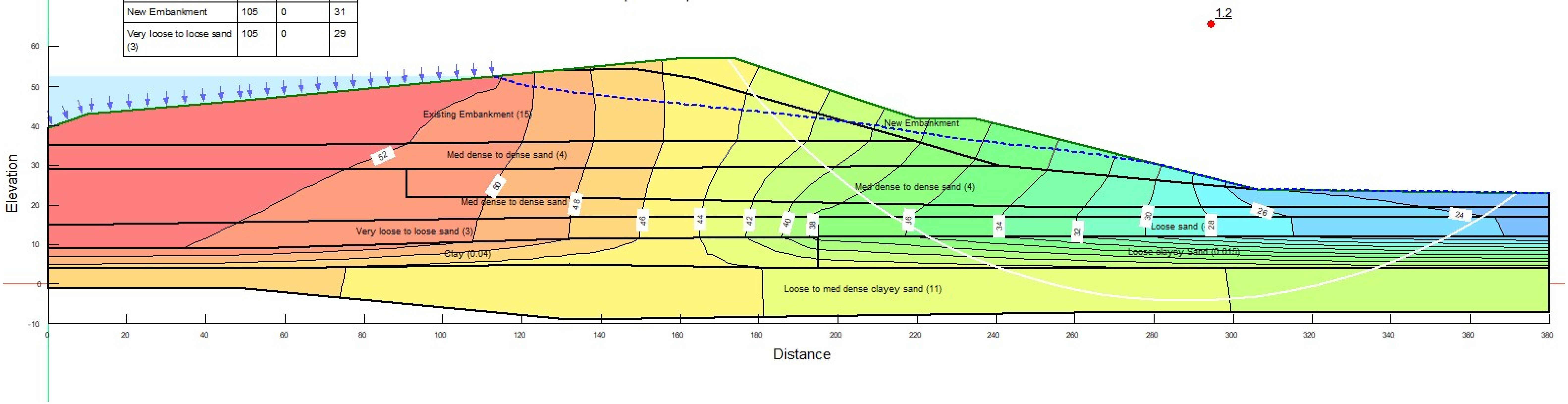


Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clay (0.04)	115	1,000	0
Existing Embankment (15)	110	0	32
Loose Clayey Sand (0.015)	110	0	29
Loose sand (40)	105	0	30
Loose to med dense clayey sand (11)	105	0	30
Med denseto dense sand (3)	115	0	34
New Embankment	105	0	31
Very loose to loose sand (3)	105	0	29

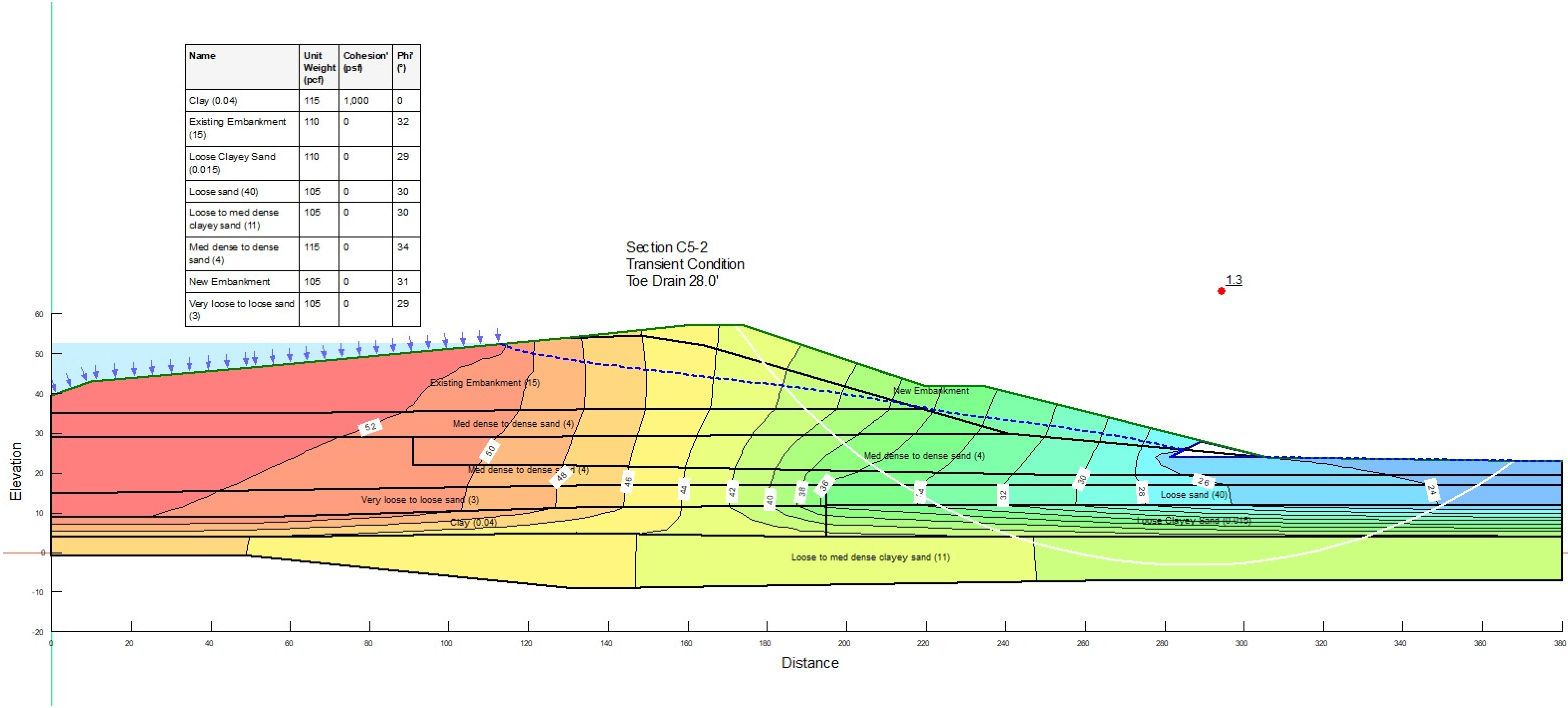


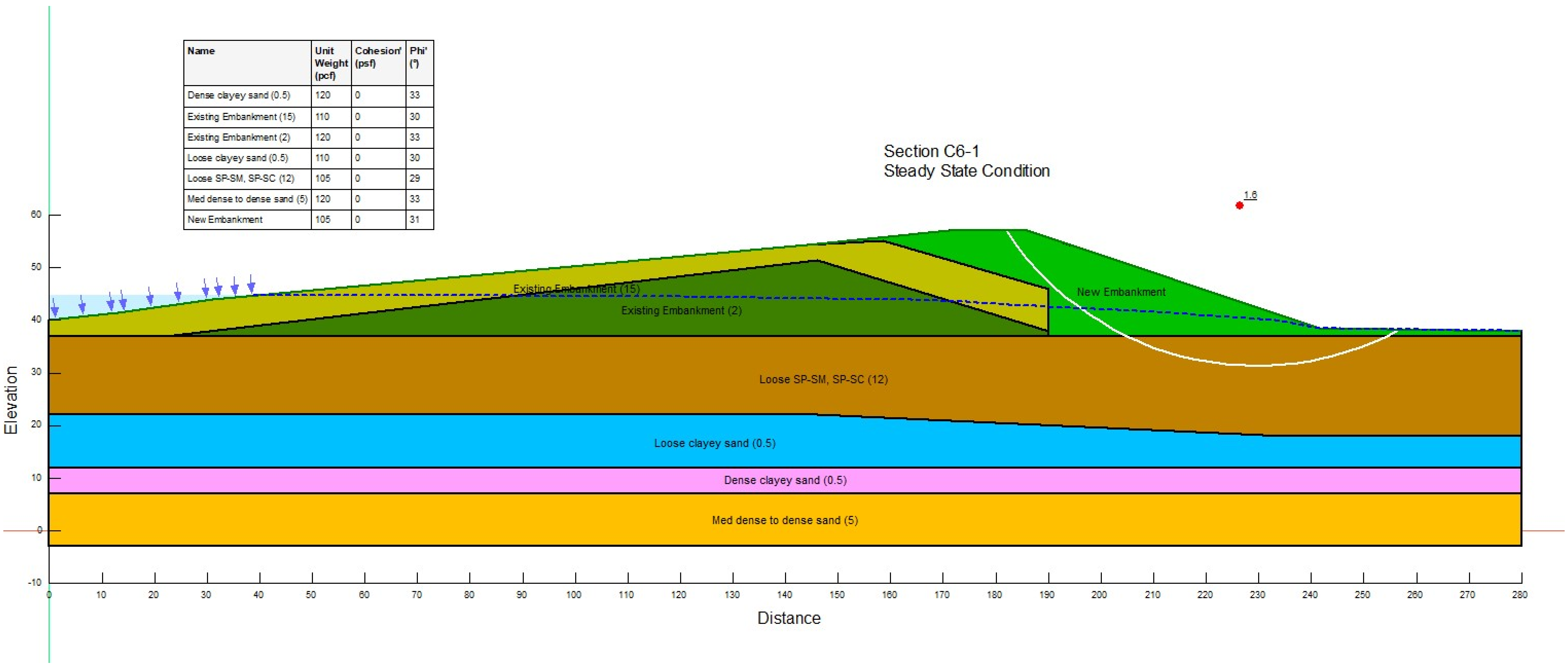
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clay (0.04)	115	1,000	0
Existing Embankment (15)	110	0	32
Loose clayey Sand (0.015)	110	0	29
Loose sand (40)	105	0	30
Loose to med dense clayey sand (11)	105	0	30
Med dense to dense sand (4)	115	0	34
New Embankment	105	0	31
Very loose to loose sand (3)	105	0	29

Section C5-2
Transient Condition
Proposed Slope



Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clay (0.04)	115	1,000	0
Existing Embankment (15)	110	0	32
Loose Clayey Sand (0.015)	110	0	29
Loose sand (40)	105	0	30
Loose to med dense clayey sand (11)	105	0	30
Med dense to dense sand (4)	115	0	34
New Embankment	105	0	31
Very loose to loose sand (3)	105	0	29

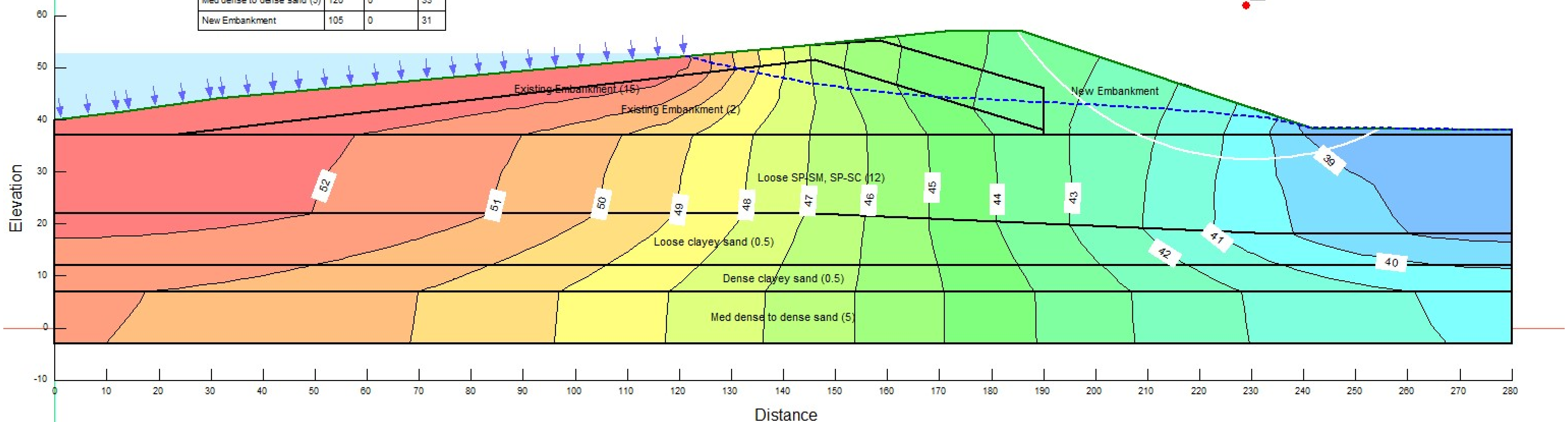




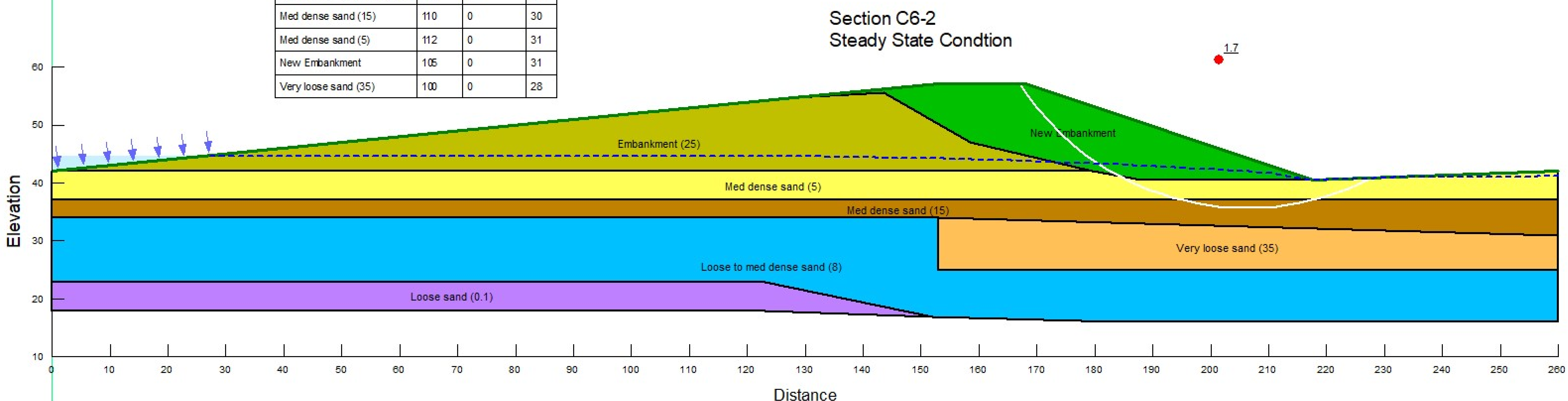
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Dense clayey sand (0.5)	120	0	33
Existing Embankment (15)	110	0	30
Existing Embankment (2)	120	0	33
Loose clayey sand (0.5)	110	0	30
Loose SP-SM, SP-SC (12)	105	0	29
Med dense to dense sand (5)	120	0	33
New Embankment	105	0	31

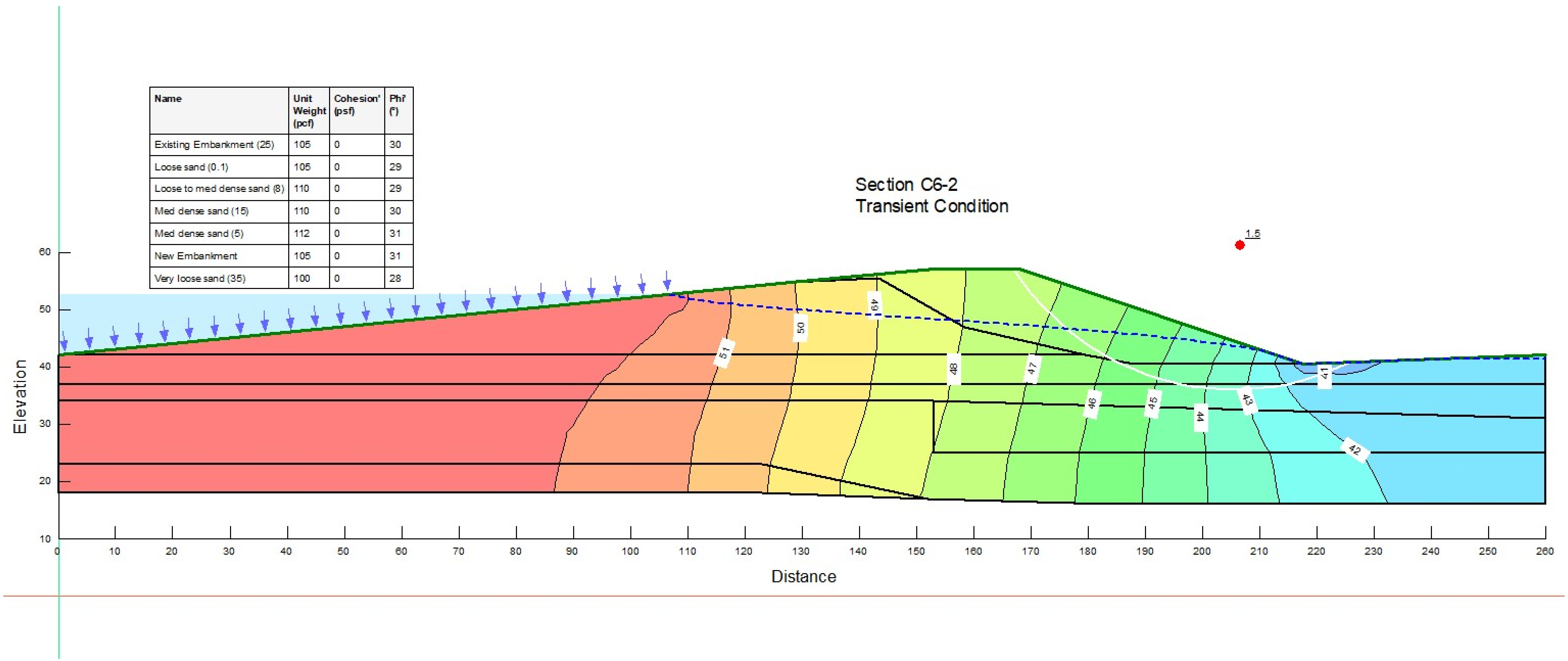
Section C6-1
Transient Condition

Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Dense clayey sand (0.5)	120	0	33
Existing Embankment (15)	110	0	30
Existing Embankment (2)	120	0	33
Loose clayey sand (0.5)	110	0	30
Loose SP-SM, SP-SC (12)	105	0	29
Med dense to dense sand (5)	120	0	33
New Embankment	105	0	31

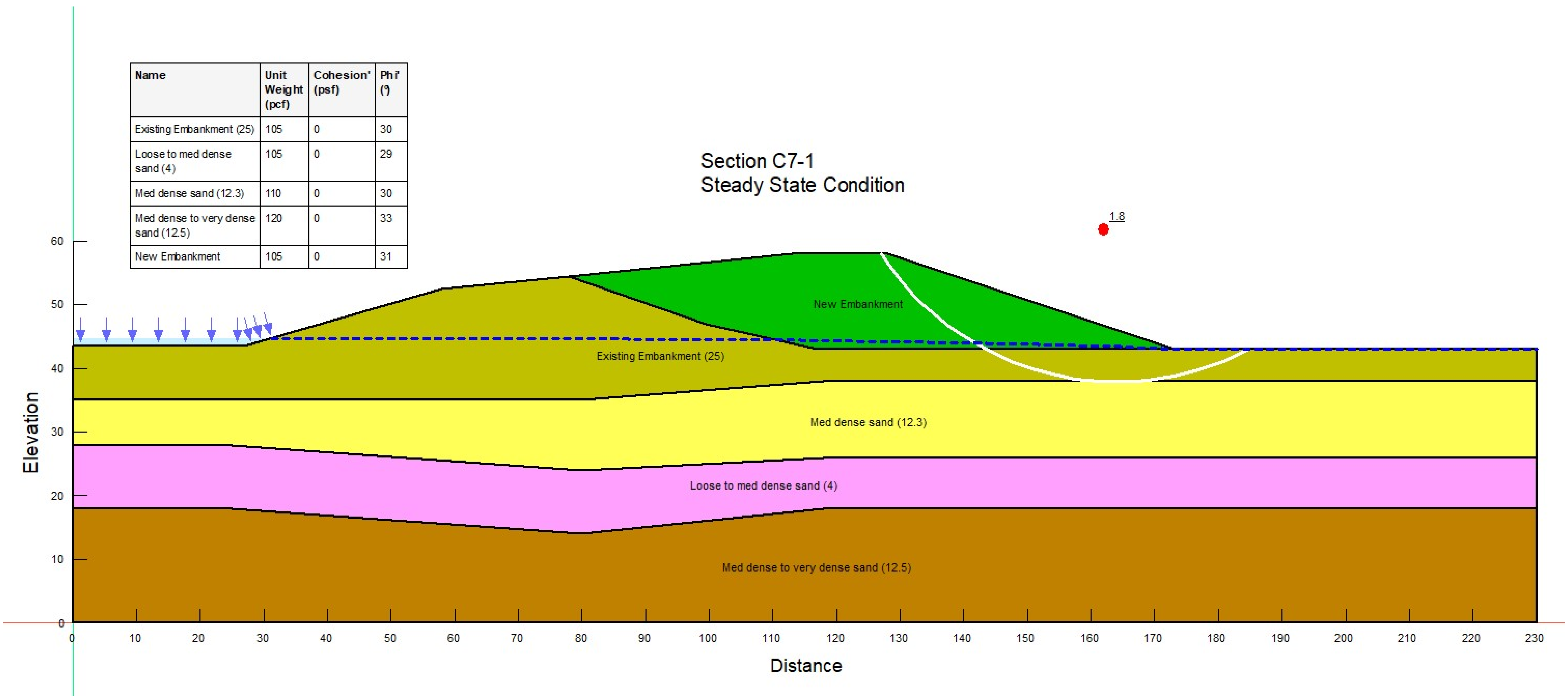


Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Embankment (25)	105	0	30
Loose sand (0.1)	105	0	29
Loose to med dense sand (8)	110	0	29
Med dense sand (15)	110	0	30
Med dense sand (5)	112	0	31
New Embankment	105	0	31
Very loose sand (35)	100	0	28

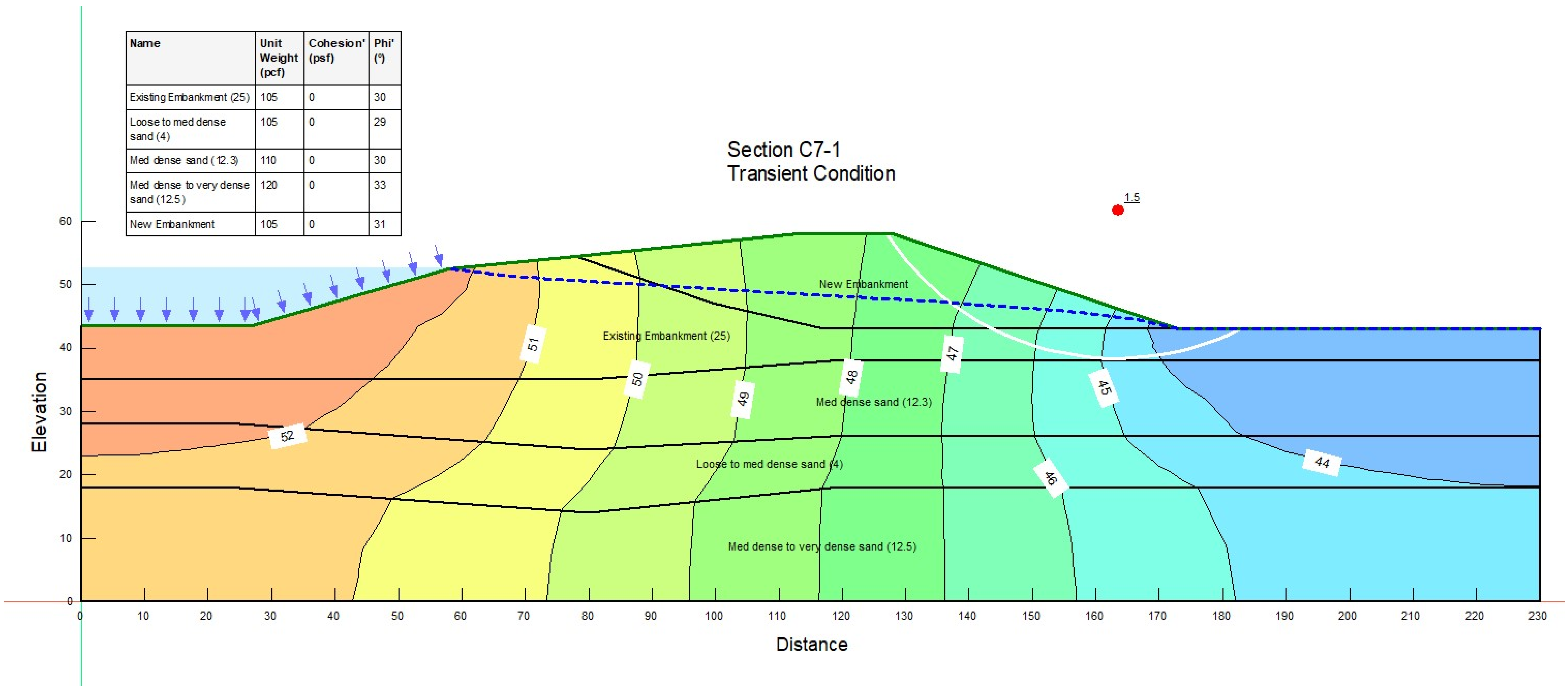




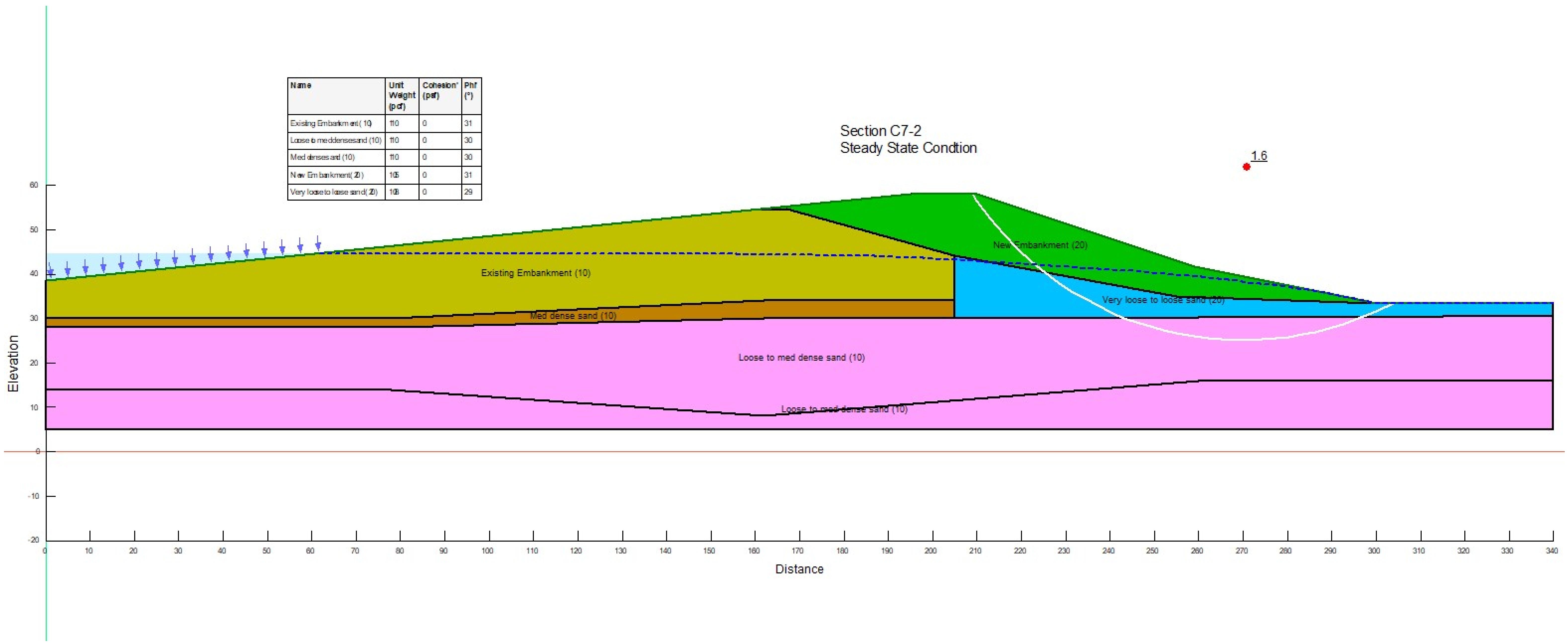
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Existing Embankment (25)	105	0	30
Loose sand (0.1)	105	0	29
Loose to med dense sand (8)	110	0	29
Med dense sand (15)	110	0	30
Med dense sand (5)	112	0	31
New Embankment	105	0	31
Very loose sand (35)	100	0	28



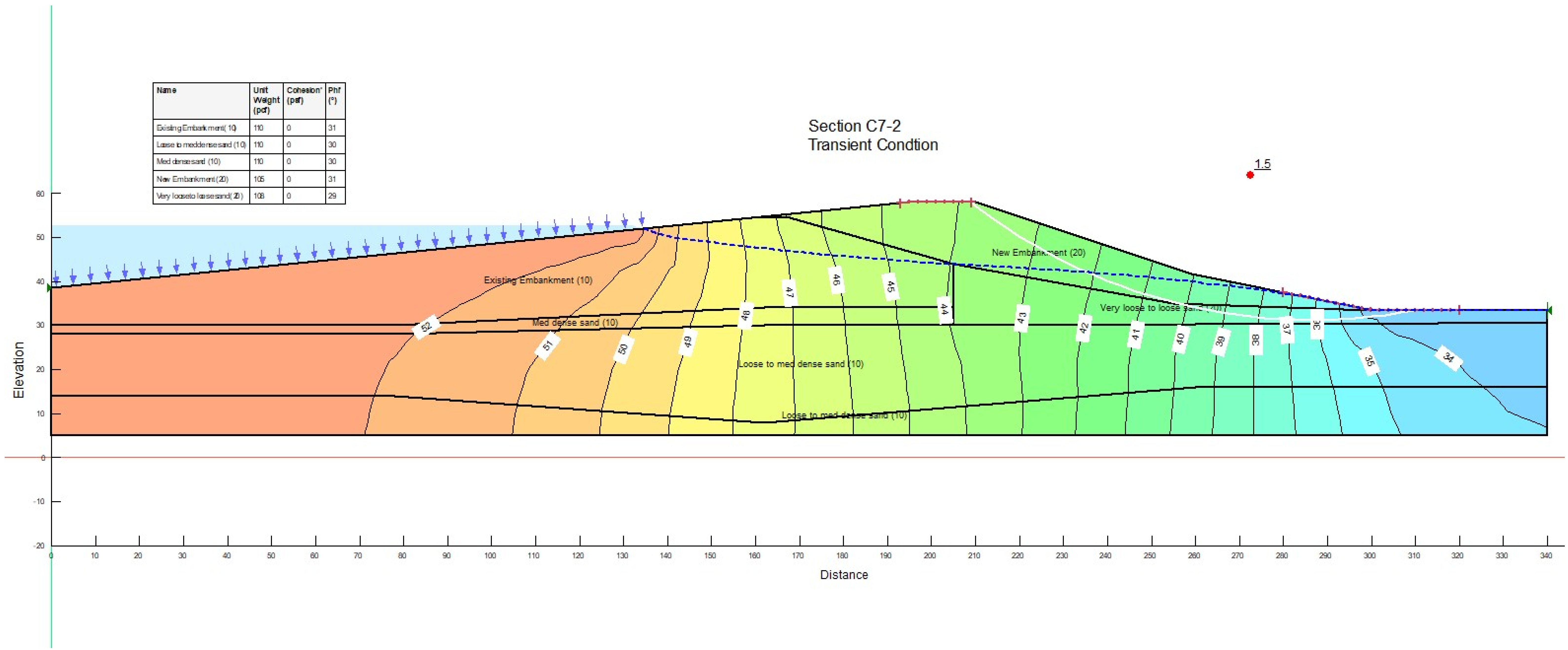
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Existing Embankment (25)	105	0	30
Loose to med dense sand (4)	105	0	29
Med dense sand (12.3)	110	0	30
Med dense to very dense sand (12.5)	120	0	33
New Embankment	105	0	31



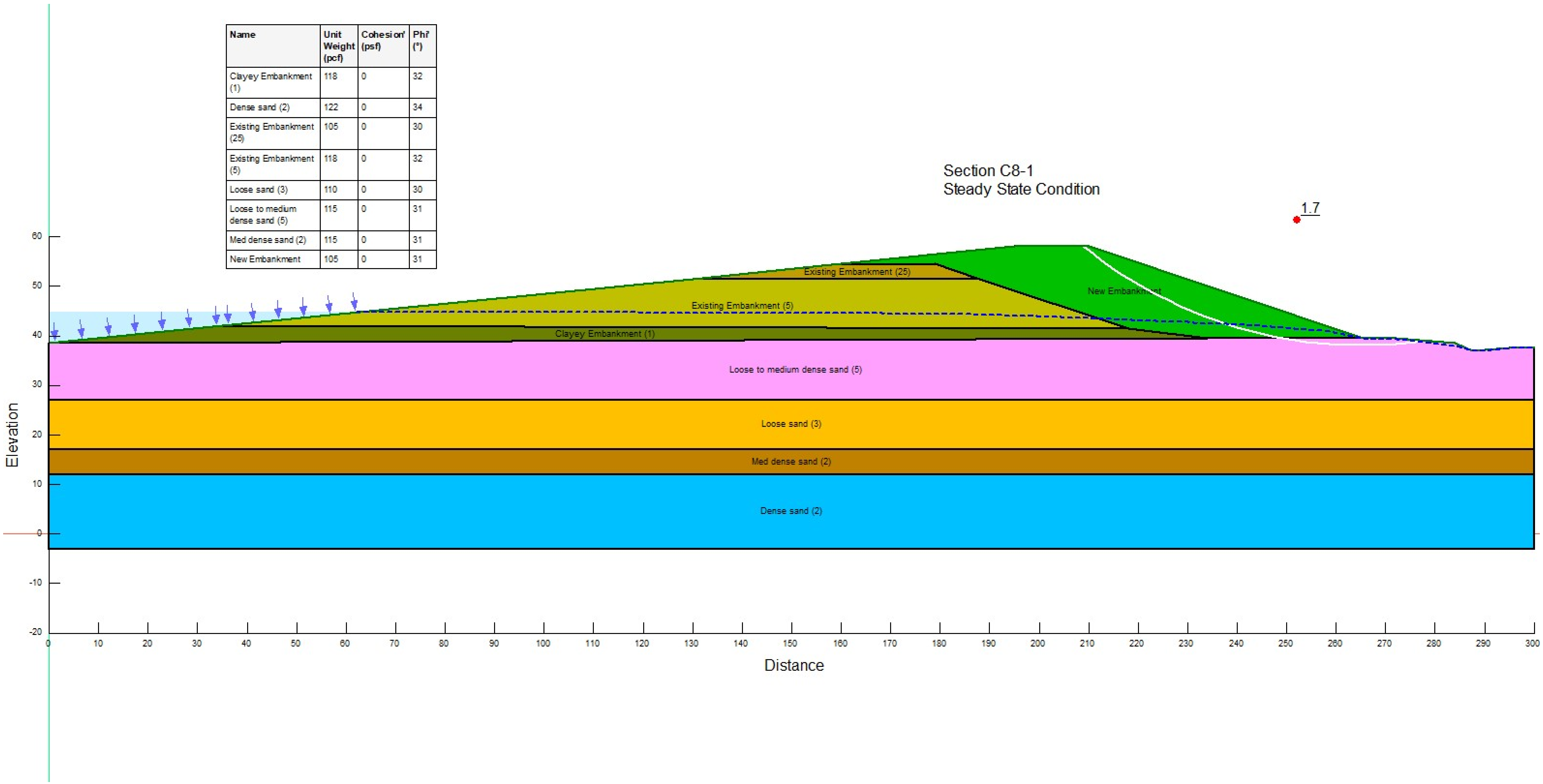
Section C7-1
Transient Condition
Name | Unit Weight (pcf) | Cohesion' (psf) | Phi' (°)
Existing Embankment (25) | 105 | 0 | 30
Loose to med dense sand (4) | 105 | 0 | 29
Med dense sand (12.3) | 110 | 0 | 30
Med dense to very dense sand (12.5) | 120 | 0 | 33
New Embankment | 105 | 0 | 31
1.5
New Embankment
Existing Embankment (25)
Med dense sand (12.3)
Loose to med dense sand (4)
Med dense to very dense sand (12.5)
52
51
50
49
48
47
46
45
44
Elevation
Distance
0
10
20
30
40
50
60
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230



Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Existing Embankment (10)	110	0	31
Loose to med dense sand (10)	110	0	30
Med dense sand (10)	110	0	30
New Embankment (20)	105	0	31
Very loose to loose sand (20)	108	0	29

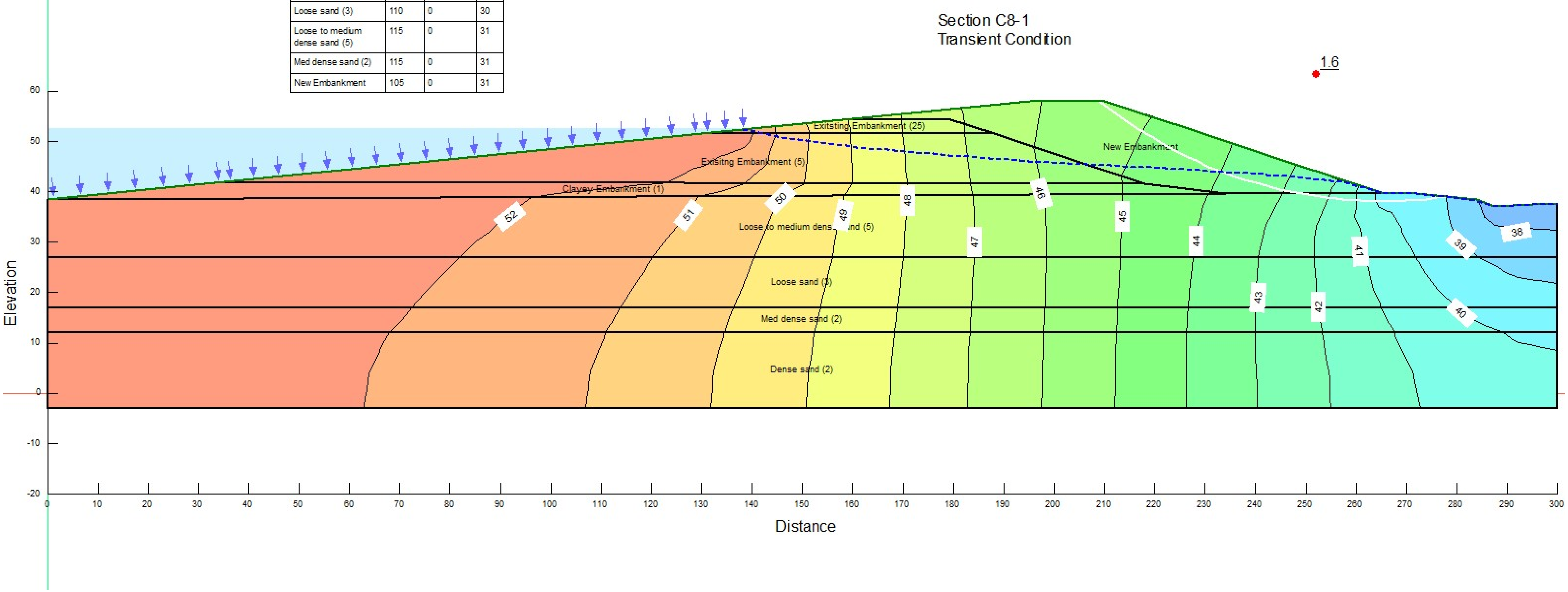


Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Existing Embankment (10)	110	0	31
Loose to med dense sand (10)	110	0	30
Med dense sand (10)	110	0	30
New Embankment (20)	105	0	31
Very loose to loose sand (20)	108	0	29

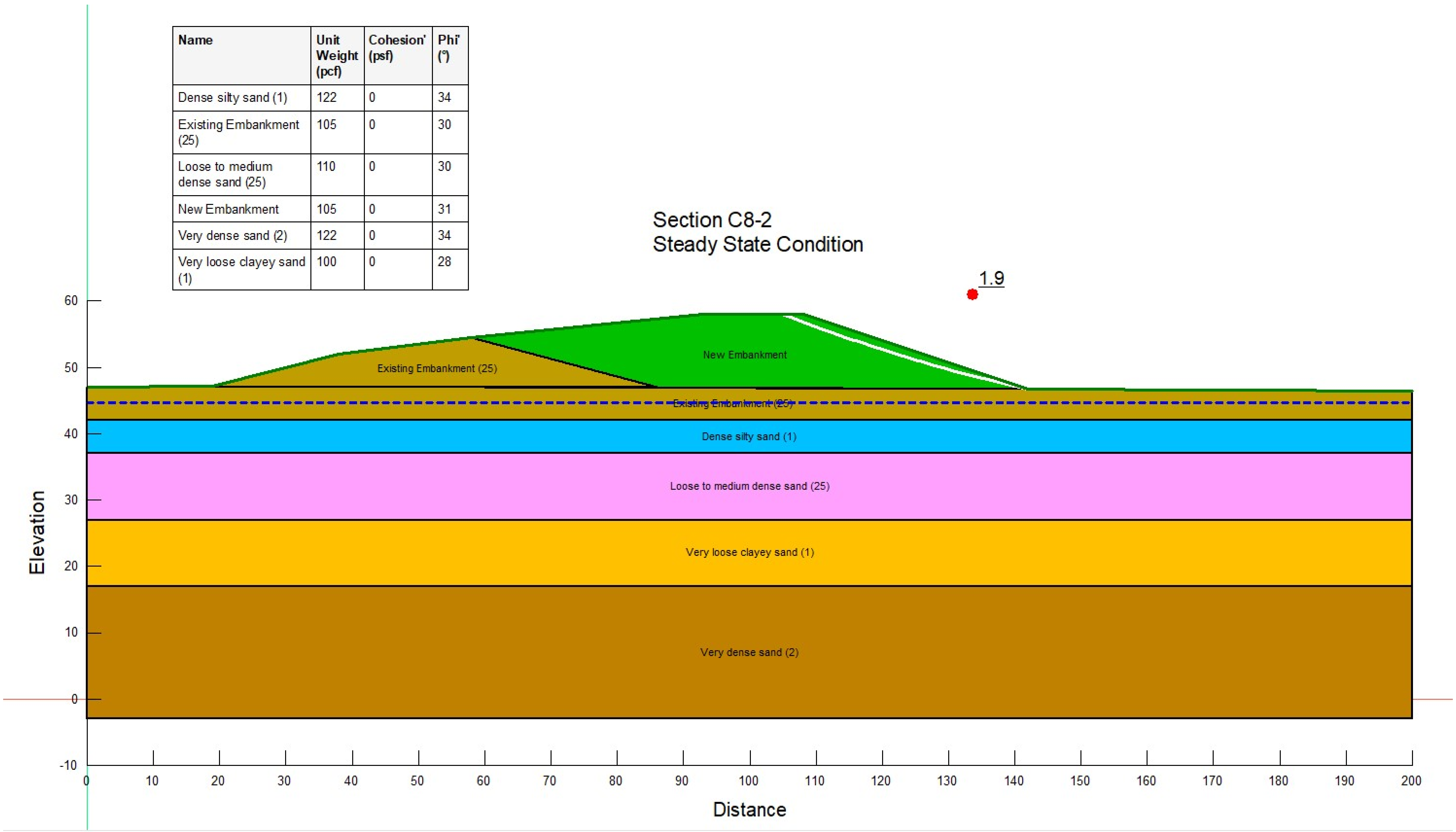


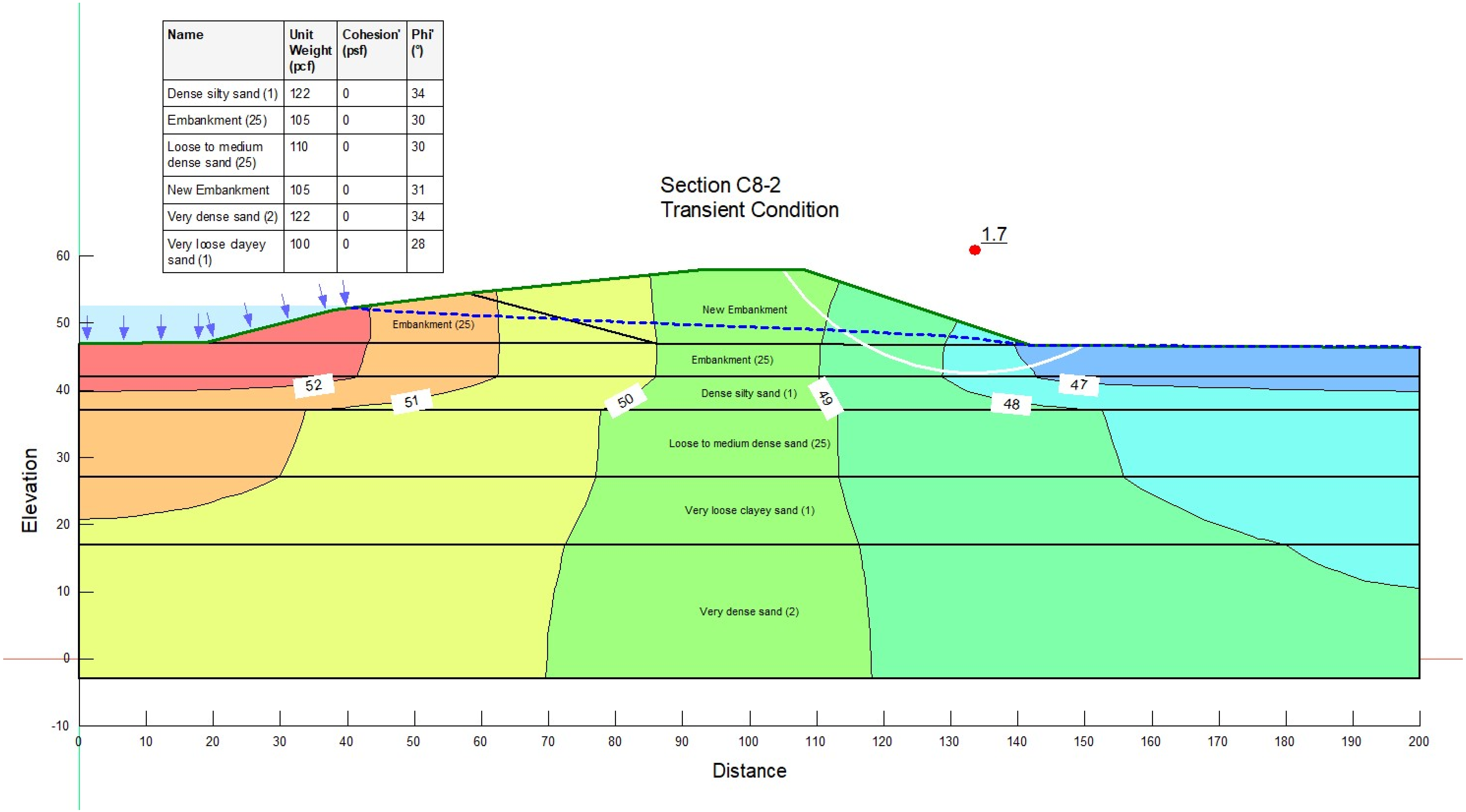
Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clayey Embankment (1)	118	0	32
Dense sand (2)	122	0	34
Existing Embankment (25)	105	0	30
Existing Embankment (5)	118	0	32
Loose sand (3)	110	0	30
Loose to medium dense sand (5)	115	0	31
Med dense sand (2)	115	0	31
New Embankment	105	0	31

Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Clayey Embankment (1)	118	0	32
Dense sand (2)	122	0	34
Exisitng Embankment (5)	118	0	32
Exitsting Embankment (25)	105	0	30
Loose sand (3)	110	0	30
Loose to medium dense sand (5)	115	0	31
Med dense sand (2)	115	0	31
New Embankment	105	0	31



Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Dense silty sand (1)	122	0	34
Existing Embankment (25)	105	0	30
Loose to medium dense sand (25)	110	0	30
New Embankment	105	0	31
Very dense sand (2)	122	0	34
Very loose clayey sand (1)	100	0	28





Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
Dense silty sand (1)	122	0	34
Embankment (25)	105	0	30
Loose to medium dense sand (25)	110	0	30
New Embankment	105	0	31
Very dense sand (2)	122	0	34
Very loose clayey sand (1)	100	0	28