Kinnickinnic River Dredging Feasibility Study

Slope and Wall Stability Analysis Report

Prepared for
US Army Corps of Engineers
Detroit District
Detroit, MI

Revision 1
January 2008

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1.0 Introduction

The Kinnickinnic River flows primarily east through the southeast corner of Wisconsin, discharging into Lake Michigan after convergence with the Milwaukee River in Milwaukee, Wisconsin. The project area is the north and south shores of the Kinnickinnic River beginning at the State Highway 32 Bridge, Kinnickinnic Ave. and extending approximately 1,800 ft. upstream to the Becher Street Bridge (Figure 1).

The Wisconsin Department of Natural Resources (WDNR) has proposed to remove sediments within this portion of the Kinnickinnic River and there is a concern for the stability of the seawalls and unprotected areas within this portion (Figure 1). Because the stability of the riverbank within the study area may be affected by the sediment removal, the Great Lakes National Project Office (GLNPO) and WNDR has requested that the US Army Corps of Engineers (USACE) perform a geotechnical investigation and evaluate the existing condition of the seawalls and the unprotected riverbanks along this stretch of the river. Barr Engineering (Barr) was contracted by the USACE under delivery order W911XK-04-D0005-0002, Amendment 01 dated August 4, 2006, to perform the stability analysis summarized in this report. This work was performed in general accordance with the Stability Analysis Plan (Barr, 2006) approved by the USACE.

The objectives of the stability analysis were:

1. To assist in the evaluation of suitable shoreline protection alternatives for the Kinnickinnic River Dredging project.
2. To evaluate the stability of the seawalls and unprotected slopes under the assumed dredging specification as proposed.
3. To provide a recommendation of the stable cut depth for each property parcel as identified in Figure 2.

The stability analysis was performed on the walls and unprotected shoreline. For the bridge abutments, proposed dredging limits were compared against original abutment design elevations. The analysis is summarized in Table 1. The geotechnical properties are summarized in Section 2 and were derived from the geotechnical investigation and lab testing performed previously (Coleman, 2006). The stability analysis evaluated existing and proposed post dredging conditions for each area to help determine the acceptable limits of dredging for the final design plan. The proposed dredging channel was selected by WDNR to be 20.5 to 24.5 feet below Lake Michigan Chart Datum (LMCD) (IGLD 85) for an 80-foot wide channel with side slope transitioning to 11 feet below LMCD (IGLD 85) adjacent to the riverbank as shown in Figures 2 through 19 and further described in the Concept Design Documentation Report (Barr, 2004). For cases where the proposed channel did not provide an acceptable factor of safety, a modified channel for that cross-section was developed to represent stable conditions. Table 1 identifies the cross-sections that will maintain an acceptable factor of safety under the proposed dredging conditions. Figures 3 – 19 show the modified dredging cross-section that provides an acceptable factor of safety for sections that did not maintain an acceptable factor of safety under the proposed channel. The modified cross-sections show stable conditions at each specific section, it does not consider the whole length of the channel. Based on the stability analysis described in this report, the proposed dredging channel selected by the WDNR will not provide an acceptable factor of safety for the existing walls, unprotected shoreline and bridge abutments. Further evaluation by and discussion with stakeholders is needed to determine a dredging channel that meets the needs for this section of the Kinnickinnic River.

Table 1: Proposed Channel Stability Analysis Summary

Section	Figure	Parcel	Wall Type	Does Proposed Channel Have an Acceptable Factor of Safety?
1	3	432	Steel Sheet Pile	NO
2	4	429	Steel Sheet Pile	NO
3	5	433	Steel Sheet Pile	NO
4	6	428	Unprotected/ Timber Wall?*	NO
5	7	427	Unprotected/ Timber Wall?*	NO
6	8	433	Steel Sheet Pile	NO
7	9	426B	Timber Wall	NO
8	10	436	Unprotected	NO
9	11	426A	Timber Wall	NO
10	12	437	Concrete Wall	NO
11	13	426	Bridge Abutment	NO
12	14	425	Timber Wall	NO
13	15	439	Unprotected	NO
14	16	440	Steel Sheet Pile	NO
15	17	441	Unprotected	NO
16	18	441	Timber Pile Fence	YES**
17	19	423/443	Bridge Abutment	NO

* Analyzed as unprotected shoreline, actual construction is uncertain and has not been verified – See Section 3.6 for details.

** Applied lateral load ranges from 0.35 to 3.25 kips – See Section 3.4 for details.

2.0 Geotechnical Parameters

The geotechnical parameters for the soils along the Kinnickinnic River were estimated based on field and laboratory testing data (Coleman, 2002 and Coleman, 2006). Data from other geotechnical investigations were reviewed, but not used in the stability analyses for this report since geotechnical data specific to the areas analyzed was collected (Coleman, 2002 and Coleman, 2006). The failure modes, generalized stratigraphic units, and geotechnical parameters for each soil type are detailed in this section.

2.1 Failure Modes

The shear strength of soils is dependent on the manner in which the soils are sheared. When a low-permeability soil is sheared very quickly, shear-induced porewater pressures tend to develop as the soil skeleton changes its configuration from a loose structure to a dense structure or vice-versa. These shear-induced porewater pressures can be positive or negative depending on the tendency of the soil to contract or dilate upon shearing. This is called the “undrained” condition because the rate of shearing is rapid relative to the permeability of the soil and the porewater pressures have no time to drain away. Thus, this failure mode corresponds to the short-term or “end-of-construction” stability of a slope or wall.

On the other hand, if a low-permeability soil is sheared very slowly, or if a high-permeability soil is sheared either slowly or quickly, no shear-induced porewater pressures are allowed to develop as the soil skeleton contracts or dilates. This is called the “drained” condition because no excess, shear-induced porewater pressures develop. Applied to the long-term stability of a slope or wall, this failure mode is typically always applied to high-permeability, or “granular” soils.

Both of the failure modes mentioned above were analyzed as part of the dredging feasibility study. Hereafter, they are termed End-of-Construction (Undrained) and Long-Term (Drained). It was especially important to consider the End-of-Construction case in addition to the Long-Term case because it is anticipated that the dredging will take place rapidly relative to the low permeability of the silt and till layers. These layers are described in greater detail below.

2.2 Stratigraphy

Based on the geotechnical investigation and subsequent laboratory testing, the materials at the site were divided into seven stratigraphic units. Descriptions of the individual units are summarized as follows:

2.2.1 Fill

Sand, silty sand, and silt with sand; various colors; moist to wet; concrete and asphalt chunks in some boring locations, topsoil in one boring location, trace roots; considered a “granular” material in stability analysis.

2.2.2 Silt

Clayey silt, slightly plastic, trace sand, trace gravel; brown to dark brown and greenish brown; moist to wet; very soft; trace wood and trace organics at some boring locations; USCS classification was ML in the field and MH in the laboratory based on Atterberg limits and grain size analysis; considered a “cohesive” material in stability analysis.

2.2.3 Organic Silt

Organic silt, slightly to highly plastic, trace sand, trace gravel; greenish brown, gray, and black; wet; very soft; trace to with wood, trace to with shells, trace roots at some boring locations; USCS classification was OL and OH in the field and ML, MH, and CH in the laboratory based on Atterberg limits and grain size analysis; considered a “cohesive” material in stability analysis.

2.2.4 Peat

Peat, fibrous, non to slightly plastic, trace sand; medium brown to greenish brown; wet; very soft; trace to with wood, trace to with shells, trace to with roots; USCS classification was PT in the field; considered a “cohesive” material in stability analysis.

2.2.5 Sand

Sand, with silt, fine- to coarse-grained, poorly graded, trace gravel; light brown to grayish brown; wet; very loose to loose; USCS classification was SP-SM and SM in the field and SP-SM in the laboratory based on grain size analysis; considered a “granular” material in stability analysis.

2.2.6 Till

Clay, none to with silt, slightly plastic, trace sand, trace gravel; light brown to brown; moist to wet; stiff to very stiff (soft at boring location S-3); USCS classification was CL in the field and CL in the laboratory based on Atterberg limits; considered a “cohesive” material in stability analysis.

2.2.7 Bedrock

Limestone; indicated by auger refusal, identified by residue on split spoon; considered an infinitely strong layer in stability analysis.

Figures 3 through 19 in the appendix show the stratigraphy used in modeling at each cross-section.

2.3 Parameters

The information collected during the geotechnical field investigation and subsequent laboratory testing was interpreted to estimate the unit weights and strength parameters of the various stratigraphic units. Table 2 summarizes the unit weight and shear strength parameters used in the stability analysis. Table 2 includes shear strength parameters corresponding to both the undrained and drained failure modes.

Table 2 Strength Parameters Used in Stability Analyses

Material	Saturated Unit Weight	Moist Unit Weight	Shear Strength				
			Undrained			Drained	
			USSR	Mohr-Coulumb		Mohr-Coulumb	
	γ_{sat} [pcf]	γ_{moist} [pcf]	s_u/σ'_{vo}	ϕ_{cu} [deg.]	c [psf]	ϕ' [deg.]	c' [psf]
Fill	130	122	--	30	0	30	0
Silt	112	102	0.23[1]	0[1]	250[1]	30	0
Organic Silt	103	93	0.23[1]	0[1]	250[1]	30	0
Peat	80	50	0.50	--	--	30	0
Sand	128	117	--	28	0	28	0
Till	135	129	--	0	750[2]	33	0
Bedrock	--	--	--	--	--	--	--

Notes:
1- See Section 2.3.2.3 below.
2- See Section 2.3.2.6 below.

It should be noted that the geotechnical properties of the river sediment, which has been deposited since the last time the river was dredged, were assumed to be similar to those of the organic silt layer.

This assumption is based on data from previous river sediment borings in this section of the river (Coleman, 2002). Laboratory data show that while some coarser grained material was encountered in the borings, most of the samples were very similar in grain size, moisture content, and Atterberg limits to the organic silt tested in the 2006 investigation. No blow counts were available from the previous investigation (Coleman, 2002), but it is assumed that the hydraulically deposited material is very soft as is the organic silt found in the 2006 borings from land.

The unit weights and shear strength parameters shown in Table 2 are detailed in the following sections.

2.3.1 Unit Weight

Dry unit weight laboratory tests were performed on samples from the silty clay, organic clay and clay till layers and specific gravity tests were performed on the sands, silty clay, and clay till. These units were selected for more extensive testing related to unit weight because of their impact on stability of the dock. In addition, a number of natural water content tests were performed on the fine-grained soil units. The results from these tests were used to compute saturated unit weights for the silt clay, organic clay, and clay till layers.

The saturated unit weight for the peat layer was computed based on its natural moisture content (saturated) and an assumed specific gravity of 2.50. Saturated unit weights for the fill, silt, and sand were assumed based on typical values.

Moist unit weights were then computed based on assumed water contents that are expected to be found in the soils above the water table.

2.3.2 Strength Parameters

The strength parameters assigned to the soil units are described in detail below.

2.3.2.1 Fill

Blow counts and general material descriptions were used to estimate the Mohr-Coulomb strength envelope for this material. The blow counts were in the range of 2 to 60 blows/ft. with an average of 16 blows/ft. Though the blow counts for this material were generally quite high, the friction angle ϕ' was conservatively estimated to be 30º. Because this unit is generally granular, the same friction angle ϕ' was selected for both the drained and undrained failure envelopes.

2.3.2.2 Silt

Very few hand penetrometer tests were performed on this soil in the field because the samples were not holding their shape well upon retrieval from the split spoon. Furthermore, no laboratory strength testing was performed on this material, but the average blow counts were 5.5 blows/ft, with a range of 0 to 32 blows/ft. It was concluded that the silt should have the same strength parameters as the organic silt primarily because the blow counts were very similar, although they were slightly higher than those for the organic silt. See the following section for a description of the silt strength parameters.

2.3.2.3 Organic Silt

Because of the significant impact of the organic silt on slope and wall stability at the site, two 3-inch-diameter thin-wall samples of the organic silt were collected in borings S-4 (26.0-28.3 ft.) and S-5 (14.0-16.3 ft.). Each of the samples were subjected to a consolidated-undrained (CU) triaxial compression test with porewater pressure measurements. This was done so that both the drained and undrained failure envelopes could be estimated. The three confining pressures used in each test were 0.5, 1.0, and 2.0 tsf, which correspond to the range of in-situ stresses at the site.

As shown in the Coleman Engineering Company report (Coleman, 2006), the undrained failure envelopes for the two tests based on the maximum deviator stress failure criterion were ϕ_{cu}=21.3º, c=0.49 tsf and ϕ_{cu}=26.6º, c=0.46 tsf. These results were for the samples from borings S-4 and S-5, respectively. Given that the blow counts were very low (less than 1 blow/ft.) in the vicinity of the thin-wall samples and that the blow counts for the entire unit were low (average N=4.4, ranges from 0-20), it was determined that the undrained shear strength for the organic silt as estimated from the triaxial tests was too high. It was then concluded that the samples must have been disturbed to some degree before they were tested. This is due to the following reasons: (1) most of the specimens dilated upon shearing, which is very uncharacteristic for a very soft deposit that is assumed to be close to normally consolidated, and (2) the volumetric strains that occurred as the sample was consolidated to its in-situ state of stress was on the order of 15%. This indicates a disturbed specimen.

Because the undrained failure envelope from the triaxial tests appeared to provide erroneous results, the blow counts, hand penetrometer values, unconfined compression tests, and research in the literature were used to estimate undrained shear strength. With average blow counts of 4.4 blows/ft., and many blow counts “weight of hammer”, the relative consistency was considered to be on the boundary between "very soft" and "soft". This corresponds to an unconfined compressive strength q_u of 0.25 tsf, which gives an undrained shear strength s_u of 250 psf. The few hand penetrometer values in the organic silt and the three unconfined compression tests support this undrained shear strength. This undrained shear strength value was then normalized in the form of an undrained shear strength ratio s_u/σ'_{vo}, where σ'_{vo} is the in-situ effective vertical stress. Terzaghi et al. (1996) includes tests performed on clays by various researchers, which show that for a plasticity index (PI) of about 15% (lowest measured PI), the s_u/σ'_{vo} values would be as follows:

s_u/σ'_{vo}, = 0.32 for the triaxial compression mode

s_u/σ'_{vo}, = 0.23 for the direct simple shear (DSS) mode

s_u/σ'_{vo}, = 0.15 for the triaxial extension mode

Because all three failure modes would be important in the stability analysis of the unprotected riverbank and the triaxial compression and extension modes would be important in the wall sections, these values were averaged. Thus, the undrained shear strength ratio used in the analysis was 0.23.

The software programs used for the analysis accepted undrained shear strength values in different ways. The inputs into the software programs are summarized as follows:

GeoStudio (SLOPE/W): s_u/σ'_{vo}, = 0.23 with a minimum s_u = 250 psf

Allpile: s_u = 250 psf

CWALSHT: s_u/σ'_{vo}, = 0.23 with a minimum s_u = 0 psf

Shoringsuite: s_u/σ'_{vo}, = 0.23 with a minimum s_u = 0 psf

It was concluded that even though the thin-wall samples were considered disturbed, the drained failure envelope would be acceptable for use in the analysis. This is because much of the initial soil fabric still existed in the samples when they were tested and the results from the triaxial device would likely provide a more accurate strength envelope than a direct shear test. The drained failure envelopes for the two tests based on the maximum deviator stress failure criterion were ϕ'=29.7º, c'=0.21 tsf and ϕ'=32.9º, c'=0.24 tsf. These results were for the samples from borings S-4 and S-5, respectively. A friction angle ϕ' of 30º was used in the analysis with the apparent cohesion c'

conservatively neglected. This value was corroborated by drained tests performed on clays in the literature (Terzaghi, et al., pg. 152). Using this method, a soil with a PI of around 30% should exhibit a peak friction angle ϕ' of about 30º, especially with a low clay-size fraction (CF) on the order of 10%. The organic silt unit at the site has these characteristics.

2.3.2.4 Peat

The blow counts for the peat were very low (between 0 and 1 blow/ft.) and no hand penetrometer values were reported. Data in the literature suggest that a reasonable undrained shear strength ratio s_u/σ'_{vo} is on the order of 0.60 (Ajlouni, 2000). To be conservative, an s_u/σ'_{vo} ratio of 0.5 was selected as the strength value to be used in the analysis. Furthermore, a typical drained envelope is ϕ'=30º, c'=0. Even though the blow counts were low, fibrous peat typically exhibits relatively high shear strength.

2.3.2.5 Sand

Blow counts were also very low in the sand unit. They averaged 4.8 blows/ft. and ranged from 2 to 10 blows/ft. This indicates that the sand is very loose. Consequently, a drained failure envelope of ϕ'=28º, c'=0 was selected. It is likely that the actual drained failure envelope is higher than this value and probably higher than that for the organic silt and silt units, but this value was conservatively chosen because the only available data were blow counts.

The undrained failure envelope was also ϕ'=28º, c'=0 because the sand is a granular soil unit.

2.3.2.6 Till

Due to the prevalence of the till unit and its possible impact on stability, a thin-wall sample was recovered at boring S-1 from 27.0 to 29.3 feet. It was also tested using the consolidated-undrained (CU) triaxial compression method with porewater pressure measurements. Its confining pressures were 0.5, 1.0, and 2.0 tsf, which are in the range of in-situ stresses.

In contrast to the thin-wall samples of the organic silt, these specimens were considered much higher quality, with volumetric strains only in the 1 to 2% range. However, the undrained failure envelope was still higher than the indicated hand penetrometer and unconfined compression values. The blow counts averaged 12.5 blow/ft., ranging from 7 to 35 blows/ft. These values correspond to “stiff” to “very stiff”. Typical hand penetrometer values, however, ranged from 0.5 to 1.5 tsf, which correspond to undrained shear strength values of 500 to 1,500 psf. Given that the two unconfined compression test values were 0.31 and 0.76 tsf, an undrained shear strength s_u of 750 psf was selected for use in the analysis. However, the unconfined compression test value of 0.31 tsf was encountered in boring S-3. Thus, the undrained shear strength value used in the analysis only at the cross-sections near this boring was 310 psf.

The drained failure envelope used in the analysis was based on the results from the triaxial test. The envelope from the test was ϕ'=24.9º, c'=1.01 tsf based on the maximum deviator stress failure criterion. Because the apparent cohesion of a soil should be zero for a long-term (drained) analysis, the friction angle was adjusted such that the failure envelope goes through the origin and is tangent to the Mohr circles. The resulting envelope used for the long-term condition was ϕ'=33.0º, c'=0.

2.3.2.7 Bedrock

It was assumed in the analysis that the bedrock would play no role in the stability of the slopes and walls. Thus, an infinite strength was assigned to the limestone bedrock.

3.0 Stability Analysis

Stability analyses were performed on the walls and unprotected shoreline for 17 representative cross-sections (Figure 2). For the bridge abutments, the proposed channel limits were compared against original abutment design river bottom elevations. The geotechnical properties are summarized in Section 2 and were derived from the geotechnical investigation and lab testing performed previously (Coleman, 2006). The stability analysis evaluated existing and proposed post dredging conditions for each area to help determine acceptable limits of dredging for the final design plan. When evaluation of the proposed channel section indicated an unacceptable factor of safety, a modified channel for that cross-section was developed to represent stable conditions.

3.1 Timber Walls

The timber walls were analyzed for global stability. Individual member stresses were not evaluated due to the poor condition of the visible portions of the timber walls. The global stability analyses indicate that the walls will fail under the proposed channel limits. Modified channel geometries that provide for global stability under all load cases are provided in Figures 9, 11, and 14.

3.1.1 Methods

The timber wall sections were analyzed using the Shoringsuite computer analysis program. The soil properties input into the program were developed as described in Section 2.0 of this report. Shoringsuite is used to design and analyze several different types of earth retaining structures, including sheet pile walls and driven/drilled piles with lagging. The program calculates active and passive soil bearing pressures, moments, bracing forces, vertical bearing capacity, required embedment length and system factor of safety. Soil pressures are computed using the Shoringsuite Earth Pressure module and transferred to the program's Shoring module, where the wall properties are added and a global factor of safety is obtained.

Shoring Suite is a software package that contains 4 Modules: Shoring, EarthPres, Surcharge, and Heave. These modules are sophisticated design and analysis tools developed by experienced engineers and professors. The program has been widely used by engineers, contractors, universities, and government agencies nationwide and overseas. The program is flexible, powerful, and has high performance qualities. The calculation is based on Federal Highway Administration (FHWA) methods, US Navy DM-7 (NAVFAC) manual, the Steel Sheet Design manual (USS), and Trenching and Shoring Manual - California Department of Transportation. It can be used for complex ground conditions, surcharge loads, and many types of shoring walls including: braced cuts, cantilever walls, bulkhead walls, sheet pile walls, soldier piles & lagging systems, tangent pile walls, slurry walls, and any flexible walls. The program shows diagrams of pressures, shear, moment, and deflection. It calculates the moment of the piles and selects the five most suitable piles. The program not only presents the major properties of these piles but also calculates the top deflection of each pile. For braced systems, the program supports calculation for wale and strut. For tieback systems, the program can determine the free length, bound length, and non-load zone of tieback anchors. Additional information is available at www.civiltechsoftware.com.

Record drawings indicate that the timber walls involved in this analysis consist of wakefield timber sheet pile sections 28 feet in depth, or 16 to 18 feet below the existing mudline. The wakefield walls are braced by 50-foot long, 12-inch diameter timber piles spaced at 6 foot intervals along the length of the wall. These piles extend to a depth of 32 to 35 feet below the existing mudline. In addition, these exterior piles and the wall are anchored by secondary and tertiary reinforcing piles located on the non-channel side of the wall.   Record drawings for the timber walls are provided in Appendix A.

The wall system was analyzed as a timber soldier pile system with the wakefield sheet piles considered as lagging between the soldier piles. This method was selected because the exterior soldier piles extend to a greater depth than the timber sheeting and are the controlling factor for global stability of the system. Therefore, modeling the wall as a sheet pile wall would not be accurate.

The base iteration in the timber wall sections was modeled for the proposed channel geometry selected by the WDNR and soil configurations determined from borings conducted in the vicinity of the walls. The goal of the initial iteration was to determine if the proposed section could achieve a factor of safety of 1.3 at low water in an undrained (end-of-construction) state, as this condition is most likely to result in failure. If this initial iteration failed to achieve the minimum factor of safety, the geometry of the channel was modified to determine a channel configuration that met the minimum stability requirements.   The final modified configuration was analyzed in both undrained and drained states, for both low water and flood conditions. Deep-seated failure analysis of soils beneath the timber walls was not performed since the condition of the walls was poor and the walls will likely require additional reinforcement/replacement prior to dredging.

3.1.2 Assumptions

The following assumptions were made for analysis of the timber walls:

1. The timber piles are moderately to severely deteriorated and the structural capacity of the piles would be reduced as a result. To account for the poor quality of the piles, the diameter of the timber piles was reduced from 12-inches to 6-inches for all analyses. This was chosen as a conservative baseline and the section found to be globally stable for revised dredging limits; thus, using some other increment such as 9-inch diameter piles is not warranted as global stability results will not change from the range analyzed here.

2. The existing secondary and tertiary reinforcing piles were modeled as a "deadman" anchor, with an anchored depth of 2 feet, 6-foot spacing and an angle of 0º.

3. A 15º wall friction angle was assumed on both sides of the wall.

The 2'x3' concrete cap bearing on the wall at Section 12 was modeled as a 5.4 k downward force on each pile (assuming 150 pcf concrete weight and a 6 foot long section of cap bearing on each pile).

The dock at section 7 and the concrete slab at section 9 were modeled as 100' wide strip loads adjacent to the timber walls with a weight of 75 psf. These loads were applied to the controlling scenario (Minimum Passing Geometry Undrained).

3.1.3 Results

The analysis results indicate that the proposed channel sections will not be adequate to provide short-term stability immediately after the dredging process. In no case was the proposed channel geometry able to provide a 1.3 factor of safety in an undrained (end-of-construction) state. The most significant factor affecting the stability of the walls was the depth of the mudline directly adjacent to the wall. During analysis, the desired channel depth at the wall and center of channel was taken into account, and a channel geometry was developed to maximize the usable channel area while providing a factor of safety that meets the minimum requirements. The modified channel geometries that would provide an acceptable factor of safety are provided in Figures 9, 11, and 14. The results of these analyses are included in Appendix B, along with analysis of the existing and proposed conditions in drained and undrained states, a sample of the soil properties input used in the Earth Pressure module and results of the surcharge calculations for sections 7 and 9. A summary of the global factors of safety obtained in the analyses is included in Table 3.

Table 3: Summary of Timber Wall Stability Analyses – Factors of Safety

Section	Geometry	Normal Water		Flood Water	
		Undrained[1]	Drained[2]	Undrained[1]	Drained[2]
7	Existing	**1.77**	**2.83**	--	--
7	Proposed	**0.88**	**1.69**	--	--
7	Modified	**1.30**	**2.46**	**1.43**	**2.63**
9	Existing	**1.86**	**3.08**	--	--
9	Proposed	**0.96**	**1.89**	--	--
9	Modified	**1.30**	**2.64**	**1.51**	**2.80**
12	Existing	**3.04**	**3.45**	--	--
12	Proposed	**1.14**	**2.10**	--	--
12	Modified	**1.30**	**2.44**	**1.43**	**2.65**

Note:

1 – Required Factor of Safety = 1.3

2 – Required Factor of Safety = 1.5

It should be noted that the Shoringsuite analysis program computes global stability of the piles and walls under varying conditions. The model considers the piles and walls as of uniform quality and does not take into account localized areas of deteriorating wood elements. The results included with this report are based on these uniform global factors. Although analysis of individual members was outlined in the Structural Analysis Plan (Barr, 2006), member stresses were not evaluated due to the poor condition of visible areas of the timber walls. Upon further assessment, it was determined that evaluating the stresses in rotted members is not practical. It is possible that a local failure of one or more structural elements or connections due to decay could occur.

Additional analyses of the timber walls are not warranted as the exposed portion of the timber walls is severely deteriorated. It appears that remedial measures during/prior to dredging to stabilize the timber wall sections are warranted.

3.2 Reinforced Concrete Wall

The reinforced concrete wall on Parcel 437 was evaluated for overturning and sliding stability based on the conservative assumption that the wall is a concrete gravity structure and not a cantilevered retaining wall or pile supported structure. There is no available information on this wall and the assumptions made will require verification prior to completing any dredging. A deep-seated failure analysis of soils beneath the wall may also be required dependant upon the wall construction and extent.

3.2.1 Methods

Basic statics methods were used in evaluating the global sliding and overturning stability of the concrete wall. The horizontal driving forces and overturning moments were calculated based on active soil pressures developed from the soil properties described in Section 2.0. The resisting moments were calculated using gravity loads and the horizontal resisting forces were calculated using passive soil pressure. Foundation friction coefficient was determined based on foundation material type interfaced with concrete.

3.2.2 Assumptions

The concrete wall was assumed to be a mass concrete gravity structure and not a cantilevered wall and foundation. The wall dimensions were assumed based on engineering judgment and experience with this type of structure. The concrete soil interface coefficient of friction was assumed to be 0.35 based on published values for concrete founded on clay/silt.

3.2.3 Results

The stability analysis indicates that the concrete wall is unstable for the proposed dredging limits. In order to maintain at least a factor of safety of 1.50 for sliding, a 10-foot wide bench at an elevation 10-feet down from the top of the wall is required. The river bottom could be excavated from the bench sloped down to the proposed channel depth. Figure 12 shows the modified dredge limits and Appendix C for detailed analysis.

3.3 Steel Sheet Pile Walls

The steel sheet pile (SSP) walls were analyzed for global stability and individual member stresses were compared to allowable stresses. The individual members evaluated included the SSP, wales, and anchor rods. The global stability analyses indicate that the walls will fail under the proposed channel limits. A section geometry was developed that results in adequate global stability under all load cases and is presented in Figures 3, 4, 5, 8, and 16. The section geometries were developed by using CWALSHT in "design" mode and adjusting the 10-foot wide bench elevation until the design mode determined a required pile length of less than 30-feet. After a stable section geometry was determined in CWALSHT it was analyzed for deep-seated failure. The final modified section geometry was determined after evaluating the deep-seated failure of the soils beneath the wall in Section 1, Section 2, Section 3, and Section 6. These sections covered a range of conditions for all SSP wall sections from worst case (SSP embedded in silt and organic silt – Sections 2 and 6) to best case (SSP embedded in till – Sections 1 and 3). The final modified geometry for these sections is presented in Figures 3, 4, 5 and 8.

3.3.1 Methods

The steel sheet pile walls were analyzed using the USACE CWALSHT computer program to obtain values for global stability, wall moment and anchor loads. The current program version uses free earth and fixed earth methods. Equivalent beam methods are not computed by current version of CWALSHT. The soil properties input into the program were developed as described in Section 2.0 of this report. The base iteration in the steel wall sections was the proposed channel geometry selected by the WDNR. If this iteration failed to achieve a factor of safety of 1.5 in a drained state, the geometry of the channel was modified to determine a channel configuration that would provide a sheet pile length of less than 30-feet for undrained conditions. Iterations were completed in 0.5 foot bench elevation increments until computed design length was less than actual length in the undrained condition. Once the geometry was set with the undrained conditions, the sections were checked in design mode for drained conditions with a passive factor of safety equal to 2.0. If the results indicated a pile length less than 30-feet, then the section was considered stable for both drained and undrained conditions. During the analysis it was determined that the low normal pool undrained case was the controlling case versus the high normal pool case.

The deadmen anchors for Section 2 and Section 6 were evaluated to determine if their location is within the passive wedge of the system. For Section 2, there are two rows of deadmen and the front wall is outside the passive wedge and is therefore adequate. In addition, the load at these deadmen was calculated to be 5 kips per anchor which is minimal compared to two rows of 35-foot deep deadman piles. For Section 6, the deadman was found to be within the passive wedge of the system and therefore the capacity of the deadman was further evaluated. The analyses found the capacity of the deadman exceeded the applied anchor loads with an adequate factor of safety and is therefore adequate. Because the deadman at Section 3 is an A-frame pile section of depth equal to sheet pile depth, the passive wedge analysis is not warranted. The A-frame deadman was assumed adequate.

Individual member stresses were determined in accordance with allowable stress design methods of the American Institute of Steel Construction and generally in accordance with EM 1110-2-2504 - Design of Sheet Pile Walls. The calculated stresses were compared to the allowable stresses for each member analyzed.

Member connections were not analyzed as information is not available on the connections.

The deep-seated stability of the soil beneath the sheet pile walls in Section 1, Section 2, Section 3, and Section 6 were analyzed using limit equilibrium methods with the software package SLOPE/W. No strength parameters were assigned to the sheet pile wall itself because the critical potential failure surface was adjusted such that it was located beneath the bottom tip of the wall. This was done by increasing the minimum slip surface thickness until the critical potential failure surface was just underneath the wall. All structural components were assumed to rotate with the soil in the case of failure. The results of this analysis are provided in Appendix E.

3.3.2 Assumptions

The following assumptions were made during analysis of the SSP walls:

1. The steel sheet piles were modeled as MZ27 sections and MP116 section as indicated on record drawings. Plans for the steel walls at Sections 1, 2, 3 and 6 indicate that this section (or equivalent) was used during construction. The steel wall type for Section 14 is unknown and was also modeled as MZ27. MZ27 sections have a moment of inertia of 184. in^4 and MP116 has a moment of inertia of 39.75 in^4
2. Anchored sections were analyzed using both Free Earth and Fixed Earth methods. The Fixed Earth method provides more conservative values for factors of safety and was used to determine the modified channel section where member stresses controlled. The Free Earth method for factors of safety was used to determine modified channel section where global stability controlled.
3. The Level 1 active factor of safety equals the passive factor of safety and was set at 1.0 for the analysis mode. A passive factor of safety of 1.30 was used for the design mode cases for undrained conditions and 2.0 for drained conditions. EM 1110-2-2504, “Design of Sheet Pile Walls,” recommends a factor of safety of 1.50 for extreme conditions. The undrained condition is a post-construction extreme temporary condition. Several conservative assumptions were used in the analyses and extensive testing of soil materials was completed which gives confidence in the soil properties used in the analyses. Therefore, using a factor of safety of 1.30 is justifiable (using a factor of safety of 1.50 increases the undrained design length in Table 4 by only a few feet, thus still indicating SSP less than 30 feet long).

4. SSP yield strength was assumed to be 38.5 ksi.
5. Anchor rod and wale yield strength was assumed to be 36 ksi.
6. For the sections where CWALSHT could not resolve a factor of safety in analysis mode using 30-foot long piles, the lengths determined from the design mode cases were input into CWALSHT to develop moments and anchor forces. A range of moments and anchor forces were evaluated and a due to the uncertainty in results an additional factor of safety of 1.30 was placed on member stresses.
7. Individual members were assumed to be full dimension with no reduction for deterioration and member connections were assumed to provide original design connection strength.
8. $WL^2/9$ was used instead of $WL^2/10$ to account for some corrosion of the wales.
9. Wall adhesion was not included in analyses.
10. No surcharge was placed adjacent to the walls. Although some walls may have materials which cause surcharges adjacent to them, the exact nature of these loads is unknown. We recommend any materials within 30 feet of the walls be moved away during the dredging operations.

3.3.3 Results

The analysis determined that no wall section was stable under the proposed channel limits. The following table provides a summary of the SSP wall global stability analyses.

Table 4: Summary of CWALSHT Analyses for SSP Wall Global Stability

Parcel Number	Section No.	Wall Length (ft)		Drained Design Passive (FS)	Undrained Design Passive (FS)	Design Length Drained(ft)	Design Length Undrained (ft)
		Geophysical Study	Permit Drawings				
432	1	33	NA	2.0	1.3	29.68	27.41
429	2	30	34	2.0	1.3	21.45	13.81
433	3	30**	46	2.0	1.3	25.09	22.67
433	6	30	25	2.0	1.3	22.14	19.84
440	14	NA	NA	2.0	1.3	29.63	24.85

Notes:
1. Free earth analysis results presented.
2. Iterations completed in 0.5 foot bench elevation increments until computed design length was less than actual length in undrained condition.
3. Once geometry set with undrained conditions, the sections were checked for drained conditions with passive FS = 2.0.
4. Wall adhesion for cohesive layers not included as results were non-conservative and unrealistic.
5. For example of results with wall adhesion included see CWALSHT output file included in computations Appendix E labeled "Example section w/ adhesion included."
6. Design lengths less than geophysical study documented lengths means wall condition is globally stable.

The stress analysis found all member stresses to be below the allowable stresses. This indicates members have the required strength to resist the applied loads under the modified dredge conditions provided the design assumptions on no deterioration are correct.

The modified channel limits as determined using CWALSHT are shown in Figures 3, 4, 5, 8, and 16. It should be noted that Sections 2 and 6 were modified further from the geometry determined in the CWALSHT analysis since the results of the deep-seated failure of soil beneath the walls provided an unacceptable factor of safety.

3.4 Timber Pile Fence

This section summarizes the analysis, methods, assumptions, and results for the timber pile fence located adjacent to parcel 441. The river bottom and soil profile in the vicinity of the timber pile fence is provided in Figure 18.

The soil profile at the timber pile fence was assumed from soil borings included in the geotechnical report (Coleman, 2006). The soil profile generally shows organic silt at the river bottom, underlain by sand, and glacial till (clay) to the termination depth. The soil properties are summarized in Table 2. The pile cross section supporting the timber pile fence was developed based on construction documents from the Chicago, Milwaukee, St. Paul & Pacific Railroad, entitled *Pier Protection Renewal, A-314 196'-3 ¾" Counterbalanced Swing Span over Kinnickinnic River in Milw., Wisc., Drawing H-981, May 17, 1962*, included as Appendix F. The pile cross section indicates that there are three piles per group and each pile group is spaced at 5 feet. The timber pile diameter is 14-inches. Each group of piles consists of one vertical 70 foot pile and two battered 65 foot piles. Of the shorter piles, one is battered at roughly 6 degrees and the other is battered at 12 degrees. Please refer to Figure 18 for the assumed soil and pile cross section.

3.4.1 Methods

To determine the correct mode of analysis for the laterally loaded timber piles, the piles must be calculated as "short" or "long" (Terzaghi, et al., 1996). The lateral capacity of a "short" pile is quantified by the passive resistance of the surrounding soils. The lateral capacity of a "long" pile is governed based upon the bending and shear developed in the pile during loading. The relative stiffness factor of the pile must be computed to correctly classify the pile. The relative stiffness factor is defined as follows

$$R = \sqrt[4]{EI/k_h} \qquad \text{(Terzaghi, et al., page 444)}$$

where:

R = relative stiffness factor

E = elastic modulus = 1600 ksi

I = moment of inertia = 1867 in^4 (pile diameter = 14 in)

k_h = modulus of subgrade reaction = 1.16 x 10^{-1} ksi/in (cohesive soil with s_u 250 psf)
(Terzaghi, et al., page 444)

The modulus of subgrade reaction was estimated assuming a cohesive soil and using the strength parameters of the organic silt layer (most conservative). The calculated relative stiffness was determined to be 5.93 feet. The ratio of the pile embedment length to the relative stiffness was then used to classify the piles. For a ratio of 2 or less, the pile is considered "short", while a ratio of 3.5 or more corresponds to a "long" pile (Terzaghi, et al., 1996). The minimum length occurs in the battered piles after the proposed dredging and is computed to approximately 43 feet. The corresponding ratio is then 7.25, classifying the piles as "long."

Based on the above-mentioned classification, the maximum allowable shear and bending moment need to be computed. The ultimate bending moment capacity is defined as follows

$$M_{ult} = \lambda \phi_b F_b ' S$$ (LRFD, page 42)

where:

λ = time effect factor = 1.25 (LRFD, page 129)

ϕ_b = resistance factor = 0.85 (LRFD, page 3)

F_b' = F_b = reference bending strength =1.6 ksi (Derucher, et al., page 190)

S = section modulus = 269 in^3 (pile diameter = 14 in) or 34 in^3 (pile diameter = 7 in)

The reference bending strength is unfactored (F_b' = F_b), meaning that it is assumed the timbers are in good condition and that no strength reduction factor is needed. The calculated ultimate bending capacity is 38.2 foot-kips (14-inch pile) and 4.77 foot-kips (7-inch pile). With a live load factor of 1.6 (LRFD, page 3), the allowable bending capacity (f_b) becomes <u>23.9 foot-kips</u> (14-inch pile) and <u>3.0 foot-kips</u> (7-inch pile).

The ultimate shear capacity is defined as follows

$$V_{ult} = \tfrac{2}{3} \left(\lambda \phi_v F_v ' \right) A$$ (LRFD, page 43)

where:

λ = time effect factor = 1.25 (LRFD, page 129)

ϕ_b = resistance factor = 0.75 (LRFD, page 3)

F_v' = F_v = reference bending strength =0.12 ksi (Derucher, et al., page 190)

A = cross sectional area = 154 in^2 (pile diameter = 14 in) or 38 in^2 (pile diameter = 7 in)

The reference shear strength is unfactored (F_v' = F_v), meaning that it is assumed the timbers are in good condition and that no strength reduction factor is needed. However, separate analyses were conducted assuming the pile diameters are (1) as built diameter (14-inches), and (2) half of as-built diameter (7-inches). The calculated ultimate shear capacity is 11.6 kips (14-inch pile) and 2.9 kips (7-inch pile). With a live load factor of 1.6 (LRFD, page 3), the allowable shear capacity (V) becomes 7.2 kips (14-inch pile) and 1.8 kips (7-inch pile).

The program *Allpile for Windows, Version 6*, was used to analyze the piles. *Allpile* is manufactured and distributed by CivilTech Corporation and was copyrighted in 2005. *Allpile* can analyze a variety of piles and other deep foundation systems, including driving timber piles with vertical and laterally loads. Users can define pile properties, pile loading conditions, and soil stratigraphy as inputs to the program. The program analyzes the piles and outputs bending moment and shear diagrams along the length of the piles. The program also computes deflection along the pile and displays the user-defined soil profile.

3.4.2 Assumptions

To complete the analysis of the timber pile fence, a number of assumptions were made. The soil profile was assumed to be the same as that encountered in the nearest soil boring (boring S-4) from the above-mentioned geotechnical report (Coleman, 2006). Based on record drawings, the timber piles are Douglas Fir. However, the exact strength parameters are not known since no testing of the wall materials was performed. Below is a summary of the Douglas Fir properties used in the analyses.

- maximum 1600 psi bending stress in compression and tension (Derucher, et al., page 190)
- maximum 120 psi shear stress (Derucher, et al, page 190)
- modulus of elasticity of 1600 ksi (LRFD Supplement, page 19)

The above values are conservative, but deemed necessary given the age of the timbers. It is assumed that the piles are in good condition. Therefore, a strength reduction factor was not incorporated into the analysis. However, to account for the potential loss in strength, each case was analyzed with the as-built pile diameter and with a diameter of half of the as-built diameter.

The program used for the analysis, *Allpile*, allows the user to input either a “free” or “fixed” boundary condition at the pile top. The actual timber pile fence has a semi-free boundary condition at the pile top due to the connections between the wall and the supporting piles. Since the piles are acting as a group, individual pile tops are not completely free to move laterally, but they are also only slightly fixed. For the analysis, the piles were conservatively analyzed assuming a “free” boundary condition at the pile top.

Due to the limitations of the program, *Allpile*, a sloped soil surface and overlying horizontal water layer (such as the post-dredged condition) cannot be simulated. In the post-dredged condition, the top layer (water) has a horizontal upper surface, while the interface between the water and upper soil surface is sloped at an angle as a result of dredging. This scenario cannot be modeled directly due to the limitations of the program. To overcome this shortcoming of the program, the water layer was modeled as surcharge that simulates the average vertical pressure from the water applied to the soil at the river bottom (Appendix G).

3.4.3 Results

The individual piles within the 3-pile cross section are unique. Therefore, the piles cannot be analyzed as a group. As a result, each pile is analyzed individually and assumes the pile top is free to move. Based on the profile shown in Figure 18, the piles were analyzed first for existing condition and then for river bottom geometry under proposed dredging limits (both undrained and drained conditions). Using the calculated allowable shear and bending moment capacity, the maximum lateral load capacity of each pile was determined for each condition. Appendix G shows deflection, shear, and bending moment diagrams for the maximum computed lateral load, as well as the soil profile. To simulate the variability in water levels, both low-water (NLW Datum 577.5) and high-water flood (NHWM 581.5) conditions were analyzed. Additionally, each case was also analyzed assuming the as-built pile diameter (piles in good condition, 14-inch diameter) and assuming half the as-built pile diameter (piles in poor condition, 7-inch diameter). The tables below summarize the results of the analysis.

Table 5: Summary of Timber Pile Fence Analyses - Low Water, 14-inch Piles

Pile Length [ft]	Batter [º]	Condition	Maximum Allowable Bending (f_b) [ft-kip]	Maximum Allowable Shear (V) [kip]	Pile Top Displacement [in]	Maximum Lateral Load [kip]
70	0	Initial	23.3	2.4	4.30	1.25
70	0	Drained	23.7	3.4	5.73	0.90
70	0	Undrained	23.6	3.8	5.09	0.90
65	6	Initial	23.3	2.4	4.33	1.25
65	6	Drained	23.0	3.2	4.20	1.05
65	6	Undrained	22.9	3.9	3.81	1.05
65	12	Initial	23.3	2.4	4.34	1.30
65	12	Drained	23.5	3.3	3.34	1.30
65	12	Undrained	23.4	3.9	3.01	1.30

Table 6: Summary of Timber Pile Fence Analyses - Low Water, 7-inch Piles

Pile Length [ft]	Batter [º]	Condition	Maximum Allowable Bending (f_b) [ft-kip]	Maximum Allowable Shear (V) [kip]	Pile Top Displacement [in]	Maximum Lateral Load [kip]
70	0	Initial	2.7	0.5	4.52	0.15
70	0	Drained	2.6	0.7	7.28	0.10
70	0	Undrained	2.6	0.9	6.91	0.10
65	6	Initial	2.7	0.5	4.60	0.15
65	6	Drained	2.2	0.6	4.31	0.10
65	6	Undrained	2.2	0.8	4.12	0.10
65	12	Initial	2.7	0.5	4.60	0.15
65	12	Drained	2.7	0.7	3.88	0.15
65	12	Undrained	2.7	0.9	3.69	0.15

Table 7: Summary of Timber Pile Fence Analyses - High Water, 14-inch Piles

Pile Length [ft]	Batter [º]	Condition	Maximum Allowable Bending (f_b) [ft-kip]	Maximum Allowable Shear (V) [kip]	Pile Top Displacement [in]	Maximum Lateral Load [kip]
70	0	Initial	23.2	2.4	4.27	1.25
70	0	Drained	23.7	3.4	5.73	0.90
70	0	Undrained	23.6	3.7	5.05	0.90
65	6	Initial	23.3	2.4	4.30	1.25
65	6	Drained	23.0	3.2	4.20	1.05
65	6	Undrained	22.9	3.9	3.72	1.05
65	12	Initial	23.3	2.4	4.31	1.30
65	12	Drained	23.4	3.3	3.31	1.30
65	12	Undrained	23.3	3.8	2.91	1.30

Table 8: Summary of Timber Pile Fence Analyses - Low Water, 14-inch Piles

Pile Length [ft]	Batter [º]	Condition	Maximum Allowable Bending (f_b) [ft-kip]	Maximum Allowable Shear (V) [kip]	Pile Top Displacement [in]	Maximum Lateral Load [kip]
70	0	Initial	2.7	0.5	4.54	0.15
70	0	Drained	2.6	0.7	7.28	0.10
70	0	Undrained	2.6	0.9	6.87	0.10
65	6	Initial	2.7	0.5	4.54	0.15
65	6	Drained	2.2	0.6	4.31	0.10
65	6	Undrained	2.2	0.7	4.07	0.10
65	12	Initial	2.7	0.5	4.58	0.15
65	12	Drained	2.7	0.7	3.87	0.15
65	12	Undrained	2.7	0.9	3.62	0.15

Please note that the global stability of the piles is not considered an issue in this analysis. That is, upon dredging the piles should not be expected to fail under normal working dead loads (e.g. the weight of the piles and Timber Pile Fence). This was shown in Section 3.4.1, where the piles were characterized as "long". A pile that is characterized as "long" is governed based upon bending and shear developed in the pile during loading, and not based on the passive resistance of the surrounding soils (Terzaghi et al., 1996). The results of the individual piles shown above are combined to determine the total lateral capacity of the 3-pile group along the timber pile fence. The table below shows the estimated total capacity of each 3-pile group for the different analysis conditions.

Table 9: Summary of Timber Pile Fence Analyses - Maximum Total Lateral Load Capacity

Water Level [ft]	Pile Diameter [in]	Condition	Maximum Allowable Lateral Load [kip]
577.5 (Low)	14	Initial	3.80
577.5 (Low)	14	Drained	3.25
577.5 (Low)	14	Undrained	3.25
577.5 (Low)	7	Initial	0.45
577.5 (Low)	7	Drained	0.35
577.5 (Low)	7	Undrained	0.35
581.5 (High)	14	Initial	3.80
581.5 (High)	14	Drained	3.25
581.5 (High)	14	Undrained	3.25
581.5 (High)	7	Initial	0.45
581.5 (High)	7	Drained	0.35
581.5 (High)	7	Undrained	0.35

The results indicate that the change in water level, which corresponds to a change in vertical stress placed on the soils at the river bottom, results in no change in the total lateral capacity of the piles. Please note that the analysis was performed in increments of 0.05 kips. With higher resolution, it is likely that an increase in water level would generate a slight increase in the total lateral capacity of the piles, but would be on the order of less than 0.05 kips.

A significant reduction in total pile capacity is noted when the pile diameter is reduced to half of the original diameter. This is largely due to the significant reduction in cross-sectional area of the piles. It is recommended that dive inspections be performed on the piles to determine the existing pile condition and estimate if a reduction in pile diameter is warranted for the analysis. A more thorough investigation of the piles, including destructive and non-destructive testing would be required to determine the effective section, bending strength (f_b), and shear strength (V).

The results indicate that the maximum lateral capacity of the 3-pile groups prior to dredging is approximately 3.8 kips (14-inch piles) and 0.45 kips (7-inch piles). The lateral resistance of the pile group was similar in both the drained and undrained conditions following river bottom dredging. These values were approximately 3.25 kips (14-inch pile) and 0.35 kips (7-inch pile) following dredging.

3.5 Bridge Abutments

The bridge abutments were not analyzed in detail. Instead the proposed channel limits were compared to the original abutment design channel bottom elevations. Excavating below the original bridge abutment design channel bottom elevation is not recommended and would likely not be allowed by the State. The comparison found that the proposed channel dredging is not acceptable at either the First Street Bridge abutments or the Kinnickinnic Avenue Bridge abutments. Drawings showing the original abutment design channel bottom elevation are provided in Appendix H.

3.6 Unprotected Riverbank

The slope stability analysis used limit equilibrium methods to determine the stability of the slopes under existing, proposed, and modified conditions. The modified conditions were intermediate configurations that exhibited adequate factors of safety in both the end-of-construction and long-term scenarios.

The five analyzed cross-sections of unprotected riverbank were 4, 5, 8, 13, and 15. See Figure 2 for their respective locations along the river.

3.6.1 Methods

The slope stability analysis was conducted using SLOPE/W, a computer-modeling program developed by GEO-SLOPE International, Ltd. SLOPE/W uses the limit equilibrium theory to compute a factor of safety on earth and rock slopes. It is capable of using a variety of methods to compute the factor of safety of a slope while analyzing complex geometry, stratigraphy, and loading conditions. The limit equilibrium method is usually carried out by establishing a grid and factors of safety are computed for concentric arcs at each point in the grid. When the software is finished computing the factors of safety along each arc, the lowest overall factor of safety is reported. The arc corresponding to this factor of safety is called the potential failure surface.

Spencer's method was used as the search technique to determine the factor of safety of the unprotected riverbank in the stability analysis. This method is considered the most adequate because it satisfies all conditions of static equilibrium and provides a factor of safety based on both force and moment equilibrium.

The existing conditions were modeled to obtain a factor of safety estimate for End-of-Construction and Long-Term conditions. The slopes are currently in their Long-Term condition because no unloading has occurred since the last time the river was dredged and the loading of the river sediment has taken place over a long period of time. The End-of-Construction case was modeled, along with the long-term case, to provide a baseline upon which the other modeling can be compared. If a factor of safety is determined to be below 1.0 for the existing case and no evidence of failure is evident in the field, there are likely discrepancies between actual field conditions and assumptions for geotechnical parameters, groundwater conditions, geometry, or modeling technique. If the factors of safety indicate adequate stability, more confidence can be expressed in the model and its inputs.

As the proposed conditions were modeled and resulting factors of safety were not adequate (i.e. <1.3 for End-of-Construction and <1.5 for Long-Term), then the proposed channel geometry was changed such that these minimum required factors of safety were achieved. The geometry was changed by maintaining the center of channel elevation, maintaining 2H:1V side slopes, and changing the toe of the side slopes. If the factor of safety was too low, the toe of this slope was moved toward the river centerline until the factor of safety reached a minimum acceptable value. To prevent overdesign, the same point was moved toward the shore if the factor of safety was too high, again keeping the slope fixed at 2H:1V.

The pool elevation for the cases described above was set at the normal elevation of 577.5 feet. When acceptable factors of safety were achieved after modifying the proposed geometry, the pool elevation was increased to the flood stage of 581.5 feet to determine its impact on stability. The flood elevation was not modeled for the existing or the proposed geometry. Performing the analysis based on the normal pool elevation yields lower factors of safety, and therefore is considered the critical load case.

3.6.2 Assumptions

Limited information is available for the groundwater regime at the site. Water levels in the river and the depth at which water was encountered in the borings comprise the entirety of the available groundwater data. It is possible that upward or downward flow exists in the vicinity of the Kinnickinnic River, but piezometric lines were drawn in each cross-section to simulate steady-state, hydrostatic porewater pressures. For the normal pool elevation cases, the piezometric line was drawn as a straight line from the shoreline to the elevation at which water was encountered in the respective boring. From here, the line was drawn horizontally to the upslope (i.e. away from the river) edge of the model. In the flood pool cases, the piezometric line was established at the flood pool elevation across the entire model.

The minimum slip surface thickness and location of the grid were changed to obtain the most meaningful factors of safety. For example, in the model runs where iterations were being done to find an adequate factor of safety, the potential failure surface would occasionally be a thin slice on the 2H:1V slope. This potential failure surface is genuine, but it only provides information about the face of the slope. To ensure that the more meaningful global factor of safety was computed, the minimum slip surface thickness was set at 20 feet for most cases, but went as low as 10 feet and as high as 28 feet.

Cross-Sections 4 and 5 (Figures 6 and 7) were analyzed as unprotected shorelines since there was no definitive information that timber walls existed in those areas. More recent information suggests that timber walls may exist, but that the condition of the walls is unknown and likely very poor. A timber wall was not observed at Section 4 during field inspections. A recent photograph of Section 5 identified a deteriorated timber wall; all prior photographs of this section had vegetation over the timber wall and therefore it was assumed to be unprotected. As described previously in Section 3.1.3, the exposed portions of timber walls (at other known timber wall locations) is severely deteriorated and remedial measures during/prior to dredging to stabilize the timber wall sections are warranted. Therefore, it is assumed that analysis of Cross-Sections 4 and 5 as an unprotected shoreline is a reasonable estimate of stability for these sections since little is known about these walls or their condition.

Cross-Section 5 was modeled as an unprotected slope because the timber wall is assumed to be in poor condition at this location. The timber wall at Cross-Section 5 is adjacent to a shallow channel created by the outfall from a concrete storm sewer pipe. The channel geometry was included in the model of the unprotected section with the following assumptions:

- Top of timber wall is at the lowest survey point elevation (nearest the river) in the vicinity of the wall.
- Bottom of timber wall is at Elevation 565.5. This is just for purposes of stratigraphy, the wall itself is assumed to add no strength to the slope. In reality, the wall may extend deeper than this elevation, but this bottom elevation is perceived to be a conservative assumption.
- Channel bottom is assumed to be horizontal and 14 feet wide at Elevation 574.5. This corresponds to a channel depth of 3 feet from NLW datum.
- On the channel side away from the timber wall, the underwater slope is 6H:1V and slopes upward to then match with the original surveyed river bottom geometry.
- The minimum slip surface thickness was chosen as 15 feet in the model (only at this cross-section) such that no failure surface went through the wall, but all of them went underneath the wall.

3.6.3 Results

Table 10 summarizes the results of the slope stability analysis in terms of the factor of safety. Table 10 also includes the suggested factor of safety under each condition analyzed. Figures 6, 7, 10, 15, and 17 show the existing, proposed, and modified sections of the unprotected sections.

Table 10: Summary of Unprotected Riverbank Analyses – Factors of Safety

Section	Geometry	Normal Pool Elevation		Flood Pool Elevation	
		End-of-Construction (Undrained)[1]	Long-Term (Drained)[2]	End-of-Construction (Undrained)[1]	Long-Term (Drained)[2]
4	Existing	1.67	2.41	--	--
4	Proposed	1.18	1.64	--	--
4	Modified	1.30	2.40	1.48	2.67
5	Existing	1.27	1.79	--	--
5	Proposed	0.91	1.06	--	--
5	Modified	1.30	1.80	1.46	2.06
8	Existing	1.74	2.94	--	--
8	Proposed	0.89	1.05	--	--
8	Modified	1.30	1.60	1.47	1.64
13	Existing	1.74	2.67	--	--
13	Proposed	1.08	1.13	--	--
13	Modified	1.30	1.89	1.44	2.03
15	Existing	1.40	1.65	--	--
15	Proposed	1.09	1.36	--	--
15	Modified	1.30	1.65	1.40	1.67

Notes:
1- Required Factor of Safety =1.30
2- Required Factor of Safety =1.50

Table 10 shows that the existing geometry has acceptable factors of safety. If this were not the case, there could be uncertainty in geotechnical parameters, groundwater conditions, geometry, or modeling technique. Because it is unlikely that the last three are questionable in this case, more confidence can be expressed in the geotechnical parameters such as unit weight and shear strength.

Table 10 also shows that under normal pool elevation the proposed geometry does not meet the required factor of safety. At sections 4, 13, and 15, the End-of-Construction factors of safety are in the range of 1.08 to 1.18, indicating that the slopes would not likely fail if constructed to the proposed geometry, but their stability would be marginal. The other two sections, on the other hand, have factors of safety below one, which show that the slopes would likely fail during dredging. All of the Long-Term factors of safety are above one, but only one of them (Section 4) is adequate.

The End-of-Construction factors of safety for the modified proposed geometry are all 1.30 using the normal pool elevation because these are the cases in which the geometry was adjusted to meet this factor of safety. All Long-Term factors of safety are adequate. In addition, factors of safety increased by varying amounts when the pool elevation was raised to the flood stage.

The graphical results of the slope stability analysis, including the outputs with the critical potential failure surfaces, can be found in Appendix I.

3.6.4 Verification of Computer Analyses and Results

The SLOPE/W limit equilibrium software was verified by independent means as a check on the results. The procedure followed the USACE manual EM 1110-2-1902, Section 4-2 using a combination of the graphical (force polygon) method and spreadsheet calculations.

The case selected for the verification was Cross-Section 4 using the proposed geometry with undrained conditions. This cross-section was chosen because it had fairly simple geometry, which allowed the fewest number of slices (17) to be used in the verification process. Undrained conditions were selected because both friction angle and cohesion values were used for different materials in the analysis, which provided a check on a case with wide-ranging inputs. The figure called Software Verification in Appendix I shows the geometry, soil parameters, and critical potential failure surface. For this case, the output data for each slice are shown in the table in Appendix I, and the force polygons for each slice are also shown in Appendix I.

As mentioned above, Spencer's method satisfies both force and moment equilibrium. Using this procedure, the orientation of the interslice forces is iterated until the resulting factors of safety from force and moment equilibrium are identical. In this case, lambda was 0.072. The force polygons for each slice show that the ratio of shear (vertical) to horizontal interslice forces on each slice is the same: 0.072. In addition to the interslice forces, the force polygons also comprise the total slice weight, the base normal force, and the mobilized base shear force. The moment acting on the base of the each slice is then the distance from the center of rotation to the slice base multiplied by the mobilized base shear force. When these moments are summed, they constitute the overall driving moment ΣM_d. The spreadsheet calculations show that ΣM_d= -2703545 lb*ft.

The base resisting stress is computed by the available shear strength τ at the slice base. It follows the basic equation:

$$\tau = c' + \sigma' \cdot \tan(\varphi')$$

where c'= cohesion

σ'= effective normal stress (effective base normal stress)

ϕ'= friction angle

The base resisting force is then computed by multiplying the base resisting stress by the base length. As above, the base resisting force for each slice is then multiplied by the radius and summed to give the overall resisting moment ΣM_r. The spreadsheet calculations show that ΣM_r= -3514800 lb*ft.

The factor of safety is confirmed by the following equation:

$$FS = \frac{M_r}{M_d} = \frac{-3514800 lb * ft}{-2703545 lb * ft} = 1.30$$

4.0 Discussion

The reported factors of safety for the slopes and walls were generally based on large potential failure surfaces in which the ground surface on the river bank will be impacted. The factors of safety for the underwater slopes (2H:1V) are likely somewhat lower than the reported factors of safety. Thus, there is a possibility that the underwater slopes could slump into the channel during construction or long term. This should not, however, have a major impact on global stability of the river banks, assuming the post-failure geometry of the slopes is not changed significantly from the initial geometry.

As previously mentioned, both normal and flood pool elevations were considered in the analysis presented above. It should be noted that the factors of safety are generally higher for the case using the flood pool elevation. A more critical case, which was not part of this scope, is a rapid, or sudden, drawdown. The scenario leading to this condition would comprise a flood event in which water levels were elevated for an extended period of time. After steady-state or near steady-state groundwater flow was achieved based on these elevated water levels, the river level would drop quickly, leaving elevated porewater pressures in the soils and less weight of water at the toe of the slope or wall to provide counteracting pressures. It is believed that this is the only way a rapid drawdown condition could be created in the Kinnickinnic River through Milwaukee. Due to its close proximity to Lake Michigan, there is a limit on how low the river level can drop because of the large body of water nearby.

The critical failure mode for most cross-sections using the proposed geometry was the End-of-Construction case while many of the cross-sections achieved an acceptable factor of safety for the Long-Term condition. However, the End-of-Construction case assumes that the river sediment is dredged instantaneously. In reality, the material will be dredged incrementally over a period of time. If the construction sequence and schedule were altered such that length of time of the dredging operation was extended to allow dissipation of excess porewater pressures, it is possible that acceptable factors of safety could be achieved. Adequately determining these intermediate factors of safety would likely require further testing and more sophisticated analysis. One of these analysis tools could be FLAC or PLAXIS. Both are finite difference/element software packages that can model complex constitutive models and construction sequences. Furthermore, they have the ability to accurately model structural elements, such as walls and piles.

Deep-seated failure analysis of soils beneath the SSP walls showed that the SSP walls embedded in the silt and organic silt requires a shallower dredging geometry than the geometry determined in CWALSHT. Therefore, the dredging geometry for those walls was altered (less sediment removed) to provide an acceptable factor of safety based on the deep-seated failure analysis. The deep-seated failure analysis was not performed on the timber walls or the concrete wall, because the condition of the timber walls was poor and would likely require reinforcement prior to any dredging and the construction of the concrete wall is unknown.

Overall, the proposed dredging channel selected by the WDNR does not provide an acceptable factor of safety for the majority of the shoreline without reinforcement of the shoreline. This report provides a modified dredging geometry that would provide an acceptable factor of safety for each section analyzed without further reinforcement; it does not provide a continuous modified channel geometry for the entire project area. At some locations the proposed depth of water next to the shoreline (11 ft bws) was not met, the modified cut went as shallow as the existing top of sediment. In addition, the modified dredging geometry would not maintain the proposed 80-ft wide center channel, with some sections cutting this width in more than half.

5.0 References

Ajlouni, M. A., Geotechnical Properties of Peat and Related Engineering Problems, PhD Thesis, University of Illinois at Urbana-Champaign, 2000.

Barr, 2006. Structural Analysis Plan for Riverbank Areas in the Vicinity of Proposed Dredging on the Kinnickinnic River – Milwaukee, Wisconsin, August 2006.

Barr, 2004. Kinnickinnic River, Wisconsin, Milwaukee Estuary Area of Concern Deepening/Remediation Concept Design Documentation Report, April 7, 2004, Prepared for USACE and WDNR.

Coleman, 2006. Coleman Engineering Company, Report of Subsurface Exploration for Kinnickinnic River Stability Analysis and Dredging Study, Prepared for Barr Engineering Company, June 9, 2006.

Coleman, 2002. Coleman Engineering Company, Report of Subsurface Investigation for Kinnickinnic River, Prepared for U.S. Army Corps of Engineers, Detroit District, October, 2002.

Derucher, K. N., Korfiatis, G. P., and Ezeldin, A. S., Materials for Civil & Highway Engineers, Fourth Edition, Prentice-Hall, Inc., 1998.

Load and Resistance Factor Design (LRFD Supplement), Manual for Engineered Wood Construction, Structural Lumber Supplement, 1996.

Load and Resistance Factor Design (LRFD), Manual for Engineered Wood Construction, 1996 Edition, 1996.

Terzaghi, K., Peck, R. B., Mesri, G., Soil Mechanics in Engineering Practice, Third Edition, John Wiley & Sons, Inc., 1996.

United States Army Corps of Engineers, EM 1110-2-2504 Design of Sheet Pile Walls, March 1994

United States Army Corps of Engineers, EM 1110-2-2906 Design of Pile Foundations, January 1991.

Figures

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NOTE:
PARCEL BOUNDARIES ARE APPROXIMATED FOR THE PURPOSE OF VISULIZATION ONLY. FOR LEGAL PROPERTY DESCRIPTIONS REFER TO THE APPROPRIATE PLAT DOCUMENT.

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

SIGNATURE

PRINTED NAME

DATE ______ REG. NO. ______

	A	B	C	0	1	2	3
CLIENT							
BID							
CONSTRUCTION							
RELEASED TO/FOR	DATE RELEASED						

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Corporate Headquarters:
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Ph: 1-800-632-2277

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BARR ENGINEERING CO.
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55435-4803
Ph: 1-800-632-2277
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Scale	AS SHOWN
Date	
Drawn	
Checked	
Designed	
Approved	

KINNICKINNIC RIVER DREDGING
MILWAUKEE, WI

FIGURE 1
SITE LOCATION

BARR PROJECT No.

CLIENT PROJECT No.

DWG. No. REV. No.

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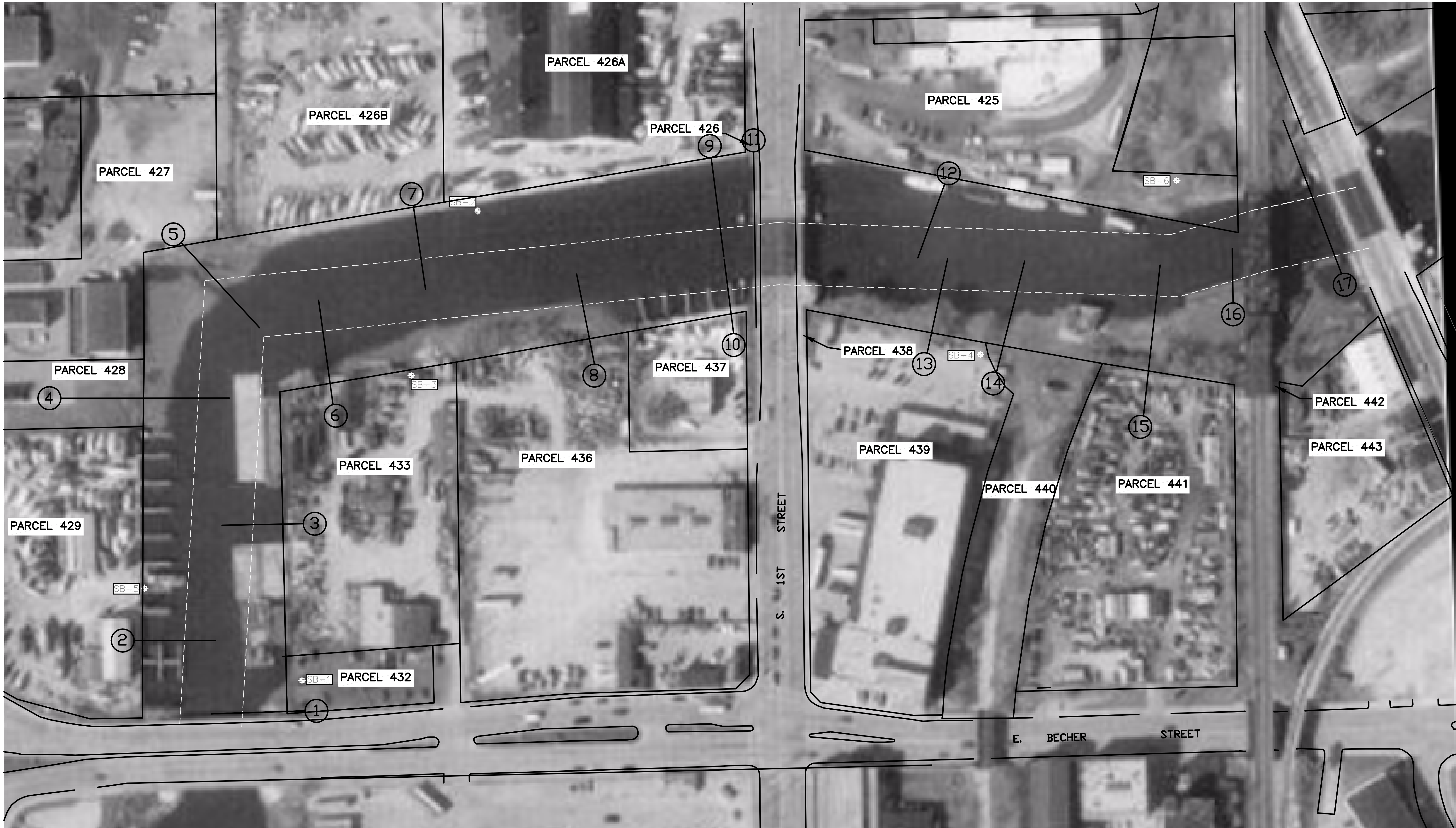

NOTE:
PARCEL BOUNDARIES ARE APPROXIMATED FOR THE PURPOSE OF VISULIZATION ONLY. FOR LEGAL PROPERTY DESCRIPTIONS REFER TO THE APPROPRIATE PLAT DOCUMENT.

— — — — — PROPOSED CHANNEL SELECTED BY WDNR

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION

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SIGNATURE ______
PRINTED NAME ______
DATE ______ REG. NO. ______

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CLIENT							
BID							
CONSTRUCTION							
	DATE RELEASED						

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55435-4803
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Scale	AS SHOWN
Date	
Drawn	
Checked	
Designed	
Approved	

KINNICKINNIC RIVER DREDGING
MILWAUKEE, WI

FIGURE 2
CROSS-SECTION LOCATIONS

BARR PROJECT No.
CLIENT PROJECT No.
DWG. No.
REV. No.

VERTICAL DATUM
IGLD85 (ft)

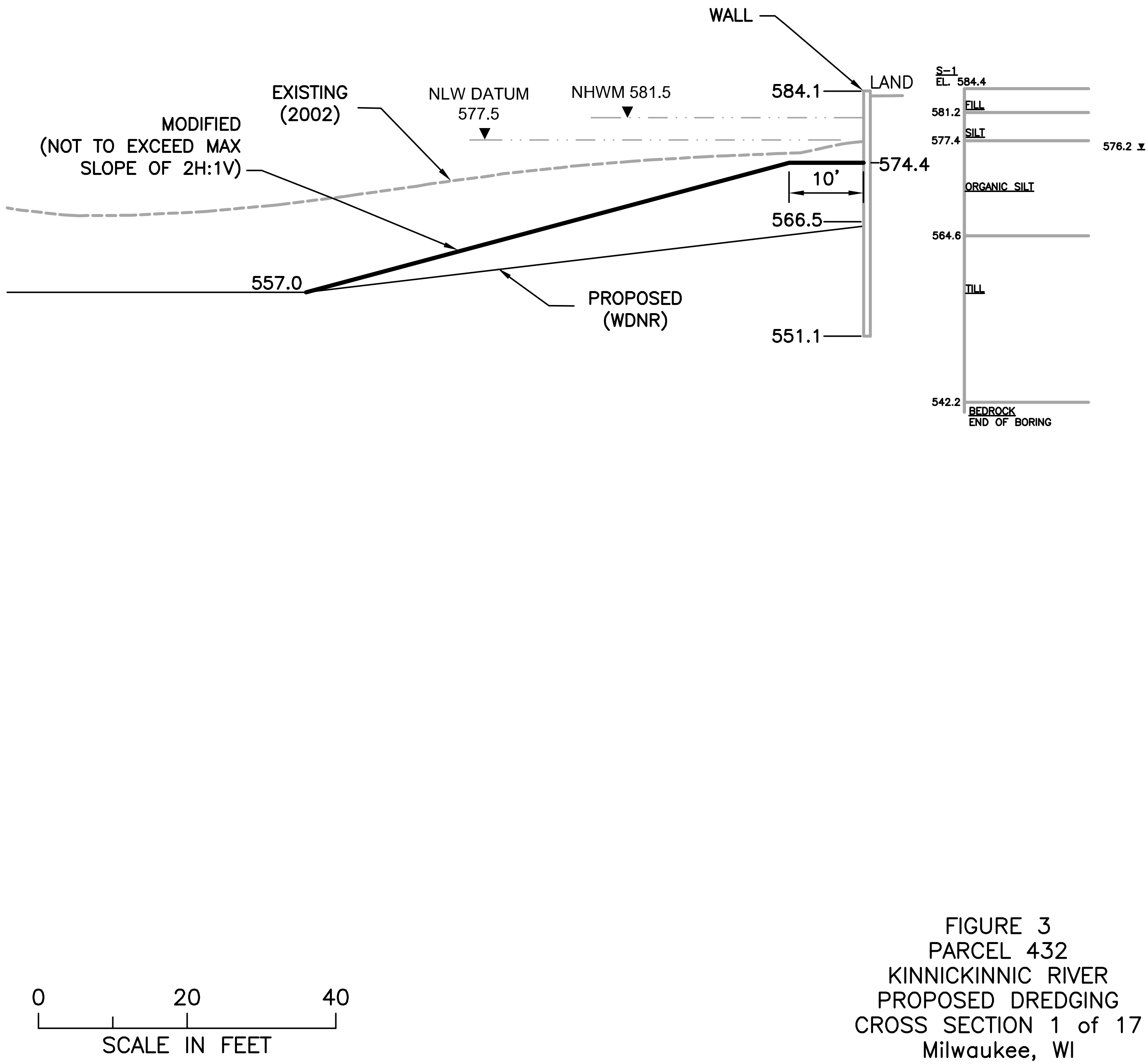

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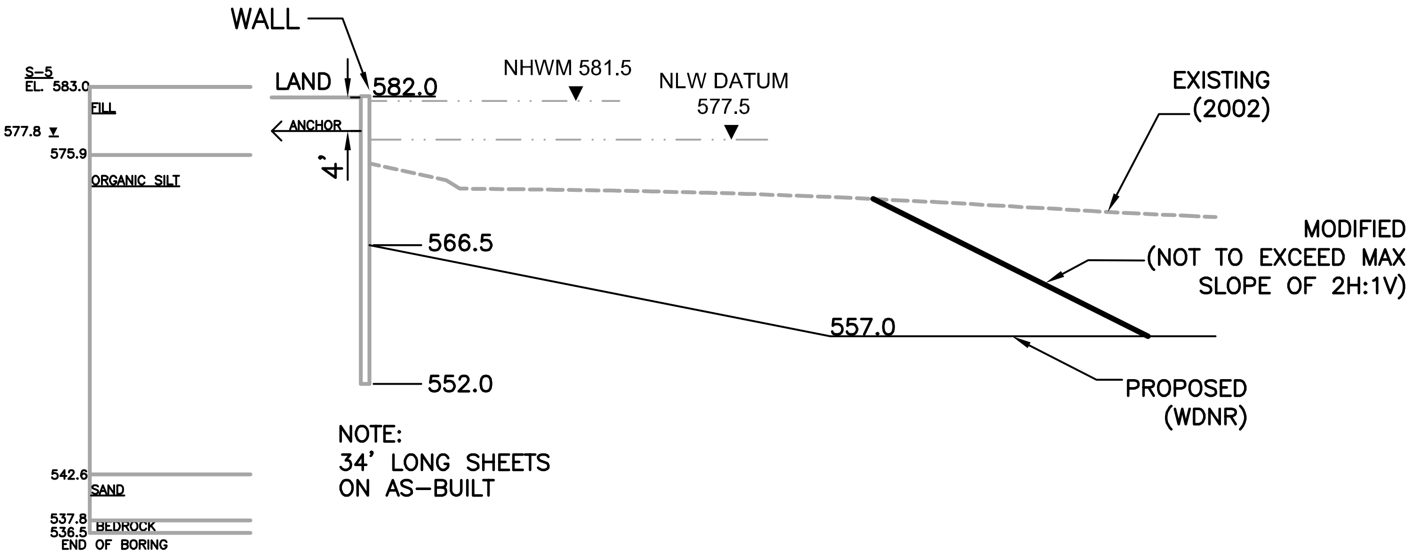
FIGURE 3
PARCEL 432
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 1 of 17
Milwaukee, WI

VERTICAL DATUM
IGLD85 (ft)



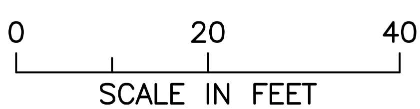


FIGURE 4
PARCEL 429
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 2 of 17
Milwaukee, WI

VERTICAL DATUM
IGLD85 (ft)

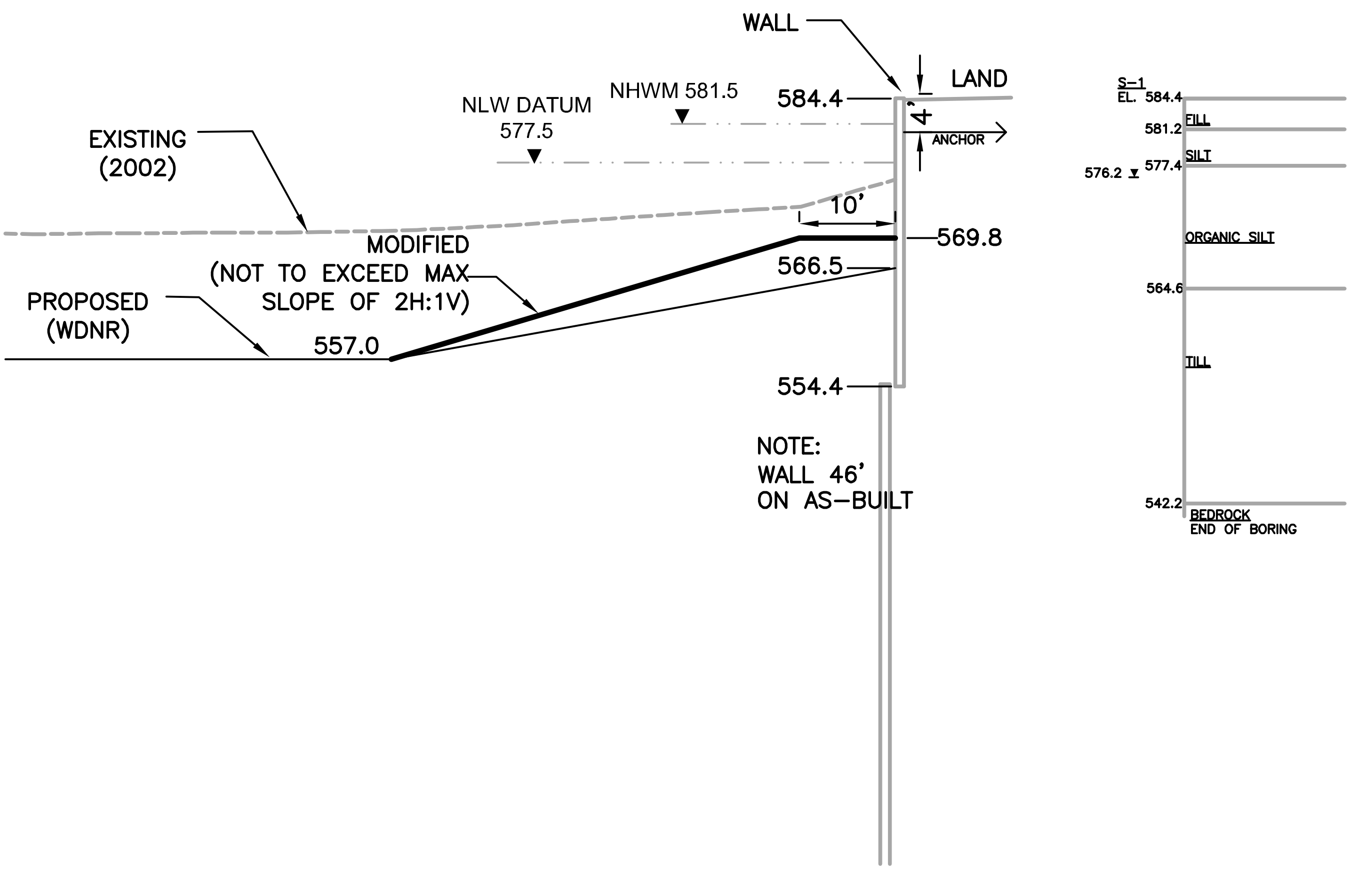


FIGURE 5
PARCEL 433
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 3 of 17
Milwaukee, WI

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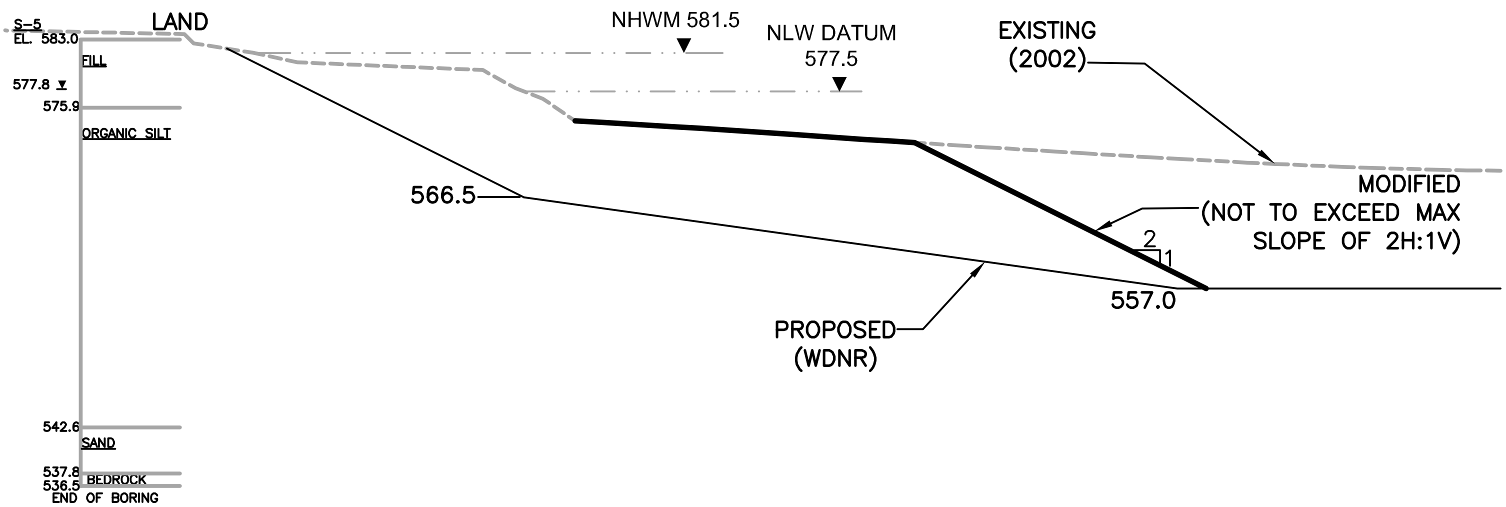
VERTICAL DATUM
IGLD85 (ft)



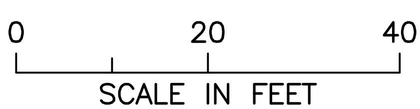


FIGURE 6
PARCEL 428
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 4 of 17
Milwaukee, WI

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VERTICAL DATUM
IGLD85 (ft)

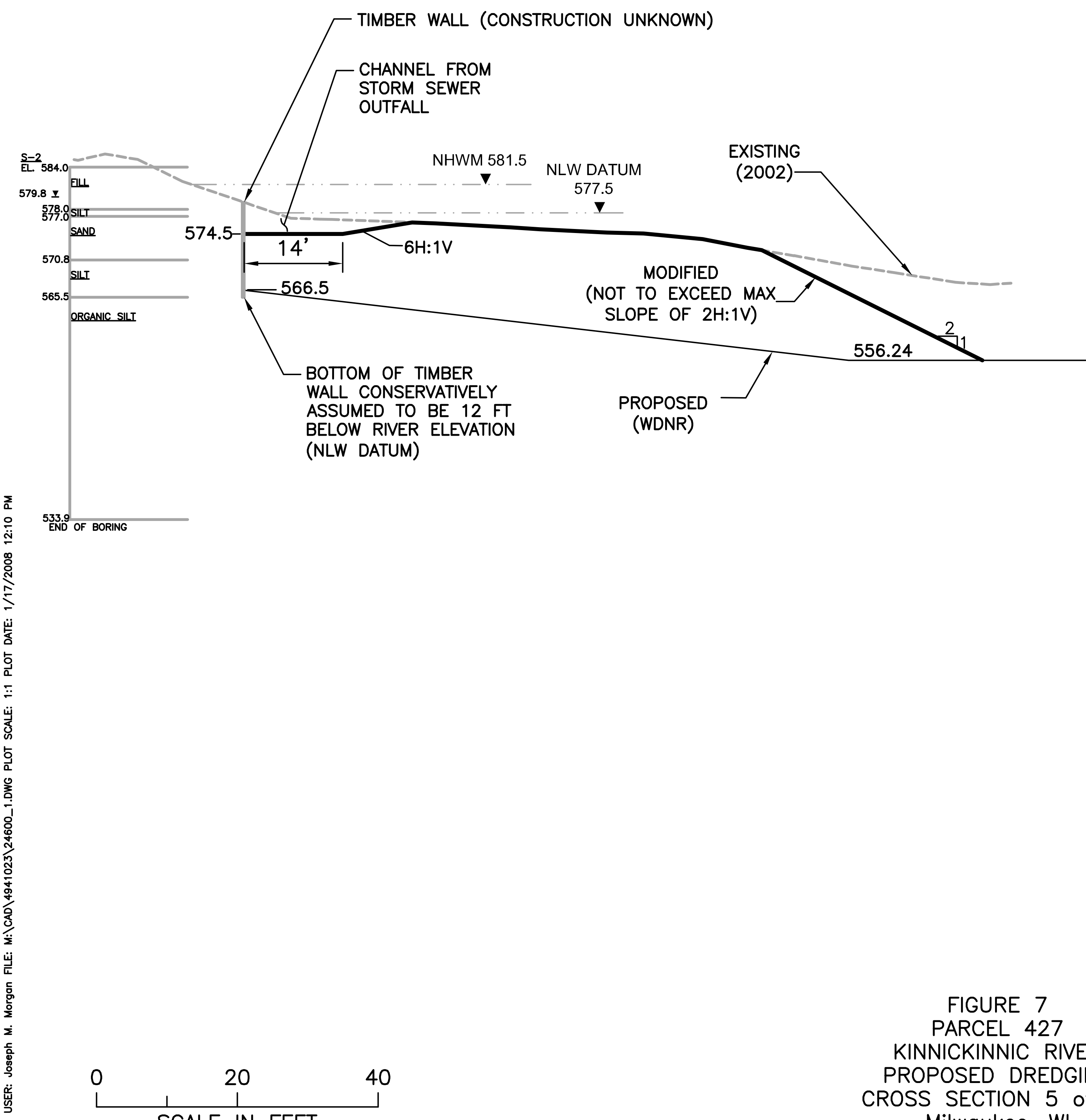

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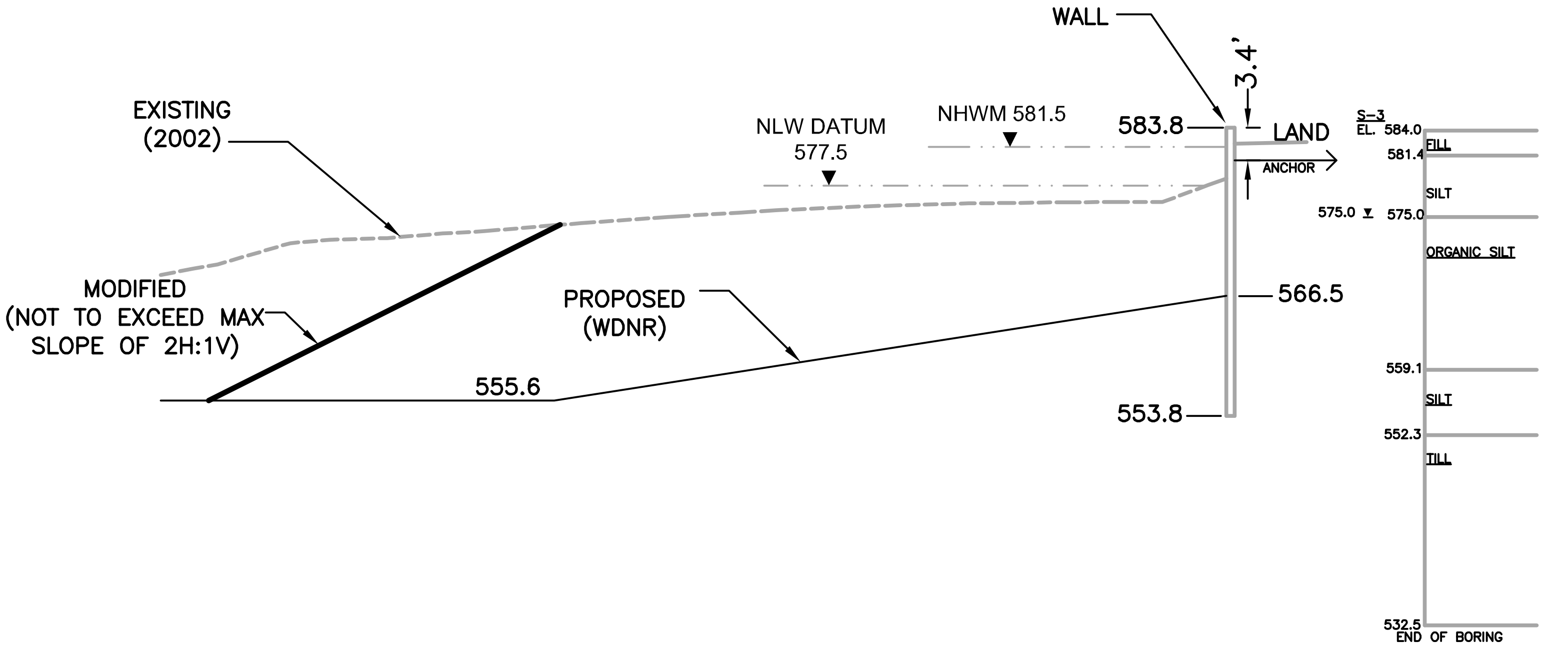
FIGURE 7
PARCEL 427
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 5 of 17
Milwaukee, WI

VERTICAL DATUM
IGLD85 (ft)

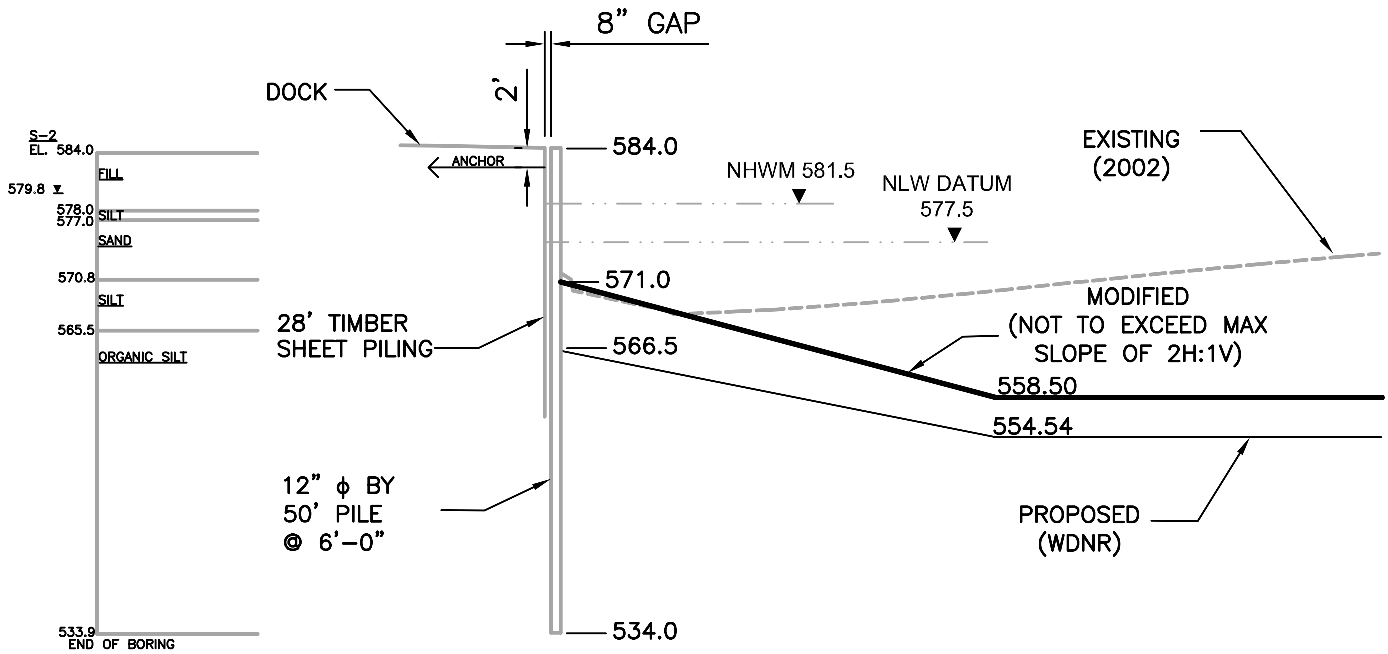


CADD USER: Joseph M. Morgan FILE: M:\CAD\4941023\24601_1.DWG PLOT SCALE: 1:1 PLOT DATE: 1/17/2008 12:11 PM

0 20 40
SCALE IN FEET

FIGURE 8
PARCEL 433
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 6 of 17
Milwaukee, WI

VERTICAL DATUM
IGLD85 (ft)



0 20 40
SCALE IN FEET

FIGURE 9
PARCEL 426 B
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 7 of 17
Milwaukee, WI

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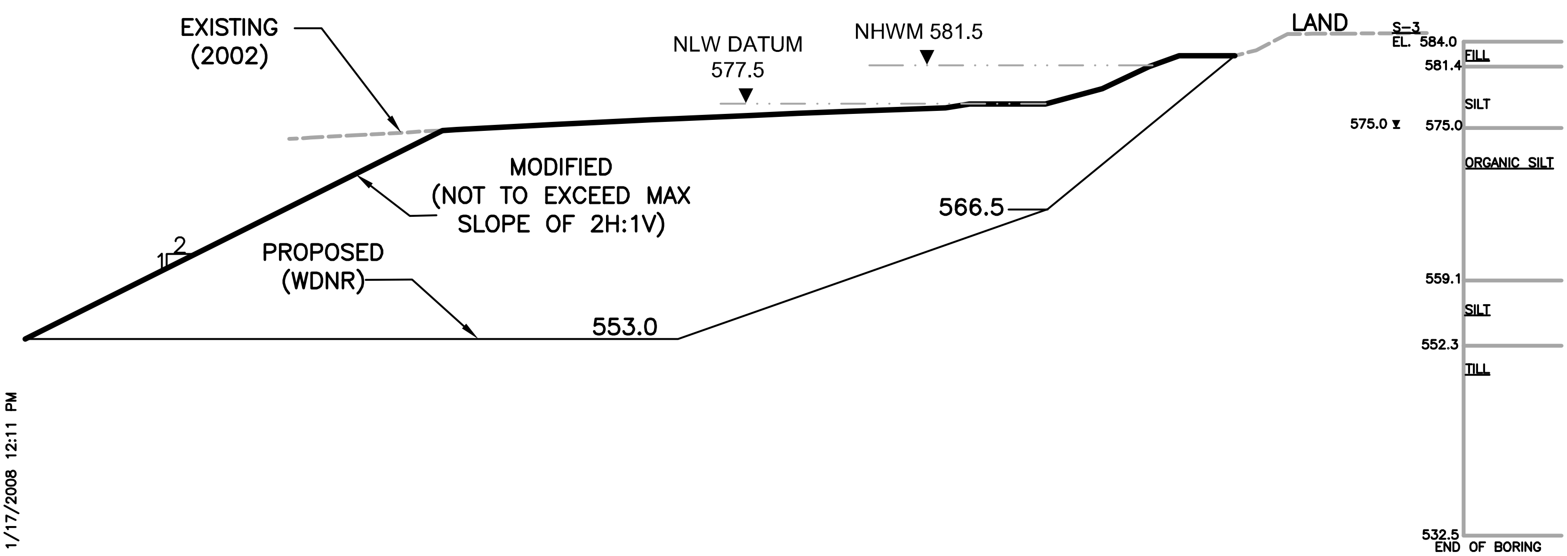
VERTICAL DATUM
IGLD85 (ft)



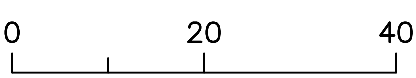


FIGURE 10
PARCEL 436
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 8 of 17
Milwaukee, WI

VERTICAL DATUM
IGLD85 (ft)

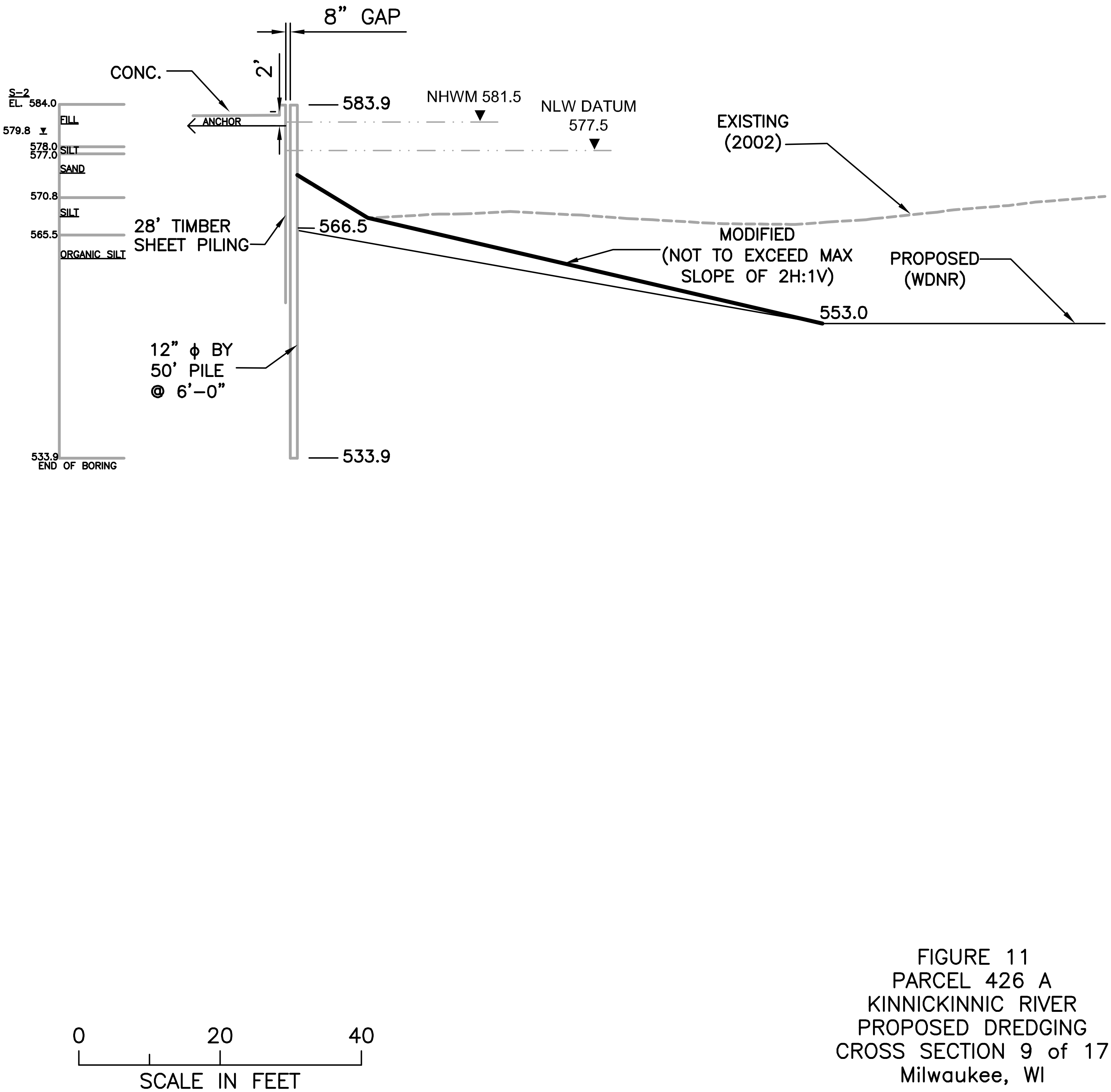


FIGURE 11
PARCEL 426 A
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 9 of 17
Milwaukee, WI

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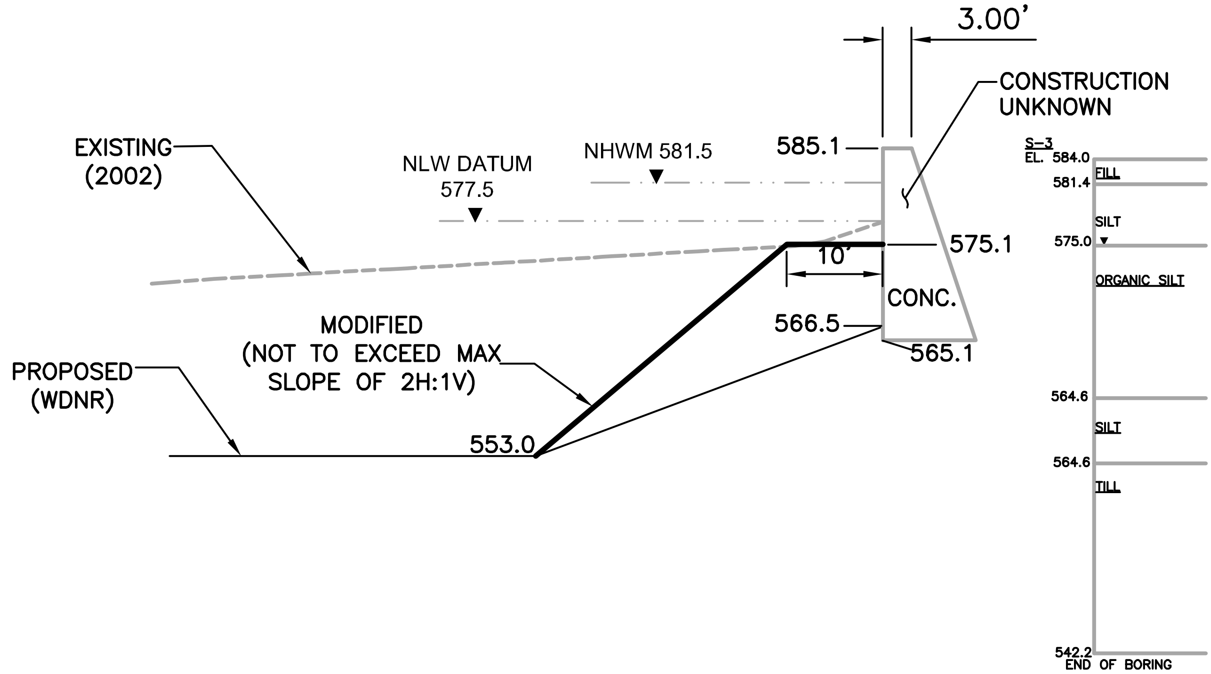
VERTICAL DATUM
IGLD85 (ft)



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SCALE IN FEET

FIGURE 12
PARCEL 437
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 10 of 17
Milwaukee, WI

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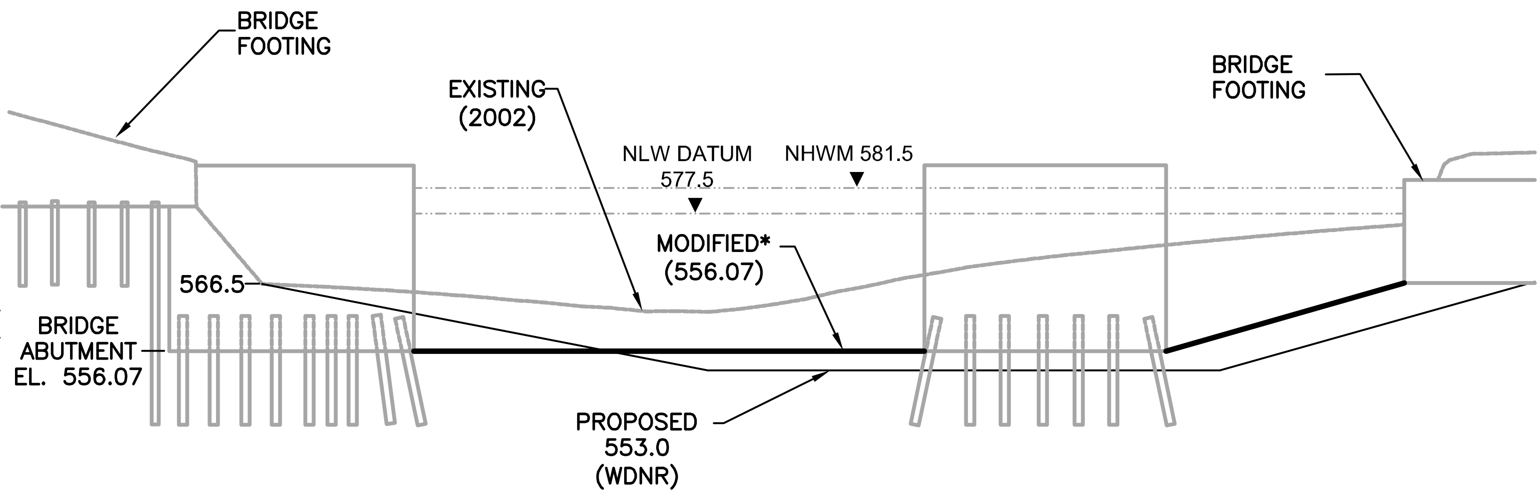
VERTICAL DATUM
IGLD85 (ft)



* MODIFIED DEPTH PER SOUTH FIRST STREET BASCULE BRIDGE SITE PLAN DREDGE ELEVATION, DEPARTMENT OF PUBLIC WORKS BUREAU OF BRIDGES AND PUBLIC BUILDINGS – CITY OF MILWAUKEE (11/26/55)

0 30 60
SCALE IN FEET

FIGURE 13
1st STREET BRIDGE
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 11 of 17
Milwaukee, WI

VERTICAL DATUM
IGLD85 (ft)

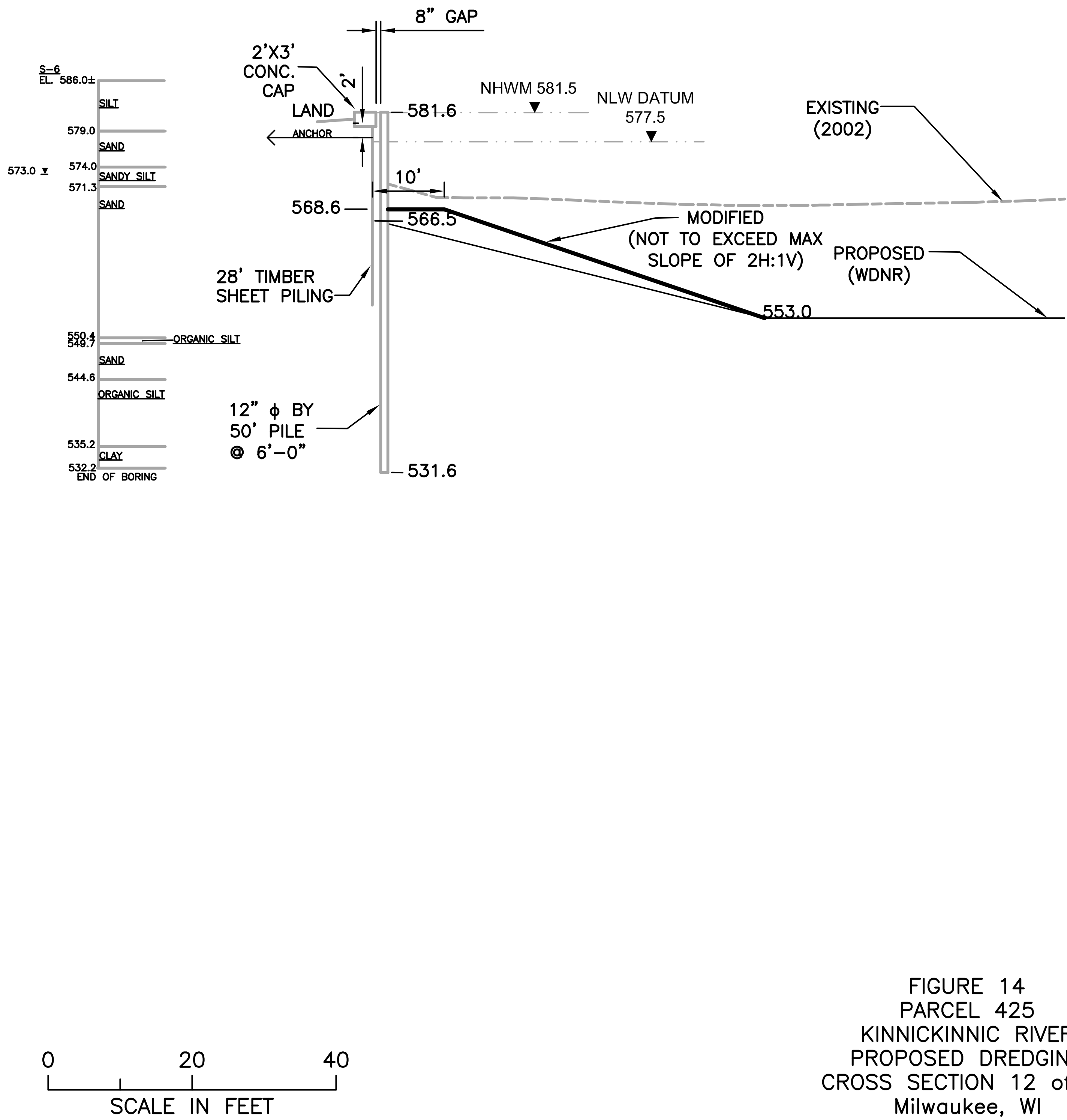


FIGURE 14
PARCEL 425
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 12 of 17
Milwaukee, WI

VERTICAL DATUM
IGLD85 (ft)

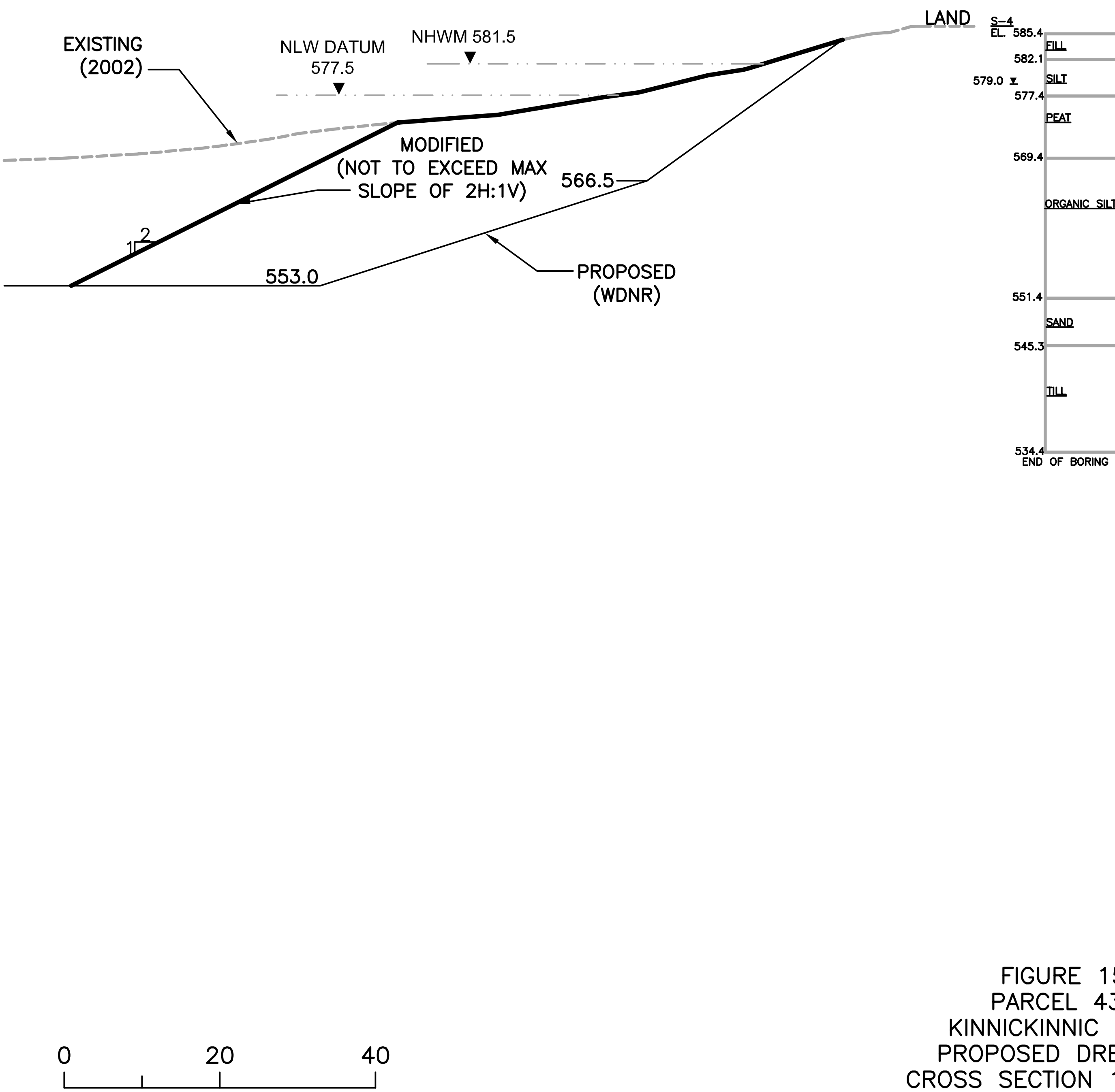


FIGURE 15
PARCEL 439
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 13 of 17
Milwaukee, WI

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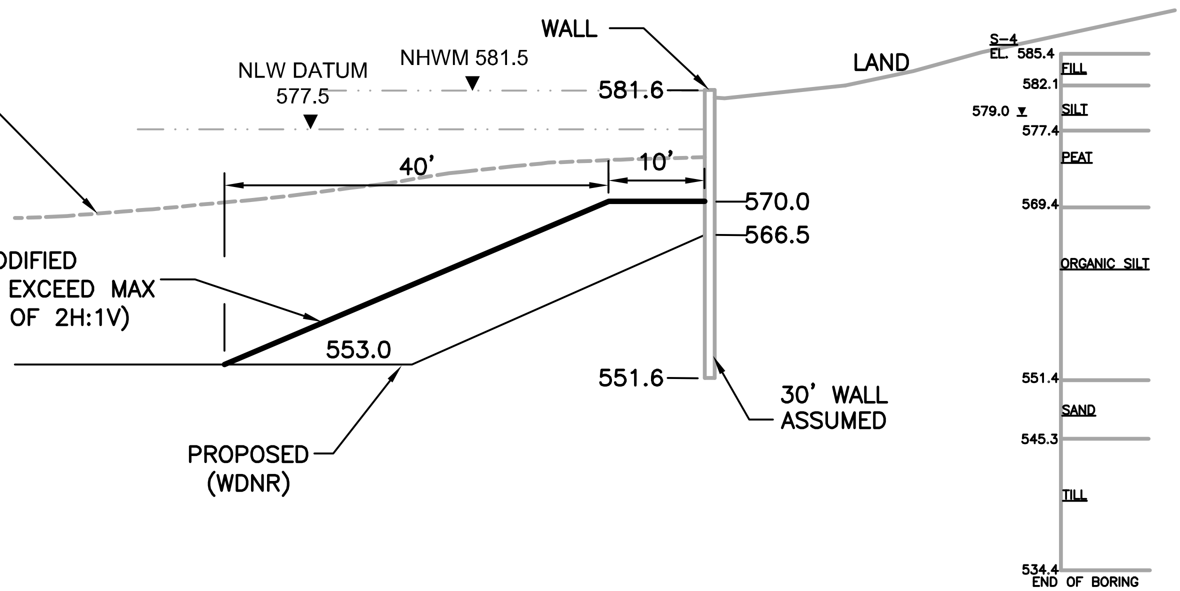
VERTICAL DATUM
IGLD85 (ft)



0 20 40
SCALE IN FEET

FIGURE 16
PARCEL 440
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 14 of 17
Milwaukee, WI

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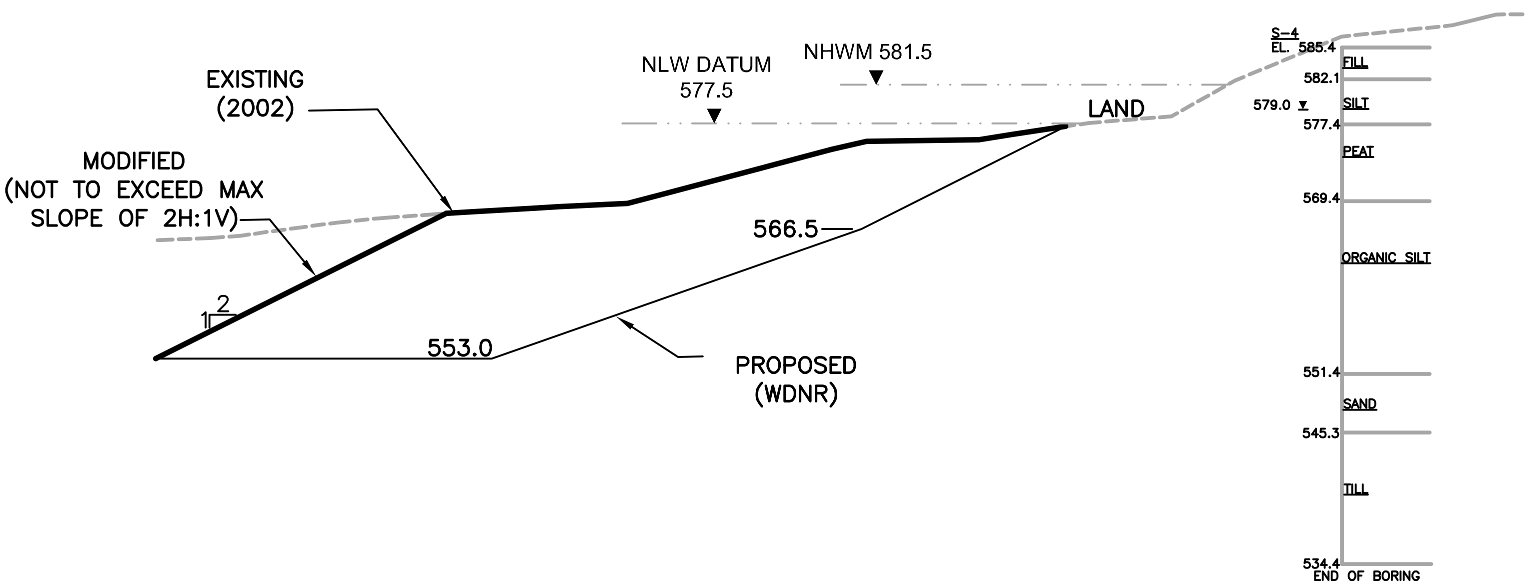
VERTICAL DATUM
IGLD85 (ft)



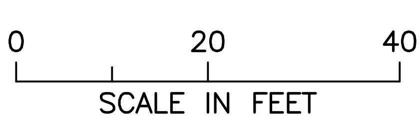
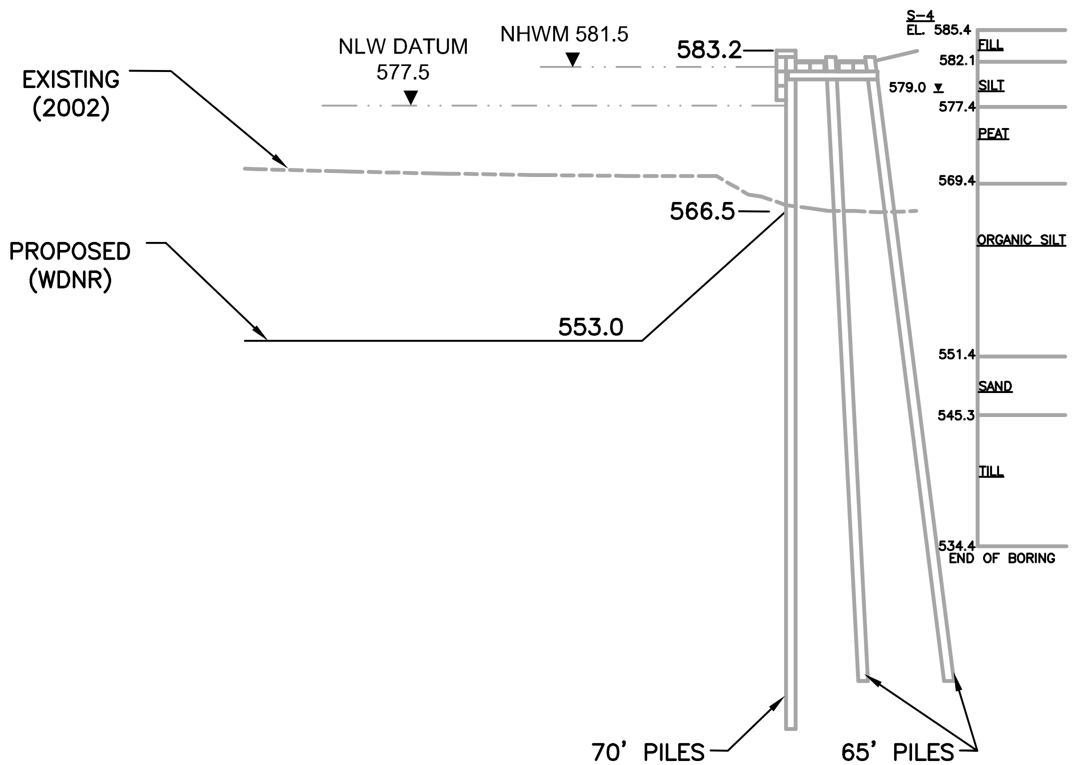


FIGURE 17
PARCEL 441
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 15 of 17
Milwaukee, WI

CADD USER: Joseph M. Morgan FILE: M:\CAD\4941023\24610_1.DWG PLOT SCALE: 1:1 PLOT DATE: 1/17/2008 12:13 PM

VERTICAL DATUM
IGLD85 (ft)



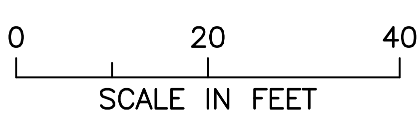
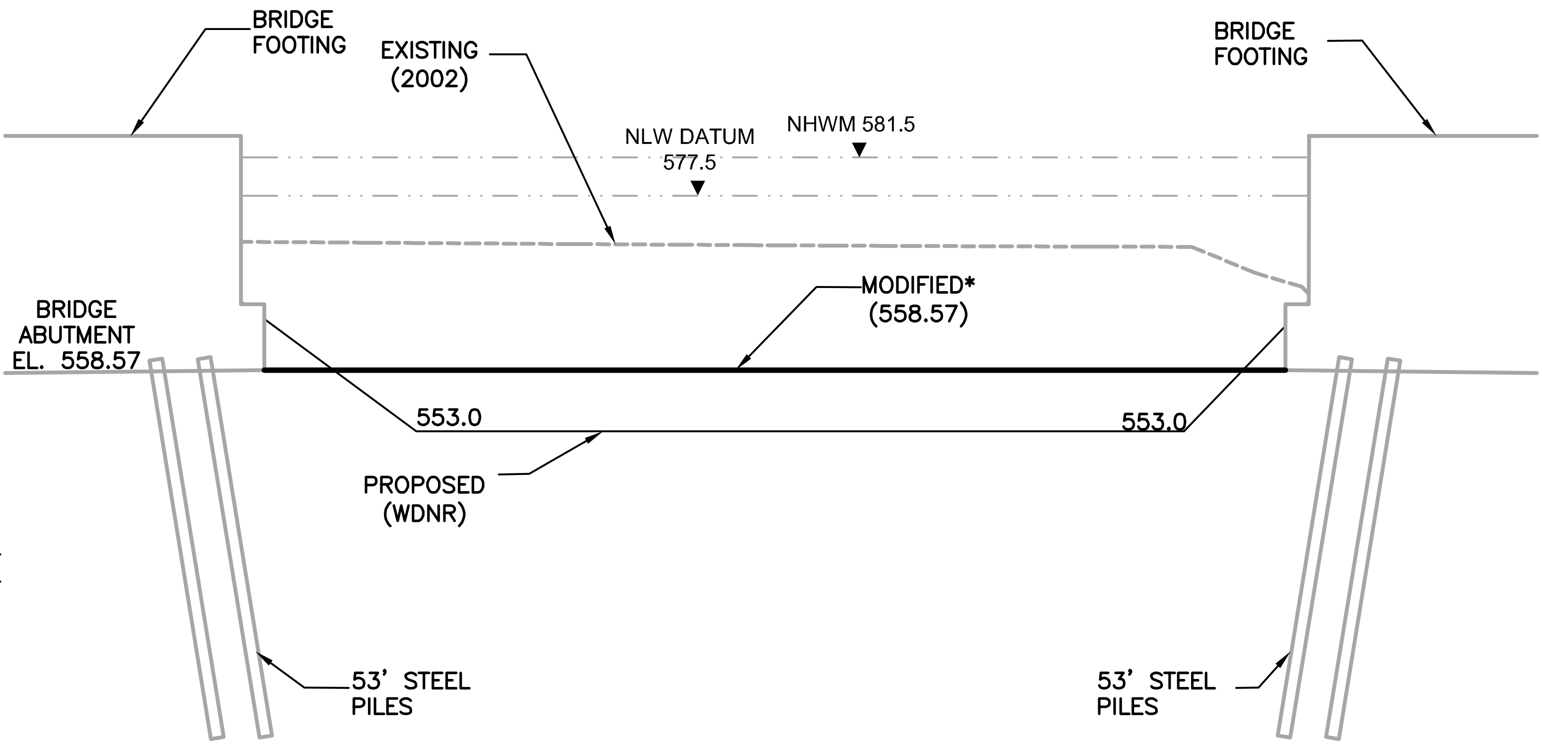


FIGURE 18
PARCEL 441
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 16 of 17
Milwaukee, WI

CADD USER: Joseph M. Morgan FILE: M:\CAD\4941023\24611_1.DWG PLOT SCALE: 1:1 PLOT DATE: 1/17/2008 12:14 PM

VERTICAL DATUM
IGLD85 (ft)



* MODIFIED DEPTH IS DEPENDANT UPON COMMUNICATION CONDUIT ELEVATION, WHICH IS UNKNOWN AND SHOULD BE FEILD VERIFIED. MODIFIED DEPTH SHOWN IS THE BRIDGE ABUTMENT ELEVATION PER SOUTH KINNICKINNIC AVENUE BASCULE BRIDGE SITE PLAN, CITY OF MILWAUKEE DEPARTMENT OF PUBLIC WORKS DIVISION OF ENGINEERS (1/95)

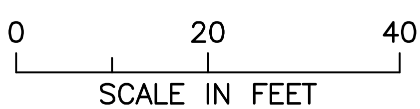
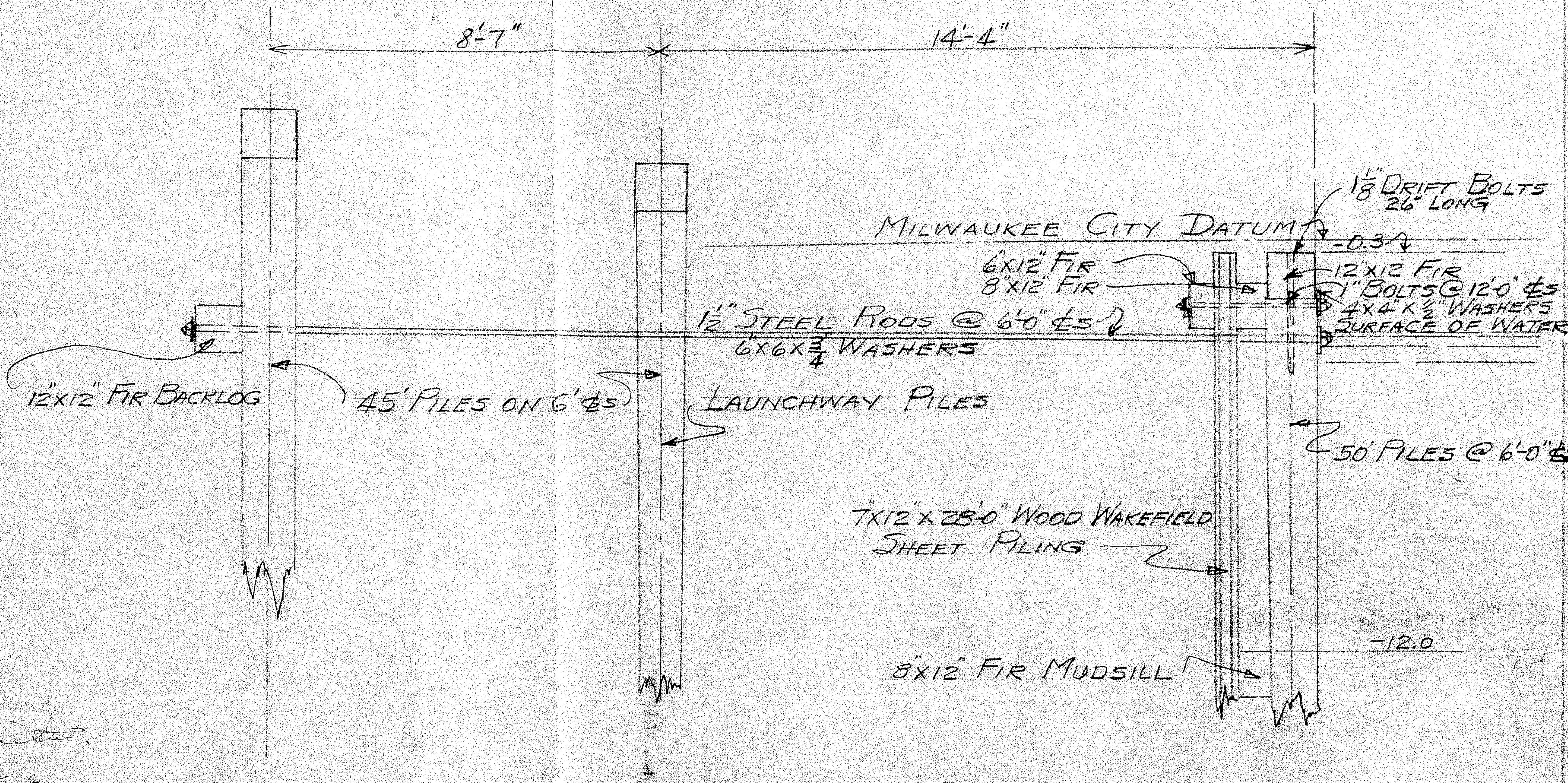


FIGURE 19
SOUTH KINNICKINNIC AVE BRIDGE
KINNICKINNIC RIVER
PROPOSED DREDGING
CROSS SECTION 17 of 17
Milwaukee, WI

CADD USER: Joseph M. Morgan FILE: M:\CAD\4941023\24612_1.DWG PLOT SCALE: 1:1 PLOT DATE: 1/17/2008 12:14 PM

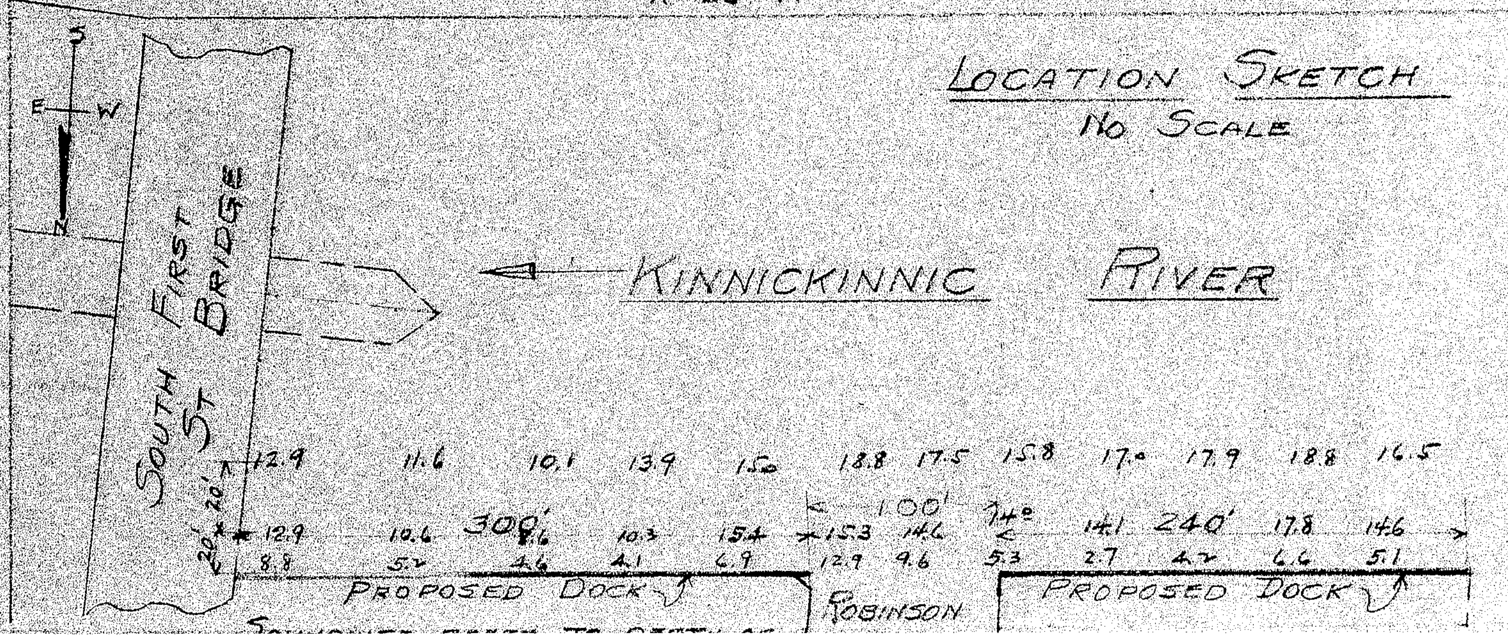
Appendices

Appendix A – Timber Wall Record Drawings



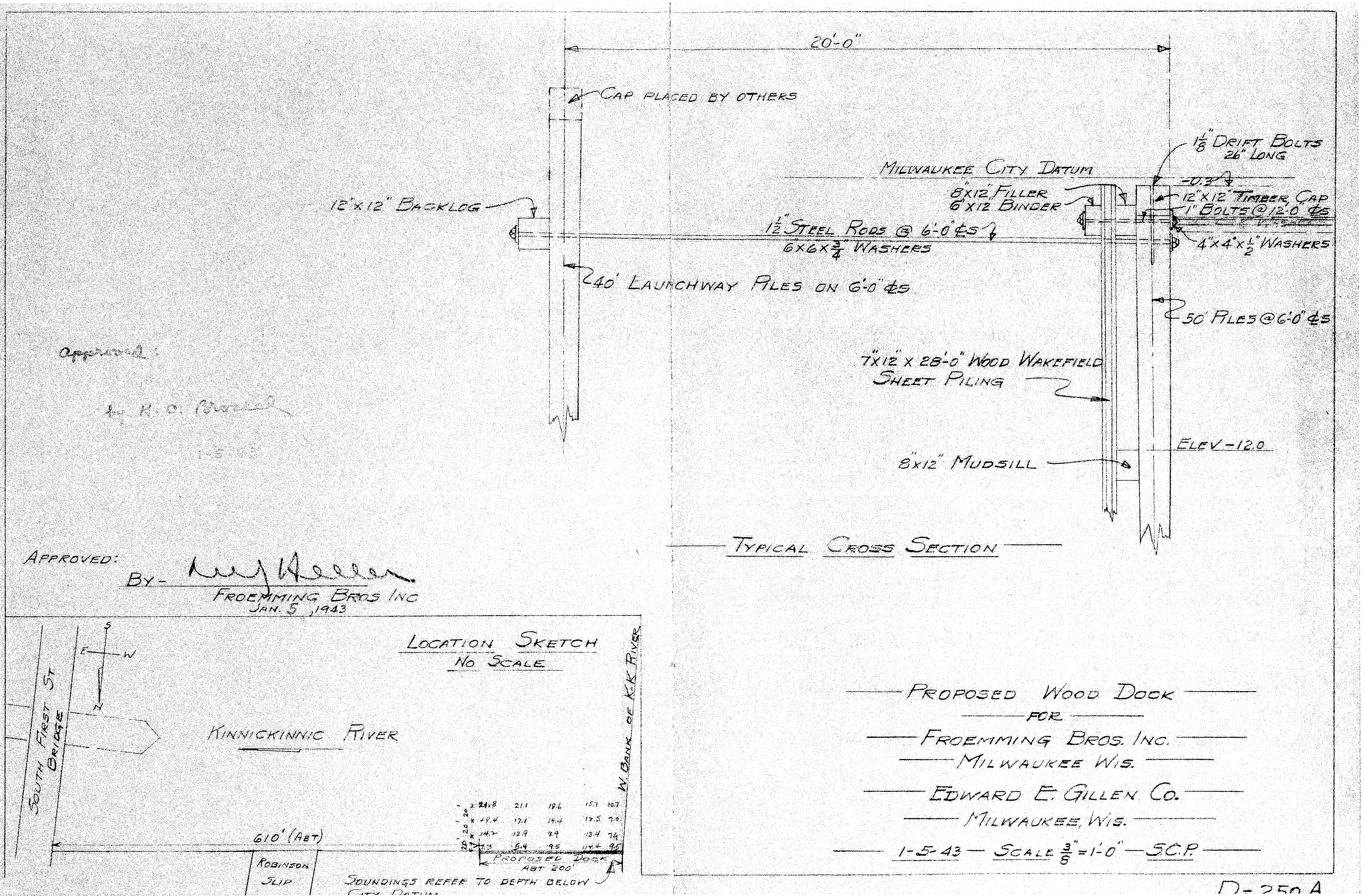
Typical Cross Section

Approved:
By- Wm Heller
Froemming Bros. Inc.
11-25-41



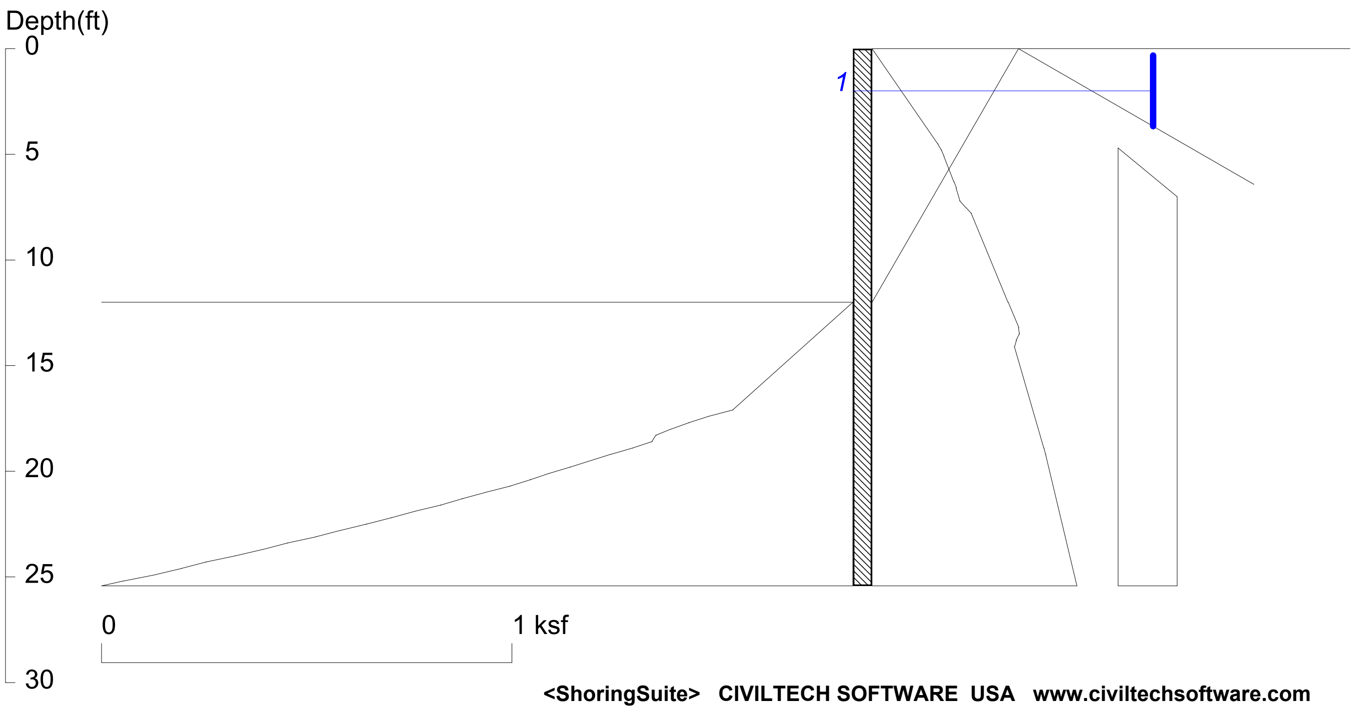
Location Sketch
No Scale

Proposed Wood Dock
for
Froemming Bros. Inc.
Milwaukee, Wis.
Edward E. Gillen Co.
Milwaukee, Wis.
11-24-41 — Scale 3/8" = 1'-0" — S.C.P.


20'-0"
CAP PLACED BY OTHERS
1⅛" DRIFT BOLTS 26" LONG
MILWAUKEE CITY DATUM
-0.3'
8"X12" FILLER
6"X12" BINDER
12"X12" TIMBER CAP
1" BOLTS @ 12'-0" ¢S
12"X12" BACKLOG
1½" STEEL RODS @ 6'-0" ¢S
6X6X¾" WASHERS
4"X4"X½" WASHERS
40' LAUNCHWAY PILES ON 6'-0" ¢S
50' PILES @ 6'-0" ¢S
7"X12" X 28'-0" WOOD WAKEFIELD SHEET PILING
ELEV -12.0
8"X12" MUDSILL
TYPICAL CROSS SECTION
Approved: by H. C. Borchel
APPROVED:
BY-
FROEMMING BROS INC
JAN. 5, 1943
LOCATION SKETCH
NO SCALE
S
E
W
N
SOUTH FIRST ST BRIDGE
KINNICKINNIC RIVER
W. BANK OF K.K. RIVER
21.8 21.1 19.6 15.7 10.7
19.4 17.1 14.4 17.5 7.9
14.2 12.9 7.9 13.4 7.4
7.3 5.4 9.5 11.4 9.5
610' (ABT)
PROPOSED DOCK ABT 200'
ROBINSON SLIP
SOUNDINGS REFER TO DEPTH BELOW CITY DATUM
PROPOSED WOOD DOCK
FOR
FROEMMING BROS. INC.
MILWAUKEE WIS.
EDWARD E. GILLEN CO.
MILWAUKEE, WIS.
1-5-43 SCALE ⅜"=1'-0" S.C.P.
D-250A

Appendix B – Timber Wall Calculations

Kinnickinnic River - Section 7 Existing Drained



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Date: 10/17/2006 File Name:

Wall Height=12.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=13.42, Pile Length=25.42
MOMENT IN PILE: Max. Moment=65.91 per Pile Spacing=6.0 at Depth=10.09

VERTICAL BEARING CAPACITY: Vertical Loading=0.0, Resistance=30.7, Vertical Factor of Safety=999.00

SYSTEM FACTOR OF SAFETY (Approximate)=2.83
The request embedment is 13.4, the user input fixed embedment = 38.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	13.4	13.4	0.0	13.3	3.3

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	12.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	12.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	4.5	0.16	0.036
2	4.5	0.16	4.8	0.17	0.029
3	4.8	0.17	5.1	0.17	0.022
4	5.1	0.17	6.3	0.20	0.020
5	6.3	0.20	6.6	0.20	0.018
6	6.6	0.20	7.2	0.21	0.016

7	7.2	0.21	7.5	0.23	0.045
8	7.5	0.23	7.8	0.24	0.048
9	7.8	0.24	12.0	0.33	0.021
10	12.0	0.33	13.2	0.36	0.021
11	13.2	0.36	13.5	0.36	0.006
12	13.5	0.36	13.8	0.35	-0.026
13	13.8	0.35	14.1	0.35	-0.014
14	14.1	0.35	18.9	0.42	0.015
15	18.9	0.42	19.2	0.42	0.013
16	19.2	0.42	25.4	0.93	0.012
17	4.7	0.00	7.0	0.14	0.062
18	7.0	0.14	25.4	0.14	0.000

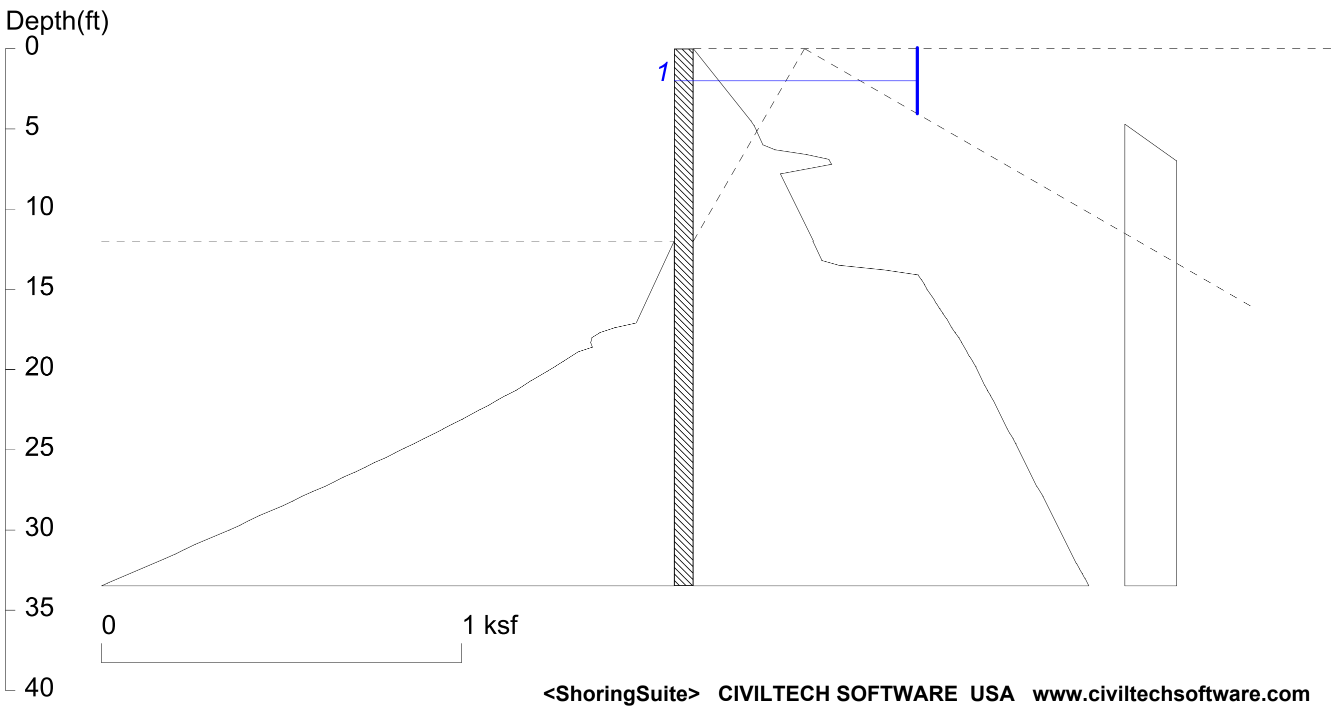
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	12.00	0.00	17.10	0.29	0.0574
2	17.10	0.29	17.40	0.35	0.1980
3	17.40	0.35	17.70	0.40	0.1574
4	17.70	0.40	18.00	0.44	0.1449
5	18.00	0.44	18.30	0.48	0.1242
6	18.30	0.48	18.60	0.49	0.0334
7	18.60	0.49	18.90	0.54	0.1572
8	18.90	0.54	19.20	0.59	0.1748
9	19.20	0.59	19.80	0.69	0.1649
10	19.80	0.69	20.10	0.74	0.1691
11	20.10	0.74	20.40	0.79	0.1536
12	20.40	0.79	20.70	0.83	0.1647
13	20.70	0.83	21.00	0.89	0.2001
14	21.00	0.89	21.30	0.95	0.1909
15	21.30	0.95	21.60	1.00	0.1759
16	21.60	1.00	21.90	1.07	0.2107
17	21.90	1.07	22.20	1.13	0.1894
18	22.20	1.13	22.50	1.19	0.2028
19	22.50	1.19	22.80	1.25	0.2087
20	22.80	1.25	23.10	1.31	0.1989
21	23.10	1.31	23.40	1.38	0.2331
22	23.40	1.38	23.70	1.44	0.1983
23	23.70	1.44	24.00	1.50	0.2226
24	24.00	1.50	24.30	1.58	0.2405
25	24.30	1.58	24.60	1.64	0.1973
26	24.60	1.64	24.90	1.70	0.2181
27	24.90	1.70	25.20	1.78	0.2581
28	25.20	1.78	25.42	1.85	0.2319
29	1024.42	1.85	1024.42	1.91	0.1978
30	1024.42	1.91	1024.42	1.97	0.2217
31	1024.42	1.97	1024.42	2.20	0.2534
32	1024.42	2.20	1024.42	2.26	0.2026
33	1024.42	2.26	1024.42	2.32	0.1997
34	1024.42	2.32	1024.42	2.40	0.2488
35	1024.42	2.40	1024.42	2.77	0.2500
36	1024.42	2.77	1024.42	2.84	0.2377
37	1024.42	2.84	1024.42	2.91	0.2062
38	1024.42	2.91	1024.42	2.97	0.2173
39	1024.42	2.97	1024.42	3.57	0.2477
40	1024.42	3.57	1024.42	3.64	0.2460
41	1024.42	3.64	1024.42	3.71	0.2275
42	1024.42	3.71	1024.42	3.77	0.2068
43	1024.42	3.77	1024.42	4.86	0.2027
44	1024.42	4.86	1024.42	4.92	0.1881

45	1024.42	4.92	1024.42	4.97	0.1790
46	1024.42	4.97	1024.42	5.03	0.1932
47	1024.42	5.03	1024.42	9.09	0.2021

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 7 Existing Undrained



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Date: 10/17/2006 File Name:

Wall Height=12.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=21.48, Pile Length=33.48

MOMENT IN PILE: Max. Moment=88.51 per Pile Spacing=6.0 at Depth=10.85

VERTICAL BEARING CAPACITY: Vertical Loading=0.0, Resistance=43.4, Vertical Factor of Safety=999.00

SYSTEM FACTOR OF SAFETY (Approximate)=1.77

The request embedment is 21.5, the user input fixed embedment = 38.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	16.5	16.5	0.0	14.0	4.1

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	12.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	12.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	4.5	0.16	0.036
2	4.5	0.16	4.8	0.17	0.029
3	4.8	0.17	5.1	0.17	0.022
4	5.1	0.17	6.0	0.19	0.020
5	6.0	0.19	6.3	0.23	0.109
6	6.3	0.23	6.6	0.31	0.292

7	6.6	0.31	6.9	0.38	0.207
8	6.9	0.38	7.2	0.38	0.027
9	7.2	0.38	7.5	0.31	-0.236
10	7.5	0.31	7.8	0.24	-0.238
11	7.8	0.24	12.0	0.33	0.022
12	12.0	0.33	13.2	0.36	0.021
13	13.2	0.36	13.5	0.41	0.158
14	13.5	0.41	13.8	0.53	0.432
15	13.8	0.53	14.1	0.62	0.300
16	14.1	0.62	14.4	0.63	0.031
17	14.4	0.63	14.7	0.64	0.028
18	14.7	0.64	15.0	0.65	0.024
19	15.0	0.65	15.6	0.67	0.032
20	15.6	0.67	15.9	0.68	0.024
21	15.9	0.68	16.2	0.68	0.027
22	16.2	0.68	16.5	0.69	0.033
23	16.5	0.69	16.8	0.70	0.031
24	16.8	0.70	17.4	0.72	0.025
25	17.4	0.72	17.7	0.73	0.031
26	17.7	0.73	18.0	0.74	0.033
27	18.0	0.74	18.3	0.75	0.028
28	18.3	0.75	18.9	0.76	0.026
29	18.9	0.76	19.2	0.77	0.024
30	19.2	0.77	19.5	0.78	0.028
31	19.5	0.78	19.8	0.78	0.027
32	19.8	0.78	21.0	0.81	0.021
33	21.0	0.81	21.3	0.82	0.024
34	21.3	0.82	21.6	0.82	0.028
35	21.6	0.82	21.9	0.83	0.026
36	21.9	0.83	23.7	0.87	0.022
37	23.7	0.87	24.0	0.88	0.026
38	24.0	0.88	24.3	0.89	0.028
39	24.3	0.89	24.6	0.89	0.024
40	24.6	0.89	27.3	0.95	0.022
41	27.3	0.95	27.9	0.97	0.028
42	27.9	0.97	32.1	1.06	0.022
43	32.1	1.07	32.4	1.07	0.025
44	32.4	1.07	32.7	1.08	0.027
45	32.7	1.08	33.0	1.09	0.024
46	33.0	1.09	33.5	1.24	0.022
47	1032.5	1.24	1032.5	1.26	0.026
48	1032.5	1.26	1032.5	1.57	0.023
49	1032.5	1.57	1032.5	1.58	0.026
50	1032.5	1.58	1032.5	1.70	0.023
51	4.7	0.00	7.0	0.14	0.062
52	7.0	0.14	33.5	0.14	0.000

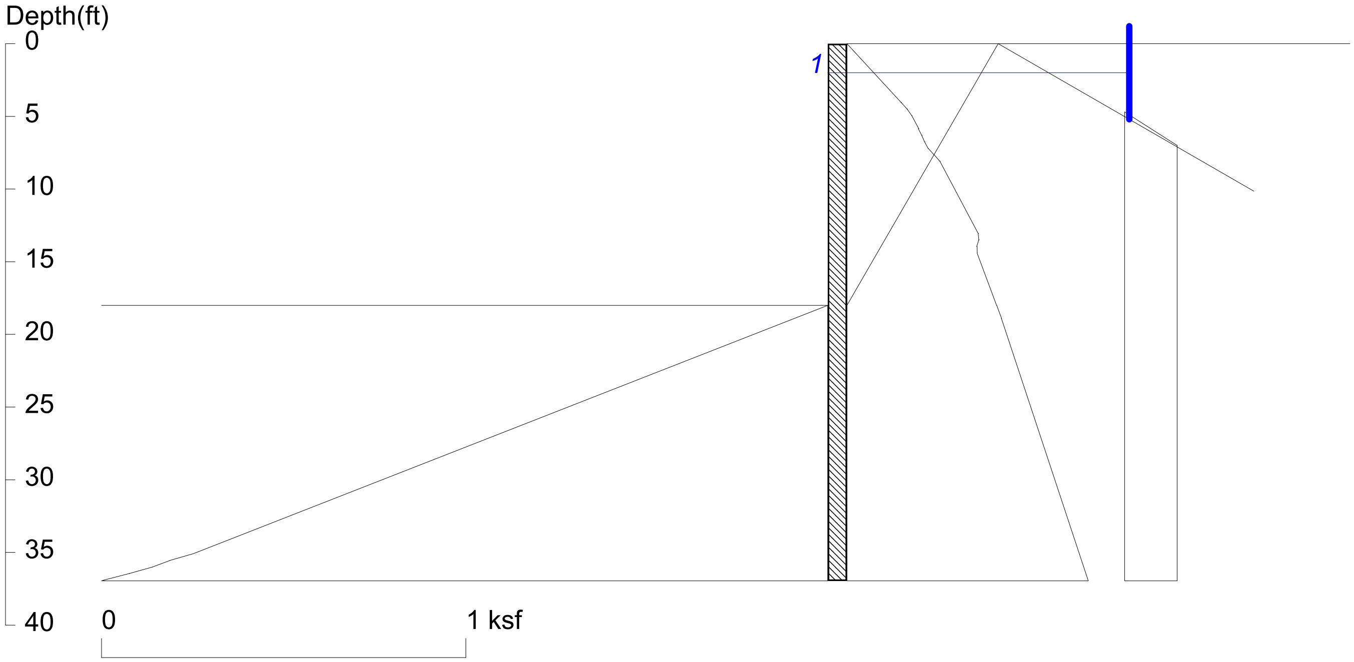
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	12.00	0.00	17.10	0.11	0.0207
2	17.10	0.11	17.40	0.17	0.2008
3	17.40	0.17	17.70	0.21	0.1352
4	17.70	0.21	18.00	0.23	0.0725
5	18.00	0.23	18.30	0.23	0.0125
6	18.30	0.23	18.60	0.23	-0.0164
7	18.60	0.23	18.90	0.27	0.1345
8	18.90	0.27	19.50	0.31	0.0700
9	19.50	0.31	19.80	0.33	0.0711
10	19.80	0.33	20.10	0.35	0.0734

11	20.10	0.35	20.70	0.40	0.0759
12	20.70	0.40	21.00	0.42	0.0675
13	21.00	0.42	21.30	0.44	0.0729
14	21.30	0.44	21.60	0.47	0.0878
15	21.60	0.47	21.90	0.49	0.0806
16	21.90	0.49	22.20	0.51	0.0749
17	22.20	0.51	22.50	0.54	0.0888
18	22.50	0.54	23.10	0.59	0.0816
19	23.10	0.59	23.40	0.62	0.0896
20	23.40	0.62	23.70	0.64	0.0858
21	23.70	0.64	24.00	0.67	0.0881
22	24.00	0.67	24.30	0.69	0.0908
23	24.30	0.69	24.60	0.72	0.0874
24	24.60	0.72	24.90	0.75	0.0953
25	24.90	0.75	25.20	0.78	0.0883
26	25.20	0.78	25.50	0.80	0.0860
27	25.50	0.80	25.80	0.83	0.1042
28	25.80	0.83	26.10	0.86	0.0865
29	26.10	0.86	26.40	0.89	0.0917
30	26.40	0.89	26.70	0.92	0.1072
31	26.70	0.92	27.00	0.94	0.0865
32	27.00	0.94	27.30	0.97	0.0882
33	27.30	0.97	27.60	1.00	0.1081
34	27.60	1.00	27.90	1.03	0.1005
35	27.90	1.03	28.20	1.06	0.0866
36	28.20	1.06	28.50	1.09	0.0935
37	28.50	1.09	29.10	1.15	0.1068
38	29.10	1.15	29.40	1.18	0.0927
39	29.40	1.18	29.70	1.21	0.0870
40	29.70	1.21	30.00	1.24	0.1006
41	30.00	1.24	30.90	1.33	0.1057
42	30.90	1.33	31.20	1.36	0.0928
43	31.20	1.36	31.50	1.39	0.0880
44	31.50	1.39	31.80	1.42	0.1006
45	31.80	1.42	33.30	1.57	0.1049
46	33.30	1.57	33.48	1.60	0.0983
47	1032.48	1.60	1032.48	1.63	0.0895
48	1032.48	1.63	1032.48	1.66	0.0958
49	1032.48	1.66	1032.48	1.97	0.1044
50	1032.48	1.97	1032.48	2.00	0.0985
51	1032.48	2.00	1032.48	2.03	0.0914
52	1032.48	2.03	1032.48	2.06	0.0971
53	1032.48	2.06	1032.48	2.12	0.1040
54	1032.48	2.12	1032.48	2.15	0.0981
55	1032.48	2.15	1032.48	2.17	0.0799
56	1032.48	2.17	1032.48	2.20	0.0783
57	1032.48	2.20	1032.48	2.71	0.0893
58	1032.48	2.71	1032.48	2.75	0.0805
59	1032.48	2.75	1032.48	4.01	0.0891

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 7 Proposed Geometry Drained



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Date: 10/17/2006 File Name:

Wall Height=18.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=18.96, Pile Length=36.96
MOMENT IN PILE: Max. Moment=189.34 per Pile Spacing=6.0 at Depth=14.25

SYSTEM FACTOR OF SAFETY (Approximate)=1.69
The request embedment is 19.0, the user input fixed embedment = 32.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	25.6	25.6	0.0	19.4	6.4

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	18.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	18.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	4.1	0.15	0.037
2	4.1	0.15	4.5	0.17	0.036
3	4.5	0.17	4.9	0.18	0.028
4	4.9	0.18	5.8	0.20	0.021
5	5.8	0.20	6.3	0.20	0.020
6	6.3	0.20	6.8	0.21	0.018
7	6.8	0.21	7.2	0.22	0.022
8	7.2	0.22	7.7	0.24	0.037

9	7.7	0.24	8.1	0.25	0.033
10	8.1	0.25	13.1	0.36	0.021
11	13.1	0.36	13.5	0.36	0.004
12	13.5	0.36	13.9	0.36	-0.012
13	13.9	0.36	14.4	0.36	0.002
14	14.4	0.36	18.0	0.41	0.015
15	18.0	0.41	18.9	0.43	0.015
16	18.9	0.42	37.0	1.36	0.013
17	4.7	0.00	7.0	0.14	0.062
18	7.0	0.14	37.0	0.14	0.000

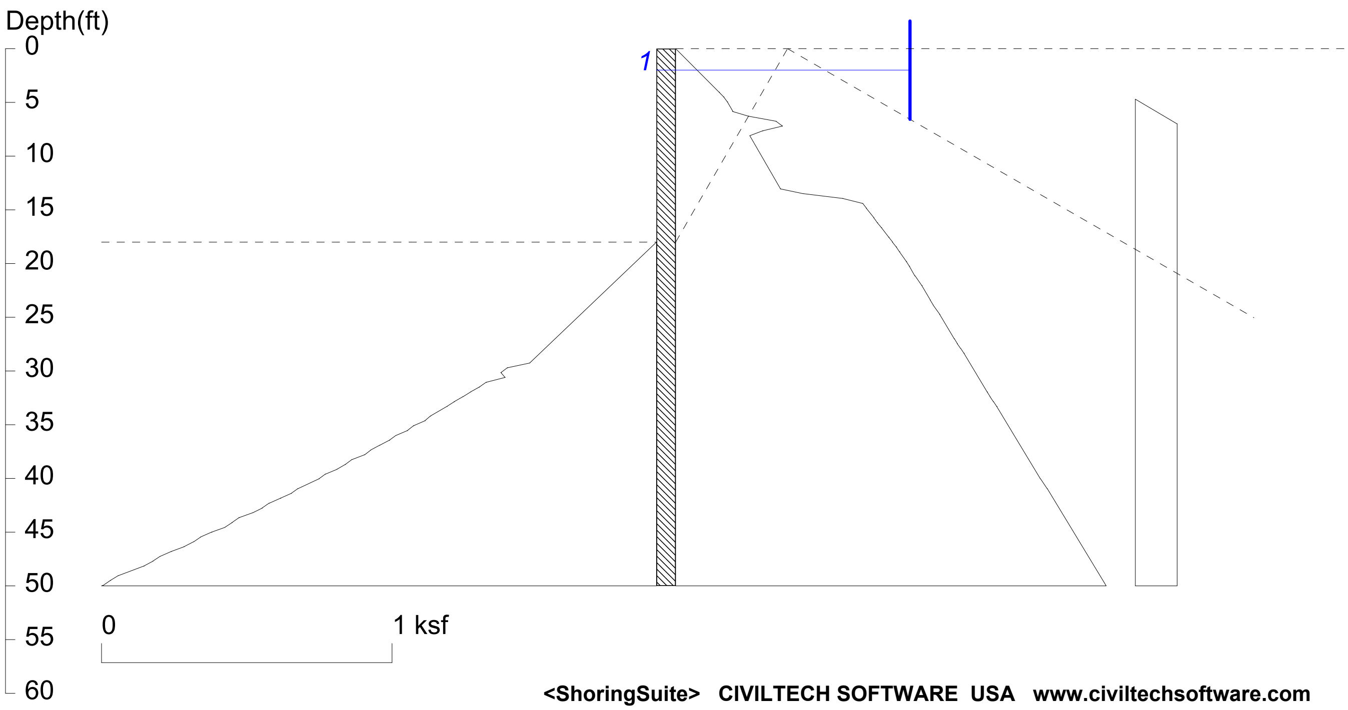
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	18.00	0.00	35.10	1.74	0.1019
2	35.10	1.74	35.55	1.80	0.1388
3	35.55	1.80	36.00	1.85	0.1074
4	36.00	1.85	36.45	1.92	0.1423
5	36.45	1.92	36.90	1.99	0.1545
6	36.90	1.99	36.96	2.04	0.1181
7	1035.96	2.04	1035.96	2.13	0.1976
8	1035.96	2.13	1035.96	2.18	0.1199
9	1035.96	2.18	1035.96	2.24	0.1375
10	1035.96	2.24	1035.96	2.34	0.2029
11	1035.96	2.34	1035.96	2.39	0.1163
12	1035.96	2.39	1035.96	2.46	0.1649
13	1035.96	2.46	1035.96	2.56	0.2064
14	1035.96	2.56	1035.96	2.61	0.1161
15	1035.96	2.61	1035.96	2.67	0.1496
16	1035.96	2.67	1035.96	2.78	0.2347
17	1035.96	2.78	1035.96	2.85	0.1416
18	1035.96	2.85	1035.96	2.90	0.1144
19	1035.96	2.90	1035.96	2.99	0.2034
20	1035.96	2.99	1035.96	3.09	0.2263
21	1035.96	3.09	1035.96	3.16	0.1473
22	1035.96	3.16	1035.96	3.21	0.1164
23	1035.96	3.21	1035.96	3.29	0.1921
24	1035.96	3.29	1035.96	3.49	0.2196
25	1035.96	3.49	1035.96	3.55	0.1293
26	1035.96	3.55	1035.96	3.60	0.1185
27	1035.96	3.60	1035.96	3.70	0.2062
28	1035.96	3.70	1035.96	3.99	0.2143
29	1035.96	3.99	1035.96	4.04	0.1251
30	1035.96	4.04	1035.96	4.10	0.1222
31	1035.96	4.10	1035.96	4.57	0.2093
32	1035.96	4.57	1035.96	4.65	0.1817
33	1035.96	4.65	1035.96	4.71	0.1285
34	1035.96	4.71	1035.96	4.78	0.1553
35	1035.96	4.78	1035.96	5.52	0.2069
36	1035.96	5.52	1035.96	5.59	0.1523
37	1035.96	5.59	1035.96	5.65	0.1347
38	1035.96	5.65	1035.96	5.74	0.1881
39	1035.96	5.74	1035.96	6.93	0.2045
40	1035.96	6.93	1035.96	7.02	0.1931
41	1035.96	7.02	1035.96	7.09	0.1446
42	1035.96	7.09	1035.96	7.16	0.1552
43	1035.96	7.16	1035.96	9.99	0.2030
44	1035.96	9.99	1035.96	10.06	0.1705
45	1035.96	10.06	1035.96	10.14	0.1580
46	1035.96	10.14	1035.96	10.22	0.1900

47	1035.96	10.22	1035.96	12.13	0.2022

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 7 Proposed Geometry Undrained



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Date: 10/17/2006 File Name:

Wall Height=18.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=32.00, Pile Length=50.00
MOMENT IN PILE: Max. Moment=324.47 per Pile Spacing=6.0 at Depth=16.08

SYSTEM FACTOR OF SAFETY=0.88
The request embedment is 19.0, the user input fixed embedment = 32. The system may be not stable!

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	36.6	36.6	0.0	21.8	9.2

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	18.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	18.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	4.1	0.15	0.037
2	4.1	0.15	4.5	0.17	0.036
3	4.5	0.17	4.9	0.18	0.028
4	4.9	0.18	5.8	0.20	0.021
5	5.8	0.20	6.3	0.25	0.123
6	6.3	0.25	6.8	0.34	0.209
7	6.8	0.34	7.2	0.37	0.049
8	7.2	0.37	7.7	0.30	-0.154

9	7.7	0.30	8.1	0.25	-0.097
10	8.1	0.25	13.1	0.36	0.021
11	13.1	0.36	13.5	0.44	0.176
12	13.5	0.44	13.9	0.57	0.302
13	13.9	0.57	14.4	0.64	0.152
14	14.4	0.64	14.9	0.66	0.028
15	14.9	0.66	15.8	0.68	0.029
16	15.8	0.68	16.2	0.69	0.027
17	16.2	0.69	16.6	0.71	0.030
18	16.6	0.71	17.5	0.73	0.028
19	17.5	0.73	18.0	0.75	0.031
20	18.0	0.75	18.5	0.76	0.029
21	18.5	0.76	18.9	0.77	0.025
22	18.9	0.77	19.8	0.79	0.026
23	19.8	0.79	20.3	0.80	0.023
24	20.3	0.80	21.1	0.82	0.021
25	21.1	0.82	22.0	0.85	0.026
26	22.0	0.85	23.4	0.88	0.022
27	23.4	0.88	23.9	0.89	0.023
28	23.9	0.89	24.8	0.91	0.026
29	24.8	0.91	27.0	0.96	0.022
30	27.0	0.96	27.5	0.97	0.024
31	27.5	0.97	27.9	0.98	0.026
32	27.9	0.98	28.4	0.99	0.024
33	28.4	0.99	32.0	1.07	0.022
34	32.0	1.07	32.4	1.08	0.023
35	32.4	1.08	32.8	1.09	0.026
36	32.8	1.09	33.3	1.11	0.025
37	33.3	1.11	40.0	1.26	0.022
38	40.0	1.26	41.0	1.28	0.025
39	41.0	1.28	50.0	1.58	0.022
40	1049.0	1.58	1049.0	1.60	0.025
41	1049.0	1.60	1049.0	2.39	0.023
42	4.7	0.00	7.0	0.14	0.062
43	7.0	0.14	50.0	0.14	0.000

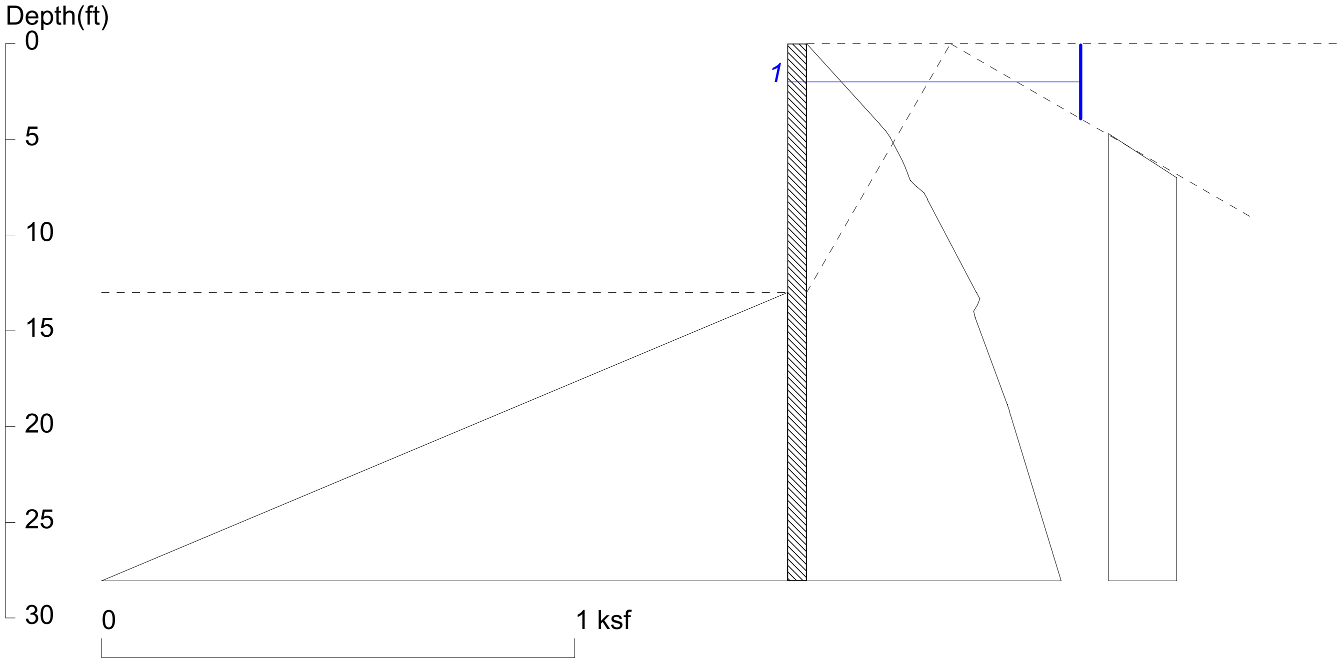
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	18.00	0.00	29.25	0.44	0.0388
2	29.25	0.44	29.70	0.51	0.1730
3	29.70	0.51	30.15	0.54	0.0489
4	30.15	0.54	30.60	0.52	-0.0328
5	30.60	0.52	31.05	0.59	0.1465
6	31.05	0.59	31.50	0.61	0.0525
7	31.50	0.61	31.95	0.64	0.0651
8	31.95	0.64	32.40	0.67	0.0587
9	32.40	0.67	32.85	0.70	0.0658
10	32.85	0.70	33.30	0.72	0.0574
11	33.30	0.72	34.20	0.78	0.0633
12	34.20	0.78	34.65	0.80	0.0421
13	34.65	0.80	35.10	0.84	0.0876
14	35.10	0.84	35.55	0.86	0.0472
15	35.55	0.86	36.00	0.90	0.0865
16	36.00	0.90	36.45	0.92	0.0506
17	36.45	0.92	36.90	0.95	0.0722
18	36.90	0.95	37.35	0.98	0.0684
19	37.35	0.98	37.80	1.00	0.0481
20	37.80	1.00	38.25	1.05	0.0967
21	38.25	1.05	38.70	1.07	0.0513

22	38.70	1.07	39.15	1.10	0.0634
23	39.15	1.10	39.60	1.14	0.0887
24	39.60	1.14	40.05	1.16	0.0510
25	40.05	1.16	40.95	1.24	0.0795
26	40.95	1.24	41.40	1.26	0.0515
27	41.40	1.26	41.85	1.29	0.0828
28	41.85	1.29	42.30	1.33	0.0852
29	42.30	1.33	42.75	1.36	0.0525
30	42.75	1.36	43.20	1.39	0.0747
31	43.20	1.39	43.65	1.44	0.1017
32	43.65	1.44	44.10	1.46	0.0540
33	44.10	1.46	44.55	1.49	0.0560
34	44.55	1.49	45.00	1.53	0.1021
35	45.00	1.53	45.45	1.57	0.0829
36	45.45	1.57	45.90	1.59	0.0543
37	45.90	1.59	46.35	1.63	0.0723
38	46.35	1.63	46.80	1.67	0.0995
39	46.80	1.67	47.25	1.71	0.0829
40	47.25	1.71	47.70	1.73	0.0554
41	47.70	1.73	48.15	1.76	0.0709
42	48.15	1.76	49.05	1.85	0.0973
43	49.05	1.85	49.50	1.88	0.0611
44	49.50	1.88	49.95	1.91	0.0560
45	49.95	1.91	50.00	1.95	0.0913
46	1049.00	1.95	1049.00	2.03	0.0954
47	1049.00	2.03	1049.00	2.06	0.0648
48	1049.00	2.06	1049.00	2.09	0.0574
49	1049.00	2.09	1049.00	2.13	0.0873
50	1049.00	2.13	1049.00	2.25	0.0939
51	1049.00	2.25	1049.00	2.28	0.0605
52	1049.00	2.28	1049.00	2.31	0.0588
53	1049.00	2.31	1049.00	2.35	0.0916
54	1049.00	2.35	1049.00	2.47	0.0926
55	1049.00	2.47	1049.00	2.51	0.0907
56	1049.00	2.51	1049.00	2.54	0.0609
57	1049.00	2.54	1049.00	2.57	0.0624
58	1049.00	2.57	1049.00	2.82	0.0916
59	1049.00	2.82	1049.00	2.85	0.0727
60	1049.00	2.85	1049.00	2.88	0.0624

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 7 Min. Passing Geometry Drained



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Date: 10/17/2006 File Name:

Wall Height=13.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=15.06, Pile Length=28.06
MOMENT IN PILE: Max. Moment=81.70 per Pile Spacing=6.0 at Depth=10.75

VERTICAL BEARING CAPACITY: Vertical Loading=0.0, Resistance=34.1, Vertical Factor of Safety=999.00

SYSTEM FACTOR OF SAFETY (Approximate)=2.46
The request embedment is 15.1, the user input fixed embedment = 37.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	15.4	15.4	0.0	14.3	3.8

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	13.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	13.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	4.2	0.16	0.037
2	4.2	0.16	4.6	0.17	0.036
3	4.6	0.17	4.9	0.18	0.028
4	4.9	0.18	6.2	0.20	0.021
5	6.2	0.20	6.5	0.21	0.019
6	6.5	0.21	6.8	0.21	0.016

7	6.8	0.21	7.2	0.22	0.015
8	7.2	0.22	7.5	0.23	0.041
9	7.5	0.23	7.8	0.25	0.046
10	7.8	0.25	8.1	0.25	0.023
11	8.1	0.25	13.0	0.36	0.021
12	13.0	0.36	13.3	0.37	0.021
13	13.3	0.37	13.6	0.36	-0.015
14	13.6	0.36	14.0	0.35	-0.025
15	14.0	0.35	14.3	0.36	0.008
16	14.3	0.36	18.9	0.42	0.015
17	18.9	0.42	19.2	0.43	0.014
18	19.2	0.43	28.1	1.00	0.012
19	4.7	0.00	7.0	0.14	0.062
20	7.0	0.14	28.1	0.14	0.000

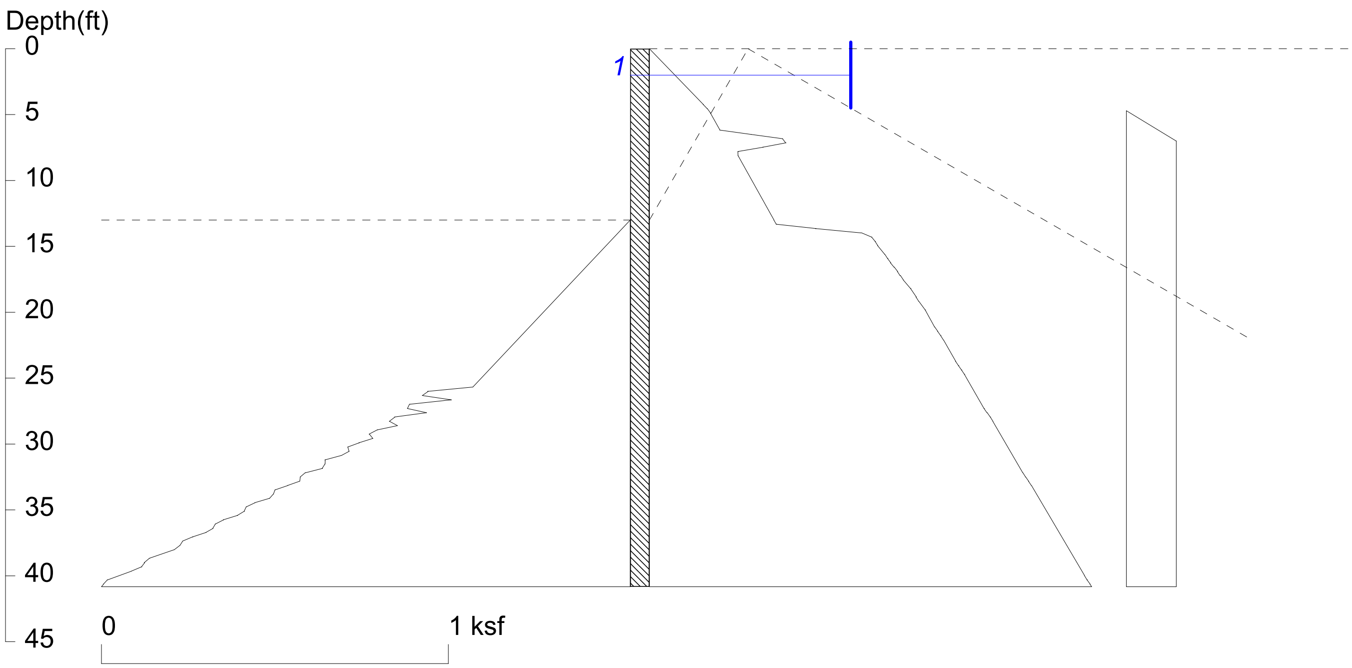
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	13.00	0.00	28.06	1.66	0.0962
2	1027.06	1.66	1027.06	1.69	0.1095
3	1027.06	1.69	1027.06	1.76	0.2065
4	1027.06	1.76	1027.06	1.79	0.0875
5	1027.06	1.79	1027.06	1.80	0.0471
6	1027.06	1.80	1027.06	1.89	0.2664
7	1027.06	1.89	1027.06	1.93	0.1116
8	1027.06	1.93	1027.06	1.94	0.0394
9	1027.06	1.94	1027.06	2.02	0.2371
10	1027.06	2.02	1027.06	2.08	0.1869
11	1027.06	2.08	1027.06	2.09	0.0479
12	1027.06	2.09	1027.06	2.14	0.1459
13	1027.06	2.14	1027.06	2.23	0.2745
14	1027.06	2.23	1027.06	2.26	0.0938
15	1027.06	2.26	1027.06	2.28	0.0488
16	1027.06	2.28	1027.06	2.35	0.2212
17	1027.06	2.35	1027.06	2.43	0.2580
18	1027.06	2.43	1027.06	2.46	0.0924
19	1027.06	2.46	1027.06	2.48	0.0535
20	1027.06	2.48	1027.06	2.55	0.2127
21	1027.06	2.55	1027.06	2.63	0.2450
22	1027.06	2.63	1027.06	2.69	0.1771
23	1027.06	2.69	1027.06	2.70	0.0608
24	1027.06	2.70	1027.06	2.75	0.1236
25	1027.06	2.75	1027.06	2.90	0.2347
26	1027.06	2.90	1027.06	2.96	0.1816
27	1027.06	2.96	1027.06	2.98	0.0658
28	1027.06	2.98	1027.06	3.02	0.1146
29	1027.06	3.02	1027.06	3.24	0.2263
30	1027.06	3.24	1027.06	3.29	0.1548
31	1027.06	3.29	1027.06	3.31	0.0706
32	1027.06	3.31	1027.06	3.36	0.1388
33	1027.06	3.36	1027.06	3.64	0.2196
34	1027.06	3.64	1027.06	3.69	0.1467
35	1027.06	3.69	1027.06	3.71	0.0767
36	1027.06	3.71	1027.06	3.76	0.1470
37	1027.06	3.76	1027.06	4.18	0.2143
38	1027.06	4.18	1027.06	4.21	0.0878
39	1027.06	4.21	1027.06	4.23	0.0830
40	1027.06	4.23	1027.06	4.30	0.2074
41	1027.06	4.30	1027.06	4.85	0.2101
42	1027.06	4.85	1027.06	4.88	0.0971

43	1027.06	4.88	1027.06	4.91	0.0921
44	1027.06	4.91	1027.06	4.97	0.2035
45	1027.06	4.97	1027.06	5.78	0.2069
46	1027.06	5.78	1027.06	5.83	0.1338
47	1027.06	5.83	1027.06	5.86	0.1036
48	1027.06	5.86	1027.06	5.92	0.1755
49	1027.06	5.92	1027.06	7.31	0.2045
50	1027.06	7.31	1027.06	7.36	0.1333
51	1027.06	7.36	1027.06	7.39	0.1179
52	1027.06	7.39	1027.06	7.45	0.1883
53	1027.06	7.45	1027.06	7.92	0.2030

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 7 Min. Passing Geometry Undrained



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Date: 10/17/2006 File Name:

Wall Height=13.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=27.83, Pile Length=40.83

MOMENT IN PILE: Max. Moment=120.37 per Pile Spacing=6.0 at Depth=12.01

VERTICAL BEARING CAPACITY: Vertical Loading=0.0, Resistance=54.1, Vertical Factor of Safety=999.00

SYSTEM FACTOR OF SAFETY (Approximate)=1.33

The request embedment is 27.8, the user input fixed embedment = 37.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	20.0	20.0	0.0	15.3	5.0

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	13.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	13.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	4.2	0.16	0.037
2	4.2	0.16	4.6	0.17	0.036
3	4.6	0.17	4.9	0.18	0.028
4	4.9	0.18	6.2	0.20	0.021
5	6.2	0.20	6.5	0.29	0.277
6	6.5	0.29	6.8	0.38	0.281

7	6.8	0.38	7.2	0.39	0.028
8	7.2	0.39	7.5	0.33	-0.202
9	7.5	0.33	7.8	0.25	-0.224
10	7.8	0.25	8.1	0.26	0.003
11	8.1	0.26	13.0	0.36	0.021
12	13.0	0.36	13.3	0.37	0.021
13	13.3	0.37	13.6	0.48	0.347
14	13.6	0.48	14.0	0.61	0.408
15	14.0	0.61	14.3	0.64	0.090
16	14.3	0.64	14.6	0.65	0.030
17	14.6	0.65	14.9	0.66	0.023
18	14.9	0.66	15.6	0.68	0.031
19	15.6	0.68	15.9	0.69	0.024
20	15.9	0.69	16.3	0.69	0.027
21	16.3	0.69	16.6	0.71	0.032
22	16.6	0.71	16.9	0.71	0.029
23	16.9	0.71	17.2	0.72	0.025
24	17.2	0.72	17.5	0.73	0.026
25	17.5	0.73	18.2	0.75	0.033
26	18.2	0.75	18.9	0.77	0.026
27	18.9	0.77	19.2	0.78	0.024
28	19.2	0.78	19.8	0.80	0.028
29	19.8	0.80	21.1	0.82	0.021
30	21.1	0.82	21.5	0.83	0.026
31	21.5	0.83	21.8	0.84	0.028
32	21.8	0.84	22.1	0.85	0.023
33	22.1	0.85	23.7	0.88	0.022
34	23.7	0.88	24.0	0.89	0.025
35	24.0	0.89	24.4	0.90	0.028
36	24.4	0.90	24.7	0.91	0.024
37	24.7	0.91	27.3	0.96	0.022
38	27.3	0.96	27.6	0.97	0.026
39	27.6	0.97	28.0	0.98	0.027
40	28.0	0.98	28.3	0.99	0.024
41	28.3	0.99	32.2	1.08	0.022
42	32.2	1.08	32.5	1.09	0.024
43	32.5	1.09	32.8	1.09	0.027
44	32.8	1.09	33.2	1.10	0.025
45	33.2	1.10	40.0	1.25	0.022
46	40.0	1.25	40.3	1.26	0.024
47	40.3	1.26	40.6	1.27	0.026
48	40.6	1.27	40.8	1.28	0.025
49	1039.8	1.28	1039.8	1.59	0.022
50	1039.8	1.59	1039.8	1.60	0.025
51	1039.8	1.60	1039.8	1.82	0.023
52	4.7	0.00	7.0	0.14	0.062
53	7.0	0.14	40.8	0.14	0.000

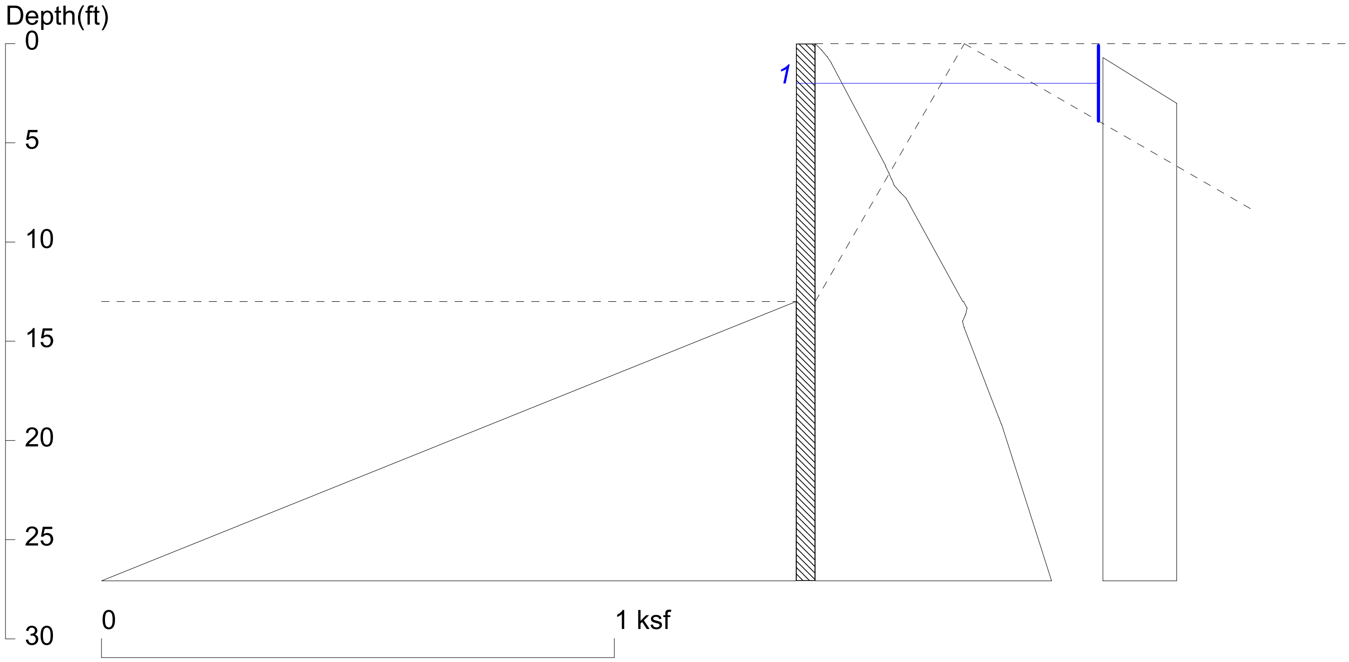
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	13.00	0.00	25.67	0.45	0.0358
2	25.67	0.45	26.00	0.58	0.3943
3	26.00	0.58	26.32	0.60	0.0535
4	26.32	0.60	26.65	0.52	-0.2529
5	26.65	0.52	26.97	0.64	0.3652
6	26.97	0.64	27.30	0.64	0.0187
7	27.30	0.64	27.62	0.59	-0.1704
8	27.62	0.59	27.95	0.68	0.2800
9	27.95	0.68	28.27	0.69	0.0505

10	28.27	0.69	28.60	0.67	-0.0705
11	28.60	0.67	28.92	0.73	0.1772
12	28.92	0.73	29.25	0.75	0.0721
13	29.25	0.75	29.57	0.74	-0.0323
14	29.57	0.74	29.90	0.78	0.1202
15	29.90	0.78	30.22	0.81	0.1027
16	30.22	0.81	30.55	0.81	-0.0114
17	30.55	0.81	30.87	0.83	0.0715
18	30.87	0.83	31.20	0.88	0.1401
19	31.20	0.88	31.52	0.88	0.0022
20	31.52	0.88	31.85	0.89	0.0234
21	31.85	0.89	32.17	0.94	0.1517
22	32.17	0.94	32.50	0.95	0.0439
23	32.50	0.95	32.82	0.95	0.0051
24	32.82	0.95	33.15	0.99	0.1061
25	33.15	0.99	33.47	1.02	0.1145
26	33.47	1.02	33.80	1.03	0.0144
27	33.80	1.03	34.12	1.04	0.0330
28	34.12	1.04	34.45	1.08	0.1280
29	34.45	1.08	34.77	1.11	0.0799
30	34.77	1.11	35.10	1.11	0.0178
31	35.10	1.11	35.42	1.13	0.0620
32	35.42	1.13	35.75	1.17	0.1202
33	35.75	1.17	36.07	1.20	0.0728
34	36.07	1.20	36.40	1.20	0.0216
35	36.40	1.20	36.72	1.22	0.0660
36	36.72	1.22	37.05	1.26	0.1142
37	37.05	1.26	37.37	1.29	0.0889
38	37.37	1.29	37.70	1.30	0.0256
39	37.70	1.30	38.02	1.32	0.0484
40	38.02	1.32	38.67	1.39	0.1093
41	38.67	1.39	39.00	1.40	0.0457
42	39.00	1.40	39.32	1.41	0.0276
43	39.32	1.41	39.65	1.44	0.0892
44	39.65	1.44	40.30	1.51	0.1054
45	40.30	1.51	40.62	1.52	0.0357
46	40.62	1.52	40.83	1.53	0.0303
47	1039.83	1.53	1039.83	1.56	0.0984
48	1039.83	1.56	1039.83	1.63	0.1021
49	1039.83	1.63	1039.83	1.64	0.0567
50	1039.83	1.64	1039.83	1.66	0.0334
51	1039.83	1.66	1039.83	1.68	0.0775
52	1039.83	1.68	1039.83	1.78	0.0995
53	1039.83	1.78	1039.83	1.79	0.0452
54	1039.83	1.79	1039.83	1.80	0.0358
55	1039.83	1.80	1039.83	1.83	0.0891
56	1039.83	1.83	1039.83	1.93	0.0973
57	1039.83	1.93	1039.83	1.95	0.0741
58	1039.83	1.95	1039.83	1.97	0.0389
59	1039.83	1.97	1039.83	1.99	0.0611
60	1039.83	1.99	1039.83	2.11	0.0954

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 7 Min. Passing Geometry Drained High Water



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Date: 10/17/2006   File Name:

Wall Height=13.0   Pile Diameter=0.5   Pile Spacing=6.0   Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=14.08,   Pile Length=27.08
MOMENT IN PILE: Max. Moment=69.45 per Pile Spacing=6.0 at Depth=10.57

SYSTEM FACTOR OF SAFETY (Approximate)=2.63
The request embedment is 14.1, the user input fixed embedment = 37.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	15.2	15.2	0.0	14.3	3.8

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	13.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	13.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	0.3	0.01	0.037
2	0.3	0.01	0.6	0.02	0.034
3	0.6	0.02	1.0	0.03	0.026
4	1.0	0.03	6.2	0.14	0.020
5	6.2	0.14	6.5	0.14	0.019
6	6.5	0.14	6.8	0.15	0.016
7	6.8	0.15	7.2	0.15	0.015
8	7.2	0.15	7.5	0.17	0.034

9	7.5	0.17	7.8	0.18	0.038
10	7.8	0.18	8.1	0.18	0.023
11	8.1	0.18	13.0	0.29	0.021
12	13.0	0.29	13.3	0.30	0.021
13	13.3	0.30	13.6	0.29	-0.009
14	13.6	0.29	14.0	0.29	-0.017
15	14.0	0.29	14.3	0.29	0.010
16	14.3	0.29	18.9	0.36	0.015
17	18.9	0.36	19.2	0.36	0.014
18	19.2	0.36	27.1	0.93	0.012
19	0.7	0.00	3.0	0.14	0.062
20	3.0	0.14	27.1	0.14	0.000

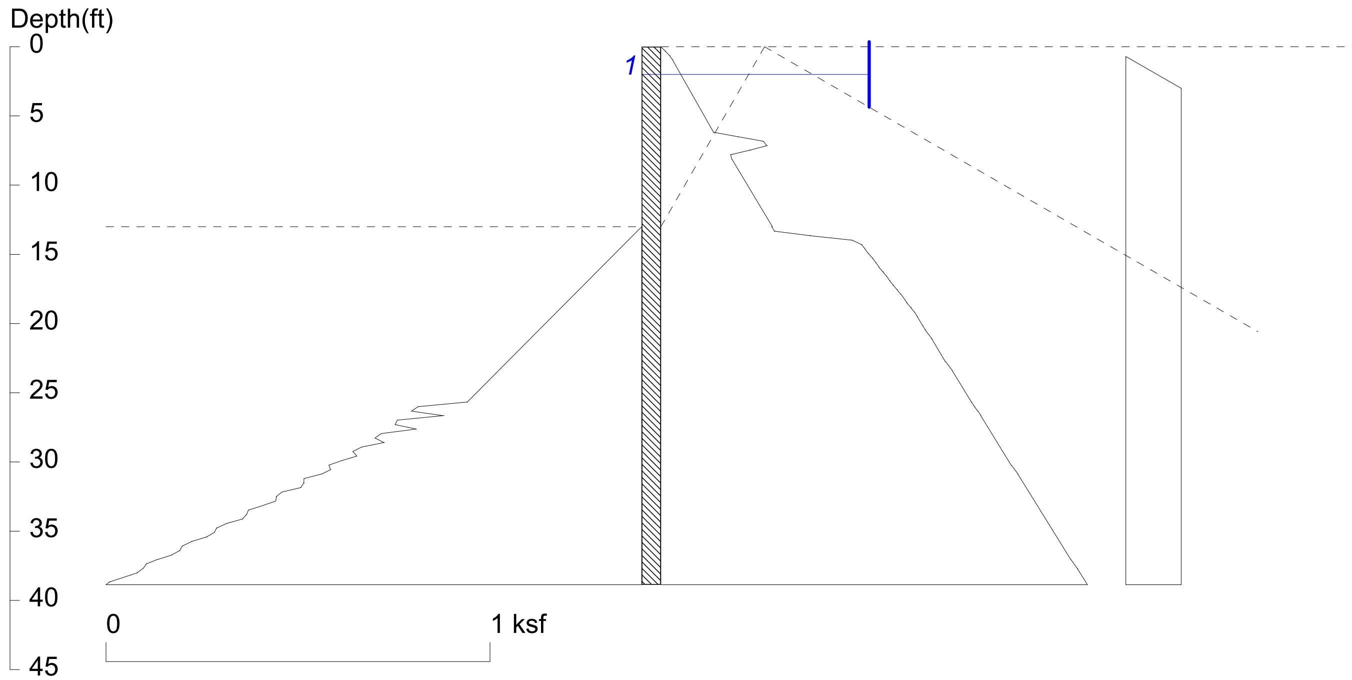
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	13.00	0.00	27.08	1.66	0.0962
2	1026.08	1.66	1026.08	1.69	0.1095
3	1026.08	1.69	1026.08	1.76	0.2065
4	1026.08	1.76	1026.08	1.79	0.0875
5	1026.08	1.79	1026.08	1.80	0.0471
6	1026.08	1.80	1026.08	1.89	0.2664
7	1026.08	1.89	1026.08	1.93	0.1116
8	1026.08	1.93	1026.08	1.94	0.0394
9	1026.08	1.94	1026.08	2.02	0.2371
10	1026.08	2.02	1026.08	2.08	0.1869
11	1026.08	2.08	1026.08	2.09	0.0479
12	1026.08	2.09	1026.08	2.14	0.1459
13	1026.08	2.14	1026.08	2.23	0.2745
14	1026.08	2.23	1026.08	2.26	0.0938
15	1026.08	2.26	1026.08	2.28	0.0488
16	1026.08	2.28	1026.08	2.35	0.2212
17	1026.08	2.35	1026.08	2.43	0.2580
18	1026.08	2.43	1026.08	2.46	0.0924
19	1026.08	2.46	1026.08	2.48	0.0535
20	1026.08	2.48	1026.08	2.55	0.2127
21	1026.08	2.55	1026.08	2.63	0.2450
22	1026.08	2.63	1026.08	2.69	0.1771
23	1026.08	2.69	1026.08	2.70	0.0608
24	1026.08	2.70	1026.08	2.75	0.1236
25	1026.08	2.75	1026.08	2.90	0.2347
26	1026.08	2.90	1026.08	2.96	0.1816
27	1026.08	2.96	1026.08	2.98	0.0658
28	1026.08	2.98	1026.08	3.02	0.1146
29	1026.08	3.02	1026.08	3.24	0.2263
30	1026.08	3.24	1026.08	3.29	0.1548
31	1026.08	3.29	1026.08	3.31	0.0706
32	1026.08	3.31	1026.08	3.36	0.1388
33	1026.08	3.36	1026.08	3.64	0.2196
34	1026.08	3.64	1026.08	3.69	0.1467
35	1026.08	3.69	1026.08	3.71	0.0767
36	1026.08	3.71	1026.08	3.76	0.1470
37	1026.08	3.76	1026.08	4.18	0.2143
38	1026.08	4.18	1026.08	4.21	0.0878
39	1026.08	4.21	1026.08	4.23	0.0830
40	1026.08	4.23	1026.08	4.30	0.2074
41	1026.08	4.30	1026.08	4.85	0.2101
42	1026.08	4.85	1026.08	4.88	0.0971
43	1026.08	4.88	1026.08	4.91	0.0921
44	1026.08	4.91	1026.08	4.97	0.2035

45	1026.08	4.97	1026.08	5.78	0.2069
46	1026.08	5.78	1026.08	5.83	0.1338
47	1026.08	5.83	1026.08	5.86	0.1036
48	1026.08	5.86	1026.08	5.92	0.1755
49	1026.08	5.92	1026.08	7.31	0.2045
50	1026.08	7.31	1026.08	7.36	0.1333
51	1026.08	7.36	1026.08	7.39	0.1179
52	1026.08	7.39	1026.08	7.45	0.1883
53	1026.08	7.45	1026.08	7.92	0.2030

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 7 Min. Passing Geometery Undrained High Water



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Date: 10/17/2006 File Name:

Wall Height=13.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=25.87, Pile Length=38.87

MOMENT IN PILE: Max. Moment=100.52 per Pile Spacing=6.0 at Depth=11.82

SYSTEM FACTOR OF SAFETY (Approximate)=1.43

The request embedment is 25.9, the user input fixed embedment = 37.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	18.9	18.9	0.0	15.1	4.7

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	13.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	13.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	0.3	0.01	0.037
2	0.3	0.01	0.6	0.02	0.034
3	0.6	0.02	1.0	0.03	0.026
4	1.0	0.03	6.2	0.14	0.020
5	6.2	0.14	6.5	0.20	0.197
6	6.5	0.20	6.8	0.27	0.201
7	6.8	0.27	7.2	0.28	0.028
8	7.2	0.28	7.5	0.23	-0.136

9	7.5	0.23	7.8	0.18	-0.152
10	7.8	0.18	8.1	0.19	0.008
11	8.1	0.19	13.0	0.29	0.022
12	13.0	0.29	13.3	0.30	0.021
13	13.3	0.30	13.6	0.39	0.286
14	13.6	0.39	14.0	0.50	0.336
15	14.0	0.50	14.3	0.52	0.078
16	14.3	0.52	14.6	0.53	0.028
17	14.6	0.53	14.9	0.54	0.027
18	14.9	0.54	15.3	0.55	0.030
19	15.3	0.55	15.6	0.56	0.028
20	15.6	0.56	15.9	0.57	0.026
21	15.9	0.57	16.3	0.58	0.031
22	16.3	0.58	16.6	0.59	0.030
23	16.6	0.59	16.9	0.60	0.025
24	16.9	0.60	17.2	0.61	0.028
25	17.2	0.61	17.5	0.62	0.031
26	17.5	0.62	17.9	0.63	0.029
27	17.9	0.63	18.5	0.64	0.026
28	18.5	0.64	18.9	0.65	0.030
29	18.9	0.65	19.2	0.66	0.029
30	19.2	0.66	19.5	0.67	0.022
31	19.5	0.67	20.1	0.68	0.021
32	20.1	0.68	20.5	0.69	0.023
33	20.5	0.69	20.8	0.70	0.027
34	20.8	0.70	21.1	0.71	0.026
35	21.1	0.71	22.8	0.74	0.022
36	22.8	0.74	23.4	0.76	0.027
37	23.4	0.76	25.7	0.81	0.022
38	25.7	0.81	26.0	0.82	0.024
39	26.0	0.82	26.3	0.83	0.027
40	26.3	0.83	26.6	0.83	0.024
41	26.6	0.83	30.2	0.91	0.022
42	30.2	0.91	30.9	0.93	0.026
43	30.9	0.93	37.0	1.07	0.022
44	37.0	1.07	37.7	1.09	0.026
45	37.7	1.09	38.9	1.35	0.022
46	1037.9	1.35	1037.9	1.36	0.024
47	1037.9	1.36	1037.9	1.71	0.023
48	0.7	0.00	3.0	0.14	0.062
49	3.0	0.14	38.9	0.14	0.000

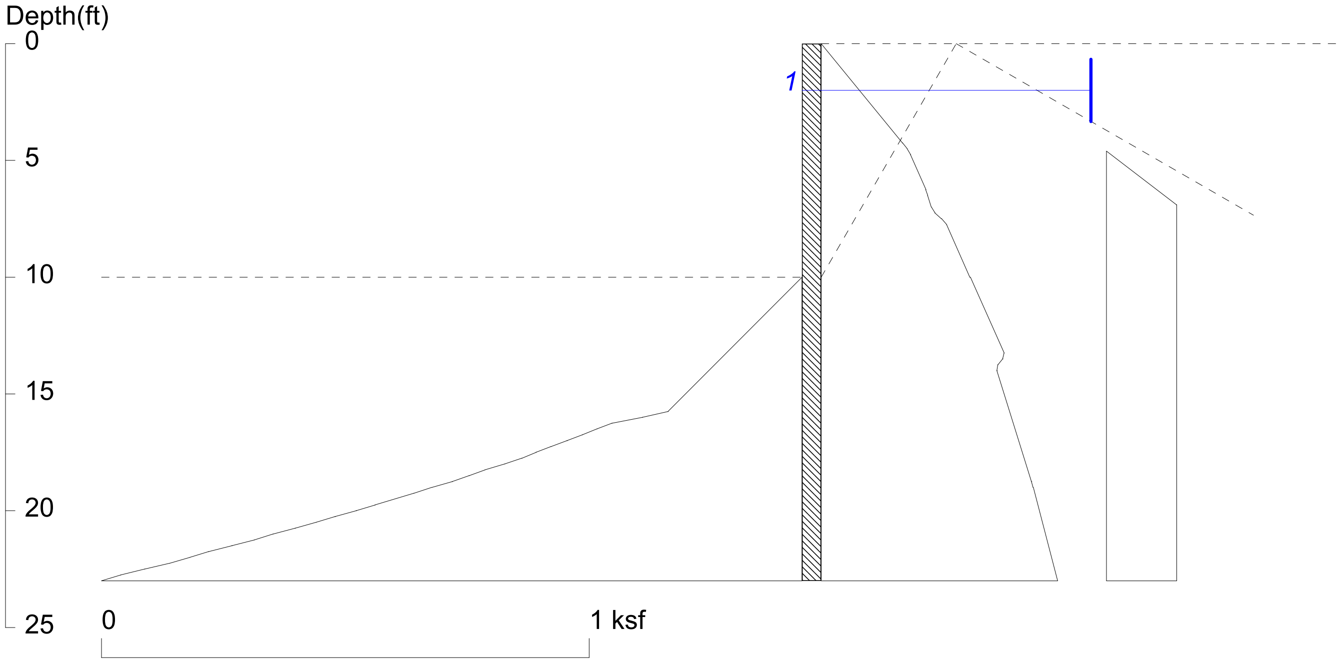
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	13.00	0.00	25.67	0.45	0.0358
2	25.67	0.45	26.00	0.58	0.3943
3	26.00	0.58	26.33	0.60	0.0535
4	26.33	0.60	26.65	0.52	-0.2529
5	26.65	0.52	26.98	0.64	0.3652
6	26.98	0.64	27.30	0.64	0.0187
7	27.30	0.64	27.63	0.59	-0.1704
8	27.63	0.59	27.95	0.68	0.2800
9	27.95	0.68	28.27	0.69	0.0505
10	28.27	0.69	28.60	0.67	-0.0705
11	28.60	0.67	28.92	0.73	0.1772
12	28.92	0.73	29.25	0.75	0.0721
13	29.25	0.75	29.58	0.74	-0.0323
14	29.58	0.74	29.90	0.78	0.1202
15	29.90	0.78	30.23	0.81	0.1027

16	30.23	0.81	30.55	0.81	-0.0114
17	30.55	0.81	30.88	0.83	0.0715
18	30.88	0.83	31.20	0.88	0.1401
19	31.20	0.88	31.52	0.88	0.0022
20	31.52	0.88	31.85	0.89	0.0234
21	31.85	0.89	32.17	0.94	0.1517
22	32.17	0.94	32.50	0.95	0.0439
23	32.50	0.95	32.83	0.95	0.0051
24	32.83	0.95	33.15	0.99	0.1061
25	33.15	0.99	33.47	1.02	0.1145
26	33.47	1.02	33.80	1.03	0.0144
27	33.80	1.03	34.13	1.04	0.0330
28	34.13	1.04	34.45	1.08	0.1280
29	34.45	1.08	34.78	1.11	0.0799
30	34.78	1.11	35.10	1.11	0.0178
31	35.10	1.11	35.42	1.13	0.0620
32	35.42	1.13	35.75	1.17	0.1202
33	35.75	1.17	36.08	1.20	0.0728
34	36.08	1.20	36.40	1.20	0.0216
35	36.40	1.20	36.72	1.22	0.0660
36	36.72	1.22	37.05	1.26	0.1142
37	37.05	1.26	37.38	1.29	0.0889
38	37.38	1.29	37.70	1.30	0.0256
39	37.70	1.30	38.03	1.32	0.0484
40	38.03	1.32	38.67	1.39	0.1093
41	38.67	1.39	38.87	1.40	0.0457
42	1037.87	1.40	1037.87	1.41	0.0276
43	1037.87	1.41	1037.87	1.44	0.0892
44	1037.87	1.44	1037.87	1.51	0.1054
45	1037.87	1.51	1037.87	1.52	0.0357
46	1037.87	1.52	1037.87	1.53	0.0303
47	1037.87	1.53	1037.87	1.56	0.0984
48	1037.87	1.56	1037.87	1.63	0.1021
49	1037.87	1.63	1037.87	1.64	0.0567
50	1037.87	1.64	1037.87	1.66	0.0334
51	1037.87	1.66	1037.87	1.68	0.0775
52	1037.87	1.68	1037.87	1.78	0.0995
53	1037.87	1.78	1037.87	1.79	0.0452
54	1037.87	1.79	1037.87	1.80	0.0358
55	1037.87	1.80	1037.87	1.83	0.0891
56	1037.87	1.83	1037.87	1.93	0.0973
57	1037.87	1.93	1037.87	1.95	0.0741
58	1037.87	1.95	1037.87	1.97	0.0389
59	1037.87	1.97	1037.87	1.99	0.0611
60	1037.87	1.99	1037.87	2.11	0.0954

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 9 Existing Geometry Drained



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Date: 10/17/2006 File Name:

Wall Height=10.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=13.00, Pile Length=23.00
MOMENT IN PILE: Max. Moment=42.84 per Pile Spacing=6.0 at Depth=8.73

VERTICAL BEARING CAPACITY: Vertical Loading=0.0, Resistance=28.5, Vertical Factor of Safety=999.00

SYSTEM FACTOR OF SAFETY (Approximate)=3.08
The request embedment is 13.0, the user input fixed embedment = 40.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	10.6	10.6	0.0	11.5	2.7

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	10.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	10.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	4.3	0.17	0.039
2	4.3	0.17	4.5	0.18	0.037
3	4.5	0.18	4.8	0.18	0.029
4	4.8	0.18	6.3	0.22	0.021
5	6.3	0.21	6.5	0.22	0.018
6	6.5	0.22	7.0	0.23	0.015

7	7.0	0.23	7.3	0.23	0.030
8	7.3	0.23	7.5	0.25	0.054
9	7.5	0.25	7.8	0.26	0.042
10	7.8	0.26	10.0	0.31	0.021
11	10.0	0.31	13.3	0.38	0.021
12	13.3	0.38	13.5	0.37	-0.013
13	13.5	0.37	13.8	0.36	-0.038
14	13.8	0.36	14.0	0.36	-0.007
15	14.0	0.36	18.8	0.43	0.015
16	18.8	0.43	19.0	0.44	0.014
17	19.0	0.44	23.0	0.82	0.012
18	4.6	0.00	6.9	0.14	0.062
19	6.9	0.14	23.0	0.14	0.000

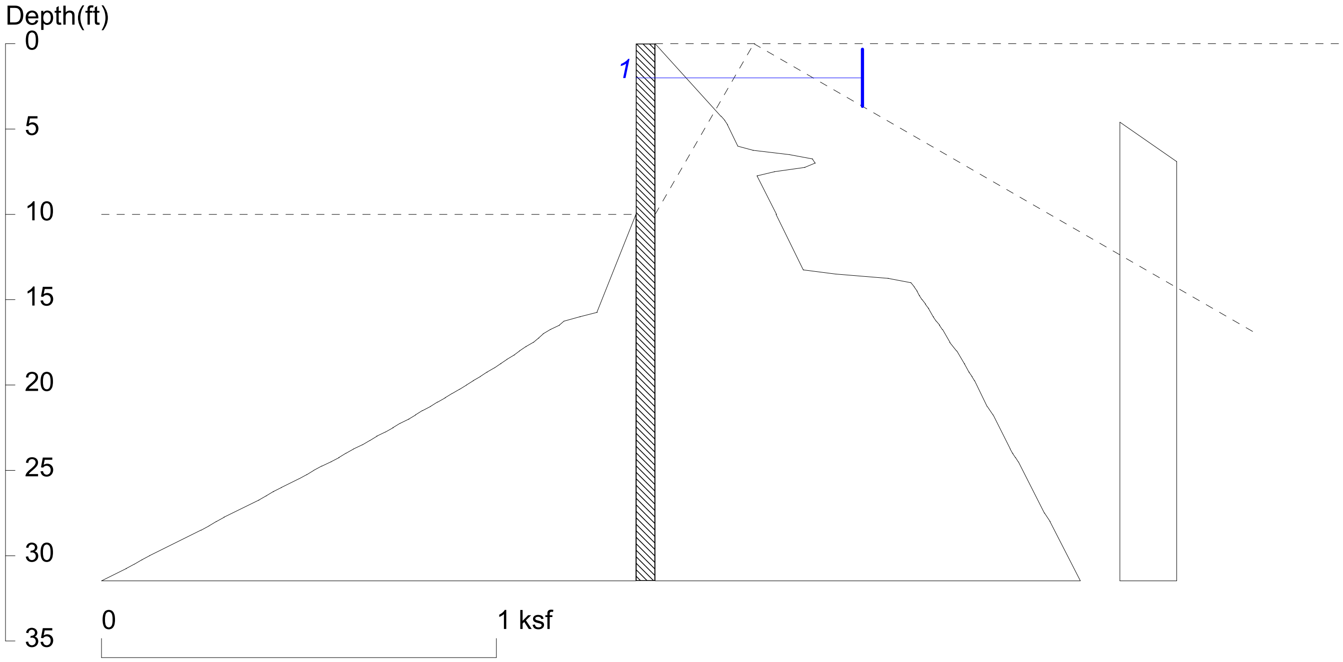
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	10.00	0.00	15.75	0.28	0.0478
2	15.75	0.28	16.00	0.33	0.2087
3	16.00	0.33	16.25	0.39	0.2499
4	16.25	0.39	16.50	0.42	0.1242
5	16.50	0.42	16.75	0.45	0.1197
6	16.75	0.45	17.00	0.48	0.1243
7	17.00	0.48	17.25	0.51	0.1309
8	17.25	0.51	17.50	0.55	0.1235
9	17.50	0.55	17.75	0.57	0.1174
10	17.75	0.57	18.00	0.61	0.1399
11	18.00	0.61	18.25	0.65	0.1627
12	18.25	0.65	18.50	0.68	0.1307
13	18.50	0.68	18.75	0.72	0.1372
14	18.75	0.72	19.00	0.76	0.1660
15	19.00	0.76	19.25	0.80	0.1466
16	19.25	0.80	19.75	0.88	0.1598
17	19.75	0.88	20.00	0.91	0.1564
18	20.00	0.91	20.25	0.96	0.1753
19	20.25	0.96	20.50	1.00	0.1553
20	20.50	1.00	20.75	1.04	0.1717
21	20.75	1.04	21.00	1.09	0.1780
22	21.00	1.09	21.25	1.12	0.1533
23	21.25	1.12	21.50	1.17	0.1846
24	21.50	1.17	21.75	1.22	0.1913
25	21.75	1.22	22.00	1.25	0.1539
26	22.00	1.25	22.25	1.30	0.1672
27	22.25	1.30	22.50	1.35	0.2025
28	22.50	1.35	22.75	1.40	0.1970
29	22.75	1.40	23.00	1.44	0.1552
30	23.00	1.44	23.00	1.48	0.1590
31	1022.00	1.48	1022.00	1.63	0.1992
32	1022.00	1.63	1022.00	1.67	0.1790
33	1022.00	1.67	1022.00	1.71	0.1569
34	1022.00	1.71	1022.00	1.75	0.1759
35	1022.00	1.75	1022.00	2.00	0.1968
36	1022.00	2.00	1022.00	2.05	0.1932
37	1022.00	2.05	1022.00	2.09	0.1610
38	1022.00	2.09	1022.00	2.13	0.1638
39	1022.00	2.13	1022.00	2.76	0.1952
40	1022.00	2.76	1022.00	2.85	0.1671
41	1022.00	2.85	1022.00	4.98	0.1941
42	1022.00	4.98	1022.00	5.03	0.1926
43	1022.00	5.03	1022.00	5.07	0.1776

44	1022.00	5.07	1022.00	5.12	0.1790
45	1022.00	5.12	1022.00	5.41	0.1939
46	1022.00	5.41	1022.00	5.46	0.1971
47	1022.00	5.46	1022.00	5.51	0.2011
48	1022.00	5.51	1022.00	6.67	0.2022

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 9 Existing Geometry Undrained



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Date: 10/17/2006 File Name:

Wall Height=10.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=21.47, Pile Length=31.47
MOMENT IN PILE: Max. Moment=59.93 per Pile Spacing=6.0 at Depth=9.38

VERTICAL BEARING CAPACITY: Vertical Loading=0.0, Resistance=41.8, Vertical Factor of Safety=999.00

SYSTEM FACTOR OF SAFETY (Approximate)=1.86
The request embedment is 21.5, the user input fixed embedment = 40.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	13.4	13.4	0.0	12.1	3.3

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	10.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	10.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	4.3	0.17	0.039
2	4.3	0.17	4.5	0.18	0.037
3	4.5	0.18	4.8	0.18	0.029
4	4.8	0.18	6.0	0.21	0.021
5	6.0	0.21	6.3	0.25	0.157
6	6.3	0.25	6.5	0.34	0.368

7	6.5	0.34	6.8	0.40	0.234
8	6.8	0.40	7.0	0.41	0.028
9	7.0	0.41	7.3	0.38	-0.105
10	7.3	0.38	7.5	0.30	-0.309
11	7.5	0.30	7.8	0.26	-0.177
12	7.8	0.26	10.0	0.31	0.022
13	10.0	0.31	13.3	0.38	0.021
14	13.3	0.38	13.5	0.46	0.328
15	13.5	0.46	13.8	0.59	0.533
16	13.8	0.59	14.0	0.65	0.230
17	14.0	0.65	14.3	0.66	0.033
18	14.3	0.66	14.5	0.66	0.030
19	14.5	0.66	14.8	0.67	0.023
20	14.8	0.67	15.0	0.68	0.026
21	15.0	0.68	15.3	0.68	0.034
22	15.3	0.68	15.5	0.69	0.031
23	15.5	0.69	16.0	0.70	0.024
24	16.0	0.70	16.3	0.71	0.030
25	16.3	0.71	16.5	0.72	0.035
26	16.5	0.72	16.8	0.73	0.029
27	16.8	0.73	17.5	0.75	0.025
28	17.5	0.75	18.0	0.76	0.035
29	18.0	0.76	18.8	0.78	0.026
30	18.8	0.78	19.3	0.80	0.024
31	19.3	0.80	19.5	0.80	0.030
32	19.5	0.80	19.8	0.81	0.027
33	19.8	0.81	21.3	0.84	0.021
34	21.3	0.84	21.8	0.86	0.030
35	21.8	0.86	23.8	0.90	0.022
36	23.8	0.90	24.0	0.90	0.024
37	24.0	0.90	24.3	0.91	0.029
38	24.3	0.91	24.5	0.92	0.027
39	24.5	0.92	27.5	0.99	0.022
40	27.5	0.99	28.0	1.00	0.029
41	28.0	1.00	31.5	1.10	0.022
42	1030.5	1.10	1030.5	1.11	0.028
43	1030.5	1.11	1030.5	1.28	0.023
44	1030.5	1.28	1030.5	1.28	0.025
45	1030.5	1.28	1030.5	1.29	0.028
46	1030.5	1.29	1030.5	1.30	0.025
47	1030.5	1.30	1030.5	1.50	0.022
48	4.6	0.00	6.9	0.14	0.062
49	6.9	0.14	31.5	0.14	0.000

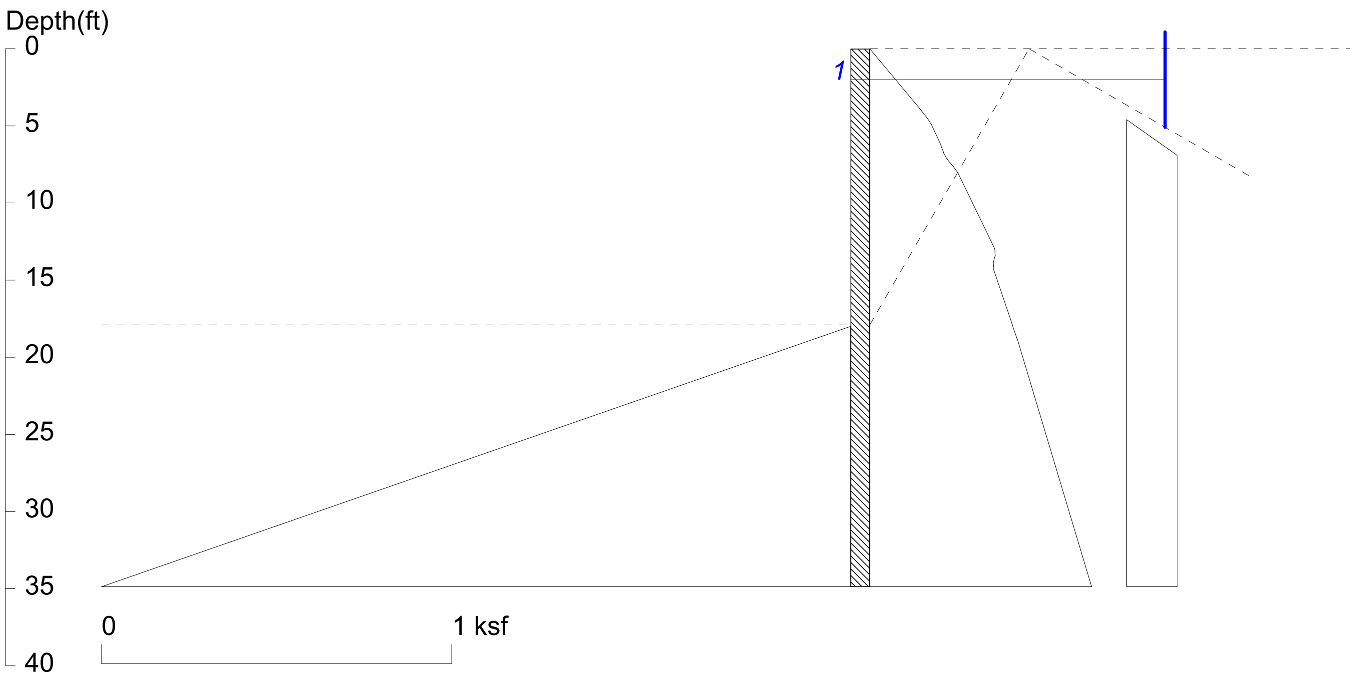
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	10.00	0.00	15.75	0.10	0.0172
2	15.75	0.10	16.00	0.14	0.1727
3	16.00	0.14	16.25	0.18	0.1581
4	16.25	0.18	16.50	0.19	0.0484
5	16.50	0.19	16.75	0.22	0.0924
6	16.75	0.22	17.00	0.23	0.0730
7	17.00	0.23	17.25	0.25	0.0479
8	17.25	0.25	17.50	0.26	0.0504
9	17.50	0.26	17.75	0.28	0.0764
10	17.75	0.28	18.00	0.29	0.0641
11	18.00	0.29	18.25	0.31	0.0561
12	18.25	0.31	18.50	0.33	0.0731
13	18.50	0.33	18.75	0.34	0.0646

14	18.75	0.34	19.00	0.36	0.0622
15	19.00	0.36	19.25	0.38	0.0748
16	19.25	0.38	19.50	0.39	0.0655
17	19.50	0.39	19.75	0.41	0.0726
18	19.75	0.41	20.00	0.43	0.0691
19	20.00	0.43	20.25	0.45	0.0714
20	20.25	0.45	20.50	0.47	0.0730
21	20.50	0.47	20.75	0.48	0.0708
22	20.75	0.48	21.00	0.50	0.0771
23	21.00	0.50	21.25	0.52	0.0706
24	21.25	0.52	21.50	0.54	0.0815
25	21.50	0.54	21.75	0.56	0.0708
26	21.75	0.56	22.00	0.58	0.0720
27	22.00	0.58	22.25	0.60	0.0856
28	22.25	0.60	22.50	0.62	0.0705
29	22.50	0.62	22.75	0.63	0.0777
30	22.75	0.63	23.00	0.66	0.0865
31	23.00	0.66	23.25	0.67	0.0707
32	23.25	0.67	23.50	0.69	0.0753
33	23.50	0.69	23.75	0.71	0.0905
34	23.75	0.71	24.00	0.74	0.0774
35	24.00	0.74	24.25	0.75	0.0707
36	24.25	0.75	24.50	0.77	0.0833
37	24.50	0.77	24.75	0.80	0.0893
38	24.75	0.80	25.00	0.82	0.0816
39	25.00	0.82	25.25	0.83	0.0714
40	25.25	0.83	25.50	0.85	0.0787
41	25.50	0.85	26.00	0.90	0.0884
42	26.00	0.90	26.25	0.92	0.0843
43	26.25	0.92	26.50	0.94	0.0722
44	26.50	0.94	26.75	0.96	0.0759
45	26.75	0.96	27.75	1.04	0.0876
46	27.75	1.04	28.00	1.06	0.0786
47	28.00	1.06	28.25	1.08	0.0730
48	28.25	1.08	28.50	1.10	0.0817
49	28.50	1.10	30.00	1.23	0.0871
50	30.00	1.23	30.25	1.25	0.0798
51	30.25	1.25	30.50	1.27	0.0743
52	30.50	1.27	30.75	1.29	0.0813
53	30.75	1.29	31.47	1.53	0.0866
54	1030.47	1.53	1030.47	1.55	0.0778
55	1030.47	1.55	1030.47	1.57	0.0759
56	1030.47	1.57	1030.47	1.59	0.0846
57	1030.47	1.59	1030.47	2.06	0.0863
58	1030.47	2.06	1030.47	2.09	0.0845
59	1030.47	2.09	1030.47	2.10	0.0781
60	1030.47	2.10	1030.47	2.12	0.0799

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 9 Proposed Geometry Drained



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Date: 10/17/2006 File Name:

Wall Height=17.9 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=16.98, Pile Length=34.88

MOMENT IN PILE: Max. Moment=178.26 per Pile Spacing=6.0 at Depth=13.93

VERTICAL BEARING CAPACITY: Vertical Loading=0.0, Resistance=40.9, Vertical Factor of Safety=999.00

SYSTEM FACTOR OF SAFETY (Approximate)=1.89

The request embedment is 17.0, the user input fixed embedment = 32.1.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	24.7	24.7	0.0	19.2	6.2

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	17.90	0.50

PASSIVE SPACING:	Z depth	Spacing
1	17.90	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	4.0	0.15	0.037
2	4.0	0.15	4.5	0.16	0.035
3	4.5	0.16	4.9	0.18	0.027
4	4.9	0.18	6.3	0.20	0.021
5	6.3	0.20	6.7	0.21	0.017
6	6.7	0.21	7.2	0.22	0.024

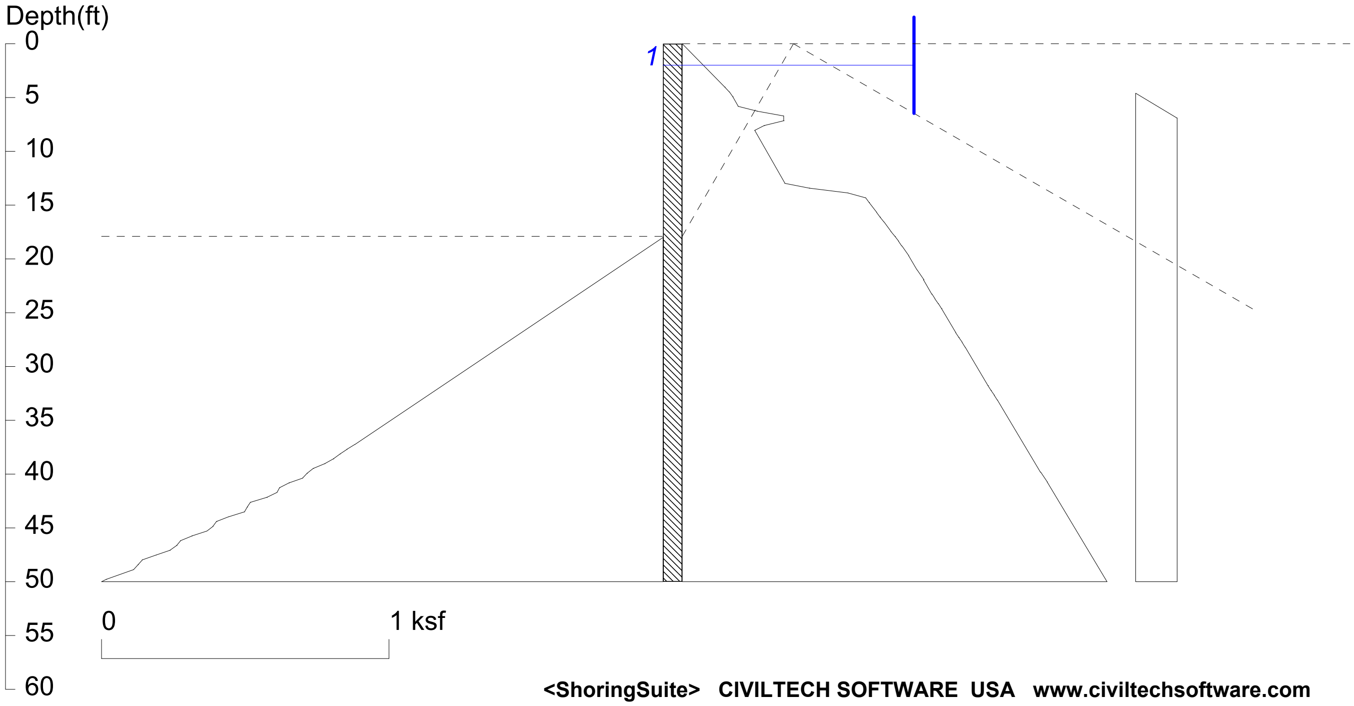
7	7.2	0.22	7.6	0.24	0.037
8	7.6	0.24	8.1	0.25	0.031
9	8.1	0.25	13.0	0.36	0.021
10	13.0	0.36	13.4	0.36	0.002
11	13.4	0.36	13.9	0.35	-0.012
12	13.9	0.35	14.3	0.35	0.003
13	14.3	0.35	17.9	0.41	0.015
14	17.9	0.41	18.8	0.42	0.015
15	18.8	0.42	34.9	1.36	0.013
16	4.6	0.00	6.9	0.14	0.062
17	6.9	0.14	34.9	0.14	0.000

PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	18.00	0.00	34.88	3.63	0.1267
2	1033.88	3.63	1033.88	3.70	0.1489
3	1033.88	3.70	1033.88	3.79	0.2027
4	1033.88	3.79	1033.88	3.85	0.1496
5	1033.88	3.85	1033.88	3.89	0.0742
6	1033.88	3.89	1033.88	3.96	0.1545
7	1033.88	3.96	1033.88	4.26	0.2260
8	1033.88	4.26	1033.88	4.30	0.0804
9	1033.88	4.30	1033.88	4.33	0.0774
10	1033.88	4.33	1033.88	4.72	0.2196
11	1033.88	4.72	1033.88	4.80	0.1621
12	1033.88	4.80	1033.88	4.83	0.0845
13	1033.88	4.83	1033.88	4.90	0.1394
14	1033.88	4.90	1033.88	5.38	0.2143
15	1033.88	5.38	1033.88	5.45	0.1708
16	1033.88	5.45	1033.88	5.49	0.0913
17	1033.88	5.49	1033.88	5.55	0.1327
18	1033.88	5.55	1033.88	6.30	0.2101
19	1033.88	6.30	1033.88	6.35	0.1056
20	1033.88	6.35	1033.88	6.39	0.0984
21	1033.88	6.39	1033.88	6.49	0.2013
22	1033.88	6.49	1033.88	7.50	0.2069
23	1033.88	7.50	1033.88	7.57	0.1563
24	1033.88	7.57	1033.88	7.62	0.1093
25	1033.88	7.62	1033.88	7.69	0.1588
26	1033.88	7.69	1033.88	9.52	0.2045
27	1033.88	9.52	1033.88	9.58	0.1282
28	1033.88	9.58	1033.88	9.64	0.1224
29	1033.88	9.64	1033.88	9.73	0.1980
30	1033.88	9.73	1033.88	11.81	0.2030

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 9 Proposed Geometry Undrained



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Date: 10/17/2006 File Name:

Wall Height=17.9 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=32.10, Pile Length=50.00

MOMENT IN PILE: Max. Moment=312.00 per Pile Spacing=6.0 at Depth=15.90

SYSTEM FACTOR OF SAFETY=0.96

The request embedment is 17.0, the user input fixed embedment = 32.1. The system may be not stable!

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	35.8	35.8	0.0	21.5	8.9

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	17.90	0.50

PASSIVE SPACING:	Z depth	Spacing
1	17.90	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	4.0	0.15	0.037
2	4.0	0.15	4.5	0.16	0.035
3	4.5	0.16	4.9	0.18	0.027
4	4.9	0.18	5.8	0.19	0.021
5	5.8	0.19	6.3	0.26	0.148
6	6.3	0.26	6.7	0.35	0.207
7	6.7	0.35	7.2	0.35	0.000
8	7.2	0.35	7.6	0.28	-0.152

9	7.6	0.28	8.1	0.25	-0.073
10	8.1	0.25	13.0	0.36	0.021
11	13.0	0.36	13.4	0.44	0.190
12	13.4	0.44	13.9	0.58	0.301
13	13.9	0.58	14.3	0.64	0.137
14	14.3	0.64	14.8	0.65	0.028
15	14.8	0.65	15.7	0.68	0.029
16	15.7	0.68	16.1	0.69	0.027
17	16.1	0.69	16.6	0.70	0.030
18	16.6	0.70	17.5	0.73	0.027
19	17.5	0.73	17.9	0.74	0.031
20	17.9	0.74	18.3	0.75	0.028
21	18.3	0.75	18.8	0.76	0.025
22	18.8	0.76	19.7	0.79	0.027
23	19.7	0.79	21.0	0.82	0.022
24	21.0	0.82	21.9	0.84	0.026
25	21.9	0.84	23.3	0.87	0.022
26	23.3	0.87	23.7	0.88	0.023
27	23.7	0.88	24.2	0.89	0.026
28	24.2	0.89	24.6	0.90	0.024
29	24.6	0.90	26.9	0.95	0.022
30	26.9	0.95	27.3	0.96	0.024
31	27.3	0.96	27.7	0.97	0.026
32	27.7	0.97	28.2	0.98	0.024
33	28.2	0.98	31.8	1.06	0.022
34	31.8	1.06	32.2	1.07	0.024
35	32.2	1.07	32.7	1.09	0.026
36	32.7	1.09	33.1	1.10	0.024
37	33.1	1.10	39.8	1.25	0.022
38	39.8	1.25	40.7	1.27	0.025
39	40.7	1.27	50.0	1.57	0.022
40	1049.0	1.57	1049.0	1.59	0.025
41	1049.0	1.59	1049.0	2.37	0.023
42	4.6	0.00	6.9	0.14	0.062
43	6.9	0.14	50.0	0.14	0.000

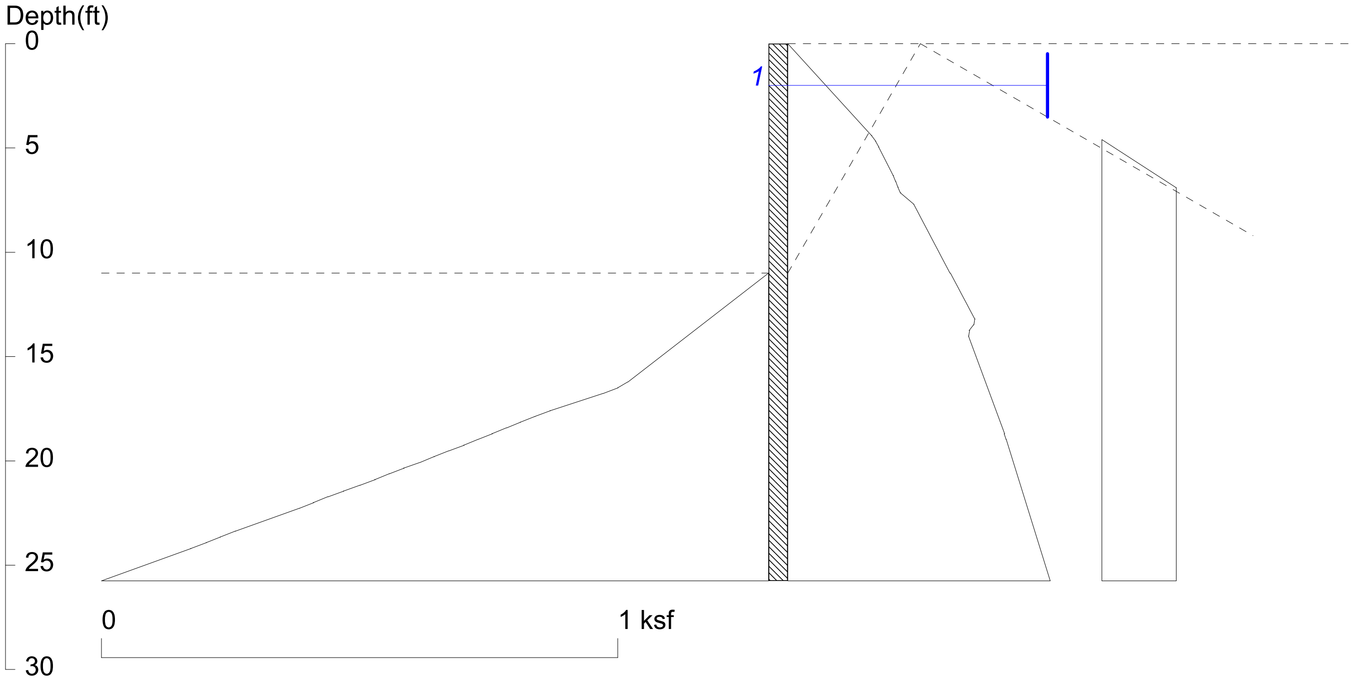
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	18.00	0.00	37.24	1.07	0.0557
2	37.24	1.07	37.69	1.10	0.0613
3	37.69	1.10	38.14	1.12	0.0560
4	38.14	1.12	38.58	1.15	0.0503
5	38.58	1.15	39.03	1.18	0.0667
6	39.03	1.18	39.48	1.22	0.0899
7	39.48	1.22	39.93	1.24	0.0466
8	39.93	1.24	40.38	1.25	0.0351
9	40.38	1.25	40.82	1.30	0.1073
10	40.82	1.30	41.27	1.33	0.0732
11	41.27	1.33	41.72	1.34	0.0198
12	41.72	1.34	42.17	1.38	0.0777
13	42.17	1.38	42.61	1.43	0.1266
14	42.61	1.43	43.06	1.45	0.0256
15	43.06	1.45	43.51	1.46	0.0222
16	43.51	1.46	43.96	1.51	0.1199
17	43.96	1.51	44.40	1.55	0.0963
18	44.40	1.55	44.85	1.57	0.0275
19	44.85	1.57	45.30	1.59	0.0485
20	45.30	1.59	45.74	1.64	0.1142
21	45.74	1.64	46.19	1.68	0.0902

22	46.19	1.68	46.64	1.69	0.0303
23	46.64	1.69	47.09	1.72	0.0518
24	47.09	1.72	47.53	1.76	0.1093
25	47.53	1.76	47.98	1.81	0.1063
26	47.98	1.81	48.43	1.83	0.0334
27	48.43	1.83	48.88	1.84	0.0345
28	48.88	1.84	49.77	1.94	0.1054
29	49.77	1.94	50.00	1.97	0.0737
30	1049.00	1.97	1049.00	1.99	0.0350
31	1049.00	1.99	1049.00	2.01	0.0650
32	1049.00	2.01	1049.00	2.11	0.1021
33	1049.00	2.11	1049.00	2.14	0.0722
34	1049.00	2.14	1049.00	2.15	0.0374
35	1049.00	2.15	1049.00	2.18	0.0659
36	1049.00	2.18	1049.00	2.32	0.0995
37	1049.00	2.32	1049.00	2.34	0.0413
38	1049.00	2.34	1049.00	2.35	0.0391
39	1049.00	2.35	1049.00	2.40	0.0961
40	1049.00	2.40	1049.00	2.53	0.0973
41	1049.00	2.53	1049.00	2.55	0.0498
42	1049.00	2.55	1049.00	2.57	0.0416
43	1049.00	2.57	1049.00	2.61	0.0881
44	1049.00	2.61	1049.00	2.78	0.0954
45	1049.00	2.78	1049.00	2.80	0.0473
46	1049.00	2.80	1049.00	2.82	0.0439
47	1049.00	2.82	1049.00	2.86	0.0913
48	1049.00	2.86	1049.00	3.07	0.0939
49	1049.00	3.07	1049.00	3.09	0.0482
50	1049.00	3.09	1049.00	3.11	0.0464
51	1049.00	3.11	1049.00	3.15	0.0915
52	1049.00	3.15	1049.00	3.40	0.0926
53	1049.00	3.40	1049.00	3.43	0.0684
54	1049.00	3.43	1049.00	3.45	0.0493
55	1049.00	3.45	1049.00	3.49	0.0730
56	1049.00	3.49	1049.00	3.82	0.0916
57	1049.00	3.82	1049.00	3.85	0.0874
58	1049.00	3.85	1049.00	3.88	0.0523
59	1049.00	3.88	1049.00	3.90	0.0560
60	1049.00	3.90	1049.00	4.39	0.0908

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 9 Min. Passing Geometry Drained



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Date: 10/17/2006 File Name:

Wall Height=11.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=14.75, Pile Length=25.75
MOMENT IN PILE: Max. Moment=55.01 per Pile Spacing=6.0 at Depth=9.48

VERTICAL BEARING CAPACITY: Vertical Loading=0.0, Resistance=32.0, Vertical Factor of Safety=999.00

SYSTEM FACTOR OF SAFETY (Approximate)=2.64
The request embedment is 14.8, the user input fixed embedment = 39.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	12.1	12.1	0.0	12.4	3.0

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	11.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	11.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	4.4	0.16	0.037
2	4.4	0.16	4.7	0.17	0.030
3	4.7	0.17	4.9	0.18	0.023
4	4.9	0.18	6.3	0.20	0.020
5	6.3	0.20	6.6	0.21	0.017
6	6.6	0.21	6.9	0.21	0.015

7	6.9	0.21	7.2	0.22	0.018
8	7.2	0.22	7.7	0.24	0.048
9	7.7	0.24	11.0	0.31	0.021
10	11.0	0.31	13.2	0.36	0.021
11	13.2	0.36	13.5	0.36	-0.006
12	13.5	0.36	13.8	0.35	-0.031
13	13.8	0.35	14.0	0.35	-0.007
14	14.0	0.35	18.7	0.42	0.015
15	18.7	0.42	19.0	0.42	0.014
16	19.0	0.42	25.8	0.88	0.013
17	4.6	0.00	6.9	0.14	0.062
18	6.9	0.14	25.8	0.14	0.000

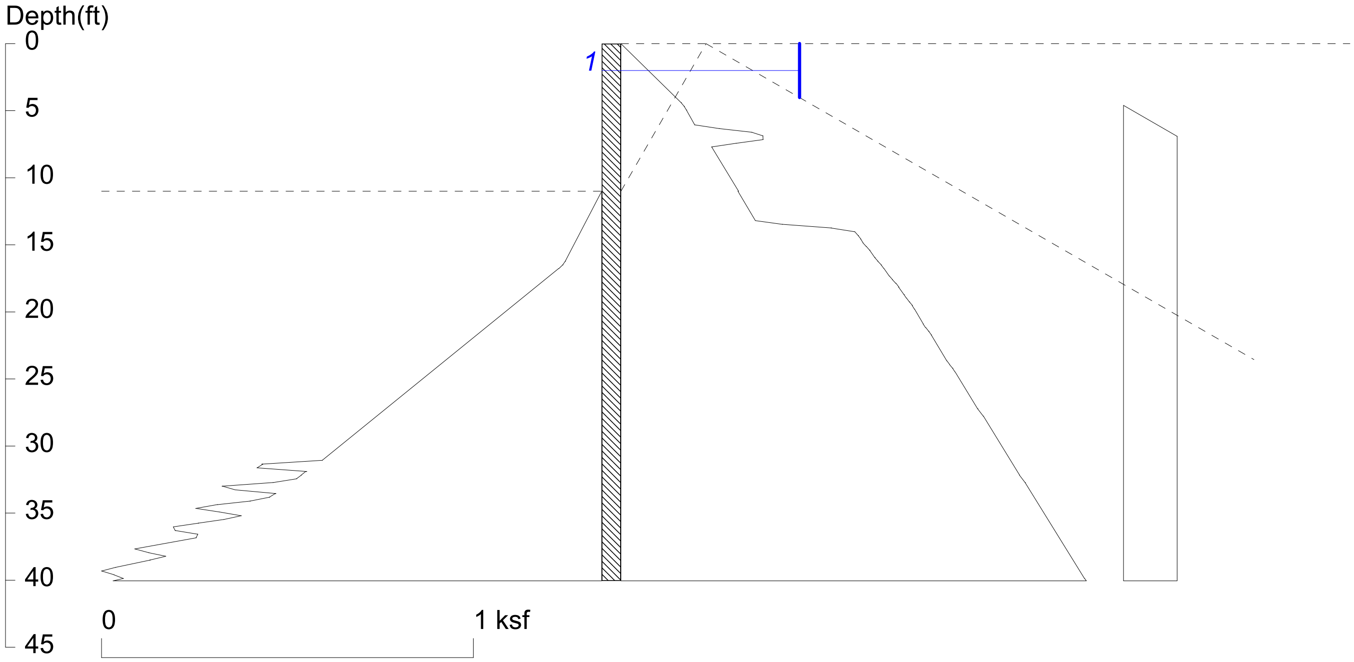
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	11.00	0.00	16.22	0.27	0.0522
2	16.22	0.27	16.50	0.29	0.0700
3	16.50	0.29	16.77	0.32	0.1055
4	16.77	0.32	17.60	0.42	0.1233
5	17.60	0.42	17.87	0.45	0.1107
6	17.87	0.45	18.15	0.48	0.1006
7	18.15	0.48	18.42	0.51	0.0970
8	18.42	0.51	18.70	0.54	0.0995
9	18.70	0.54	18.97	0.56	0.1026
10	18.97	0.56	19.25	0.59	0.0992
11	19.25	0.59	19.52	0.62	0.1085
12	19.52	0.62	19.80	0.65	0.1002
13	19.80	0.65	20.07	0.68	0.0988
14	20.07	0.68	20.35	0.71	0.1136
15	20.35	0.71	20.62	0.74	0.1049
16	20.62	0.74	20.90	0.76	0.0993
17	20.90	0.76	21.17	0.79	0.1082
18	21.17	0.79	21.45	0.82	0.1131
19	21.45	0.82	21.72	0.85	0.1104
20	21.72	0.85	22.00	0.88	0.1002
21	22.00	0.88	22.27	0.91	0.1025
22	22.27	0.91	23.37	1.03	0.1122
23	23.37	1.03	23.65	1.06	0.1051
24	23.65	1.06	23.92	1.09	0.1012
25	23.92	1.09	24.20	1.12	0.1081
26	24.20	1.12	25.75	1.39	0.1116
27	1024.75	1.39	1024.75	1.45	0.1031
28	1024.75	1.45	1024.75	2.40	0.1112
29	1024.75	2.40	1024.75	2.46	0.1064
30	1024.75	2.46	1024.75	3.16	0.1108
31	1024.75	3.16	1024.75	3.19	0.1127
32	1024.75	3.19	1024.75	3.24	0.1682
33	1024.75	3.24	1024.75	3.31	0.2482
34	1024.75	3.31	1024.75	3.38	0.2745
35	1024.75	3.38	1024.75	3.39	0.0338
36	1024.75	3.39	1024.75	3.37	-0.0993
37	1024.75	3.37	1024.75	3.40	0.1186
38	1024.75	3.40	1024.75	3.46	0.2435
39	1024.75	3.46	1024.75	3.68	0.2580
40	1024.75	3.68	1024.75	3.70	0.0707
41	1024.75	3.70	1024.75	3.67	-0.0947
42	1024.75	3.67	1024.75	3.69	0.0862
43	1024.75	3.69	1024.75	4.03	0.2450
44	1024.75	4.03	1024.75	4.04	0.0328

45	1024.75	4.04	1024.75	4.02	-0.0785
46	1024.75	4.02	1024.75	4.05	0.1286
47	1024.75	4.05	1024.75	4.44	0.2347
48	1024.75	4.44	1024.75	4.45	0.0192
49	1024.75	4.45	1024.75	4.43	-0.0628
50	1024.75	4.43	1024.75	4.47	0.1485
51	1024.75	4.47	1024.75	4.91	0.2263
52	1024.75	4.91	1024.75	4.94	0.1192
53	1024.75	4.94	1024.75	4.93	-0.0460
54	1024.75	4.93	1024.75	4.94	0.0577
55	1024.75	4.94	1024.75	5.18	0.2196

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 9 Min. Passing Geometry Undrained



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Date: 10/17/2006 File Name:

Wall Height=11.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=29.05, Pile Length=40.05
MOMENT IN PILE: Max. Moment=84.05 per Pile Spacing=6.0 at Depth=10.63

VERTICAL BEARING CAPACITY: Vertical Loading=0.0, Resistance=54.5, Vertical Factor of Safety=999.00

SYSTEM FACTOR OF SAFETY (Approximate)=1.34
The request embedment is 29.1, the user input fixed embedment = 39.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	16.1	16.1	0.0	13.3	4.0

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	11.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	11.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	4.4	0.16	0.037
2	4.4	0.16	4.7	0.17	0.030
3	4.7	0.17	4.9	0.18	0.023
4	4.9	0.18	6.1	0.20	0.020
5	6.1	0.20	6.3	0.26	0.236
6	6.3	0.26	6.6	0.35	0.320

7	6.6	0.35	6.9	0.38	0.110
8	6.9	0.38	7.2	0.38	0.002
9	7.2	0.38	7.4	0.31	-0.263
10	7.4	0.31	7.7	0.24	-0.239
11	7.7	0.24	11.0	0.32	0.022
12	11.0	0.31	13.2	0.36	0.021
13	13.2	0.36	13.5	0.44	0.267
14	13.5	0.44	13.8	0.56	0.472
15	13.8	0.56	14.0	0.63	0.232
16	14.0	0.63	14.3	0.64	0.032
17	14.3	0.64	14.6	0.64	0.028
18	14.6	0.64	14.9	0.65	0.023
19	14.9	0.65	15.1	0.66	0.032
20	15.1	0.66	15.4	0.67	0.033
21	15.4	0.67	15.9	0.68	0.025
22	15.9	0.68	16.2	0.69	0.030
23	16.2	0.69	16.5	0.70	0.034
24	16.5	0.70	16.8	0.71	0.028
25	16.8	0.71	17.3	0.72	0.025
26	17.3	0.72	17.6	0.73	0.031
27	17.6	0.73	17.9	0.74	0.034
28	17.9	0.74	18.1	0.75	0.028
29	18.1	0.75	18.7	0.76	0.026
30	18.7	0.76	19.0	0.77	0.024
31	19.0	0.77	19.3	0.78	0.027
32	19.3	0.78	19.5	0.78	0.029
33	19.5	0.78	19.8	0.79	0.023
34	19.8	0.79	20.9	0.81	0.021
35	20.9	0.81	21.2	0.82	0.023
36	21.2	0.82	21.5	0.83	0.029
37	21.5	0.83	21.7	0.83	0.027
38	21.7	0.83	23.6	0.88	0.022
39	23.6	0.88	23.9	0.88	0.027
40	23.9	0.88	24.2	0.89	0.029
41	24.2	0.89	24.5	0.90	0.024
42	24.5	0.90	27.2	0.96	0.022
43	27.2	0.96	27.8	0.98	0.028
44	27.8	0.98	32.2	1.07	0.022
45	32.2	1.07	32.7	1.09	0.028
46	32.7	1.09	39.9	1.25	0.022
47	39.9	1.25	40.1	1.26	0.027
48	1039.1	1.26	1039.1	1.57	0.022
49	1039.1	1.57	1039.1	1.59	0.026
50	1039.1	1.59	1039.1	1.59	0.023
51	4.6	0.00	6.9	0.14	0.062
52	6.9	0.14	40.1	0.14	0.000

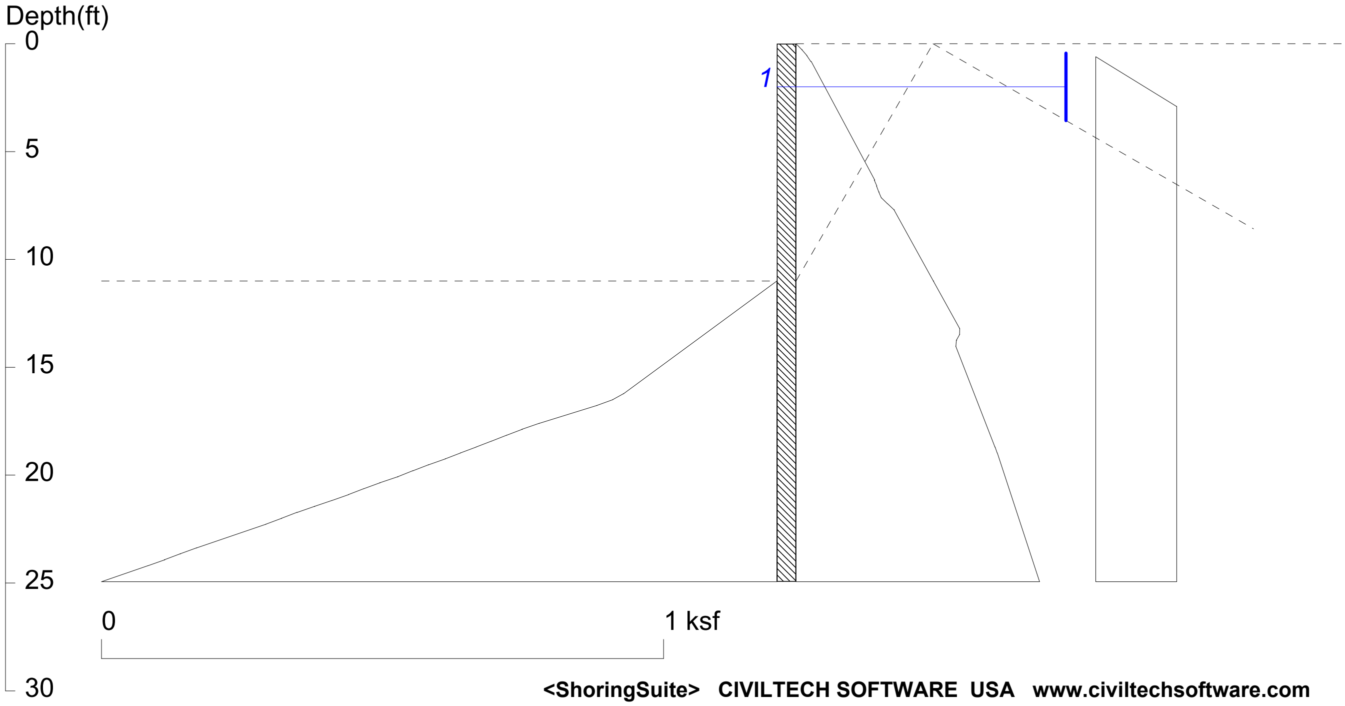
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	11.00	0.00	16.22	0.10	0.0188
2	16.22	0.10	16.50	0.10	0.0252
3	16.50	0.10	16.77	0.12	0.0380
4	16.77	0.12	31.07	0.75	0.0444
5	31.07	0.75	31.35	0.91	0.5830
6	31.35	0.91	31.62	0.93	0.0586
7	31.62	0.93	31.90	0.80	-0.4798
8	31.90	0.80	32.17	0.81	0.0449
9	32.17	0.81	32.45	0.82	0.0471
10	32.45	0.82	32.72	0.88	0.2308

11	32.72	0.88	33.00	1.02	0.4895
12	33.00	1.02	33.27	0.98	-0.1253
13	33.27	0.98	33.55	0.88	-0.3860
14	33.55	0.88	33.82	0.89	0.0587
15	33.82	0.89	34.10	0.94	0.1845
16	34.10	0.94	34.37	1.03	0.3222
17	34.37	1.03	34.65	1.09	0.2063
18	34.65	1.09	34.92	1.03	-0.2277
19	34.92	1.03	35.20	0.97	-0.2114
20	35.20	0.97	35.47	1.02	0.1694
21	35.47	1.02	35.75	1.08	0.2450
22	35.75	1.08	36.02	1.15	0.2491
23	36.02	1.15	36.30	1.15	-0.0174
24	36.30	1.15	36.57	1.09	-0.2237
25	36.57	1.09	36.85	1.09	0.0184
26	36.85	1.09	37.67	1.26	0.2002
27	37.67	1.26	37.95	1.22	-0.1368
28	37.95	1.22	38.22	1.17	-0.1692
29	38.22	1.17	38.50	1.21	0.1531
30	38.50	1.21	39.05	1.31	0.1710
31	39.05	1.31	39.32	1.35	0.1346
32	39.32	1.35	39.60	1.31	-0.1215
33	39.60	1.31	39.87	1.29	-0.0947
34	39.87	1.29	40.05	1.41	0.1517
35	1039.05	1.41	1039.05	1.45	0.1315
36	1039.05	1.45	1039.05	1.42	-0.0959
37	1039.05	1.42	1039.05	1.40	-0.0825
38	1039.05	1.40	1039.05	1.55	0.1381
39	1039.05	1.55	1039.05	1.54	-0.0278
40	1039.05	1.54	1039.05	1.52	-0.0806
41	1039.05	1.52	1039.05	1.54	0.0802
42	1039.05	1.54	1039.05	1.65	0.1280
43	1039.05	1.65	1039.05	1.67	0.0988
44	1039.05	1.67	1039.05	1.66	-0.0626
45	1039.05	1.66	1039.05	1.65	-0.0373
46	1039.05	1.65	1039.05	1.78	0.1202
47	1039.05	1.78	1039.05	1.80	0.0918
48	1039.05	1.80	1039.05	1.79	-0.0506
49	1039.05	1.79	1039.05	1.78	-0.0251
50	1039.05	1.78	1039.05	1.94	0.1142
51	1039.05	1.94	1039.05	1.94	-0.0009
52	1039.05	1.94	1039.05	1.93	-0.0419
53	1039.05	1.93	1039.05	1.95	0.0707
54	1039.05	1.95	1039.05	2.10	0.1093
55	1039.05	2.10	1039.05	2.10	-0.0044
56	1039.05	2.10	1039.05	2.09	-0.0331
57	1039.05	2.09	1039.05	2.11	0.0786
58	1039.05	2.11	1039.05	2.26	0.1054
59	1039.05	2.26	1039.05	2.28	0.0736
60	1039.05	2.28	1039.05	2.27	-0.0244

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 9 Min. Passing Geometry Drained High Water



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Date: 10/17/2006 File Name:

Wall Height=11.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=13.94, Pile Length=24.94

MOMENT IN PILE: Max. Moment=47.50 per Pile Spacing=6.0 at Depth=9.34

SYSTEM FACTOR OF SAFETY (Approximate)=2.80

The request embedment is 13.9, the user input fixed embedment = 39.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	12.5	12.5	0.0	12.5	3.1

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	11.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	11.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	0.3	0.01	0.037
2	0.3	0.01	0.6	0.02	0.034
3	0.6	0.02	0.8	0.03	0.026
4	0.8	0.03	6.3	0.14	0.021
5	6.3	0.14	6.6	0.14	0.017
6	6.6	0.14	6.9	0.15	0.015
7	6.9	0.15	7.2	0.15	0.017
8	7.2	0.15	7.4	0.16	0.039

9	7.4	0.16	7.7	0.17	0.040
10	7.7	0.17	11.0	0.24	0.021
11	11.0	0.24	13.2	0.29	0.021
12	13.2	0.29	13.5	0.29	-0.001
13	13.5	0.29	13.8	0.28	-0.022
14	13.8	0.28	14.0	0.28	-0.003
15	14.0	0.28	18.7	0.35	0.015
16	18.7	0.35	19.0	0.36	0.014
17	19.0	0.36	24.9	0.81	0.013
18	0.6	0.00	2.9	0.14	0.062
19	2.9	0.14	24.9	0.14	0.000

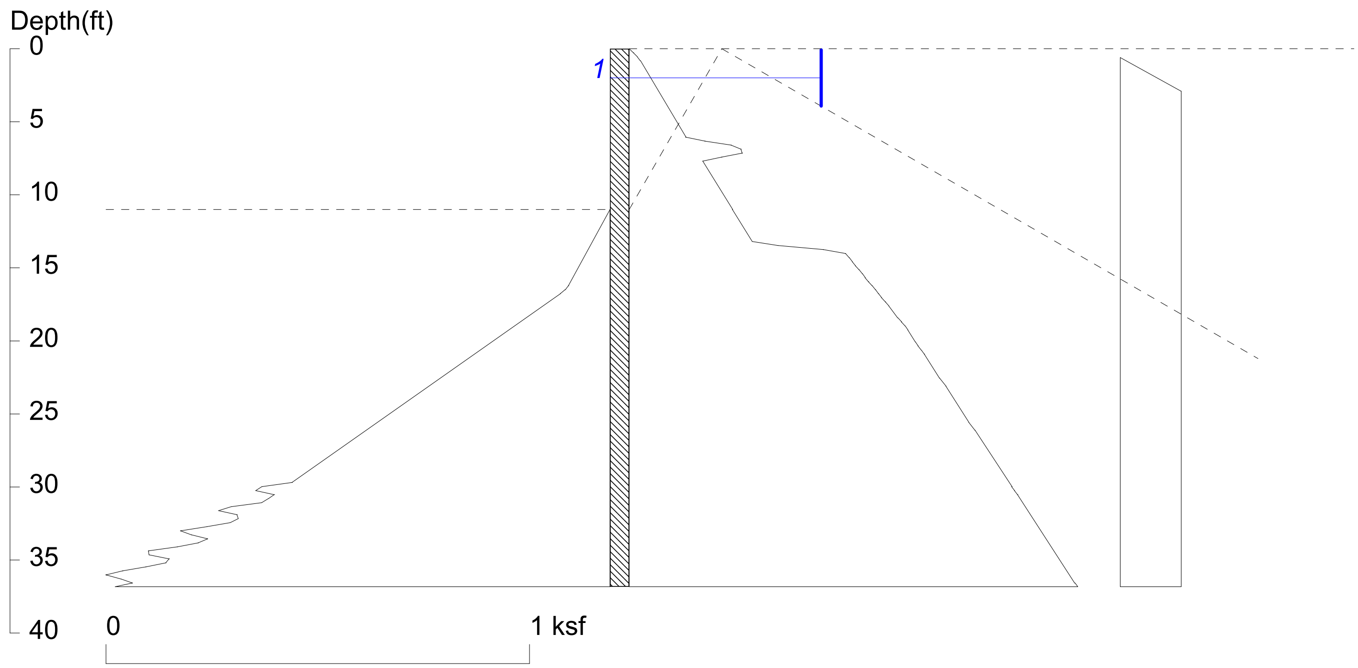
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	11.00	0.00	16.23	0.27	0.0522
2	16.23	0.27	16.50	0.29	0.0700
3	16.50	0.29	16.77	0.32	0.1055
4	16.77	0.32	17.60	0.42	0.1233
5	17.60	0.42	17.88	0.45	0.1107
6	17.88	0.45	18.15	0.48	0.1006
7	18.15	0.48	18.42	0.51	0.0970
8	18.42	0.51	18.70	0.54	0.0995
9	18.70	0.54	18.98	0.56	0.1026
10	18.98	0.56	19.25	0.59	0.0992
11	19.25	0.59	19.52	0.62	0.1085
12	19.52	0.62	19.80	0.65	0.1002
13	19.80	0.65	20.08	0.68	0.0988
14	20.08	0.68	20.35	0.71	0.1136
15	20.35	0.71	20.63	0.74	0.1049
16	20.63	0.74	20.90	0.76	0.0993
17	20.90	0.76	21.17	0.79	0.1082
18	21.17	0.79	21.45	0.82	0.1131
19	21.45	0.82	21.73	0.85	0.1104
20	21.73	0.85	22.00	0.88	0.1002
21	22.00	0.88	22.27	0.91	0.1025
22	22.27	0.91	23.38	1.03	0.1122
23	23.38	1.03	23.65	1.06	0.1051
24	23.65	1.06	23.92	1.09	0.1012
25	23.92	1.09	24.20	1.12	0.1081
26	24.20	1.12	24.94	1.39	0.1116
27	1023.94	1.39	1023.94	1.45	0.1031
28	1023.94	1.45	1023.94	2.40	0.1112
29	1023.94	2.40	1023.94	2.46	0.1064
30	1023.94	2.46	1023.94	3.16	0.1108
31	1023.94	3.16	1023.94	3.19	0.1127
32	1023.94	3.19	1023.94	3.24	0.1682
33	1023.94	3.24	1023.94	3.31	0.2482
34	1023.94	3.31	1023.94	3.38	0.2745
35	1023.94	3.38	1023.94	3.39	0.0338
36	1023.94	3.39	1023.94	3.37	-0.0993
37	1023.94	3.37	1023.94	3.40	0.1186
38	1023.94	3.40	1023.94	3.46	0.2435
39	1023.94	3.46	1023.94	3.68	0.2580
40	1023.94	3.68	1023.94	3.70	0.0707
41	1023.94	3.70	1023.94	3.67	-0.0947
42	1023.94	3.67	1023.94	3.69	0.0862
43	1023.94	3.69	1023.94	4.03	0.2450
44	1023.94	4.03	1023.94	4.04	0.0328
45	1023.94	4.04	1023.94	4.02	-0.0785

46	1023.94	4.02	1023.94	4.05	0.1286
47	1023.94	4.05	1023.94	4.44	0.2347
48	1023.94	4.44	1023.94	4.45	0.0192
49	1023.94	4.45	1023.94	4.43	-0.0628
50	1023.94	4.43	1023.94	4.47	0.1485
51	1023.94	4.47	1023.94	4.91	0.2263
52	1023.94	4.91	1023.94	4.94	0.1192
53	1023.94	4.94	1023.94	4.93	-0.0460
54	1023.94	4.93	1023.94	4.94	0.0577
55	1023.94	4.94	1023.94	5.18	0.2196

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 9 Min. Passing Geometry Undrained High Water



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Wall Height=11.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=25.83, Pile Length=36.83
MOMENT IN PILE: Max. Moment=68.45 per Pile Spacing=6.0 at Depth=10.37

SYSTEM FACTOR OF SAFETY (Approximate)=1.51
The request embedment is 25.8, the user input fixed embedment = 39.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	15.4	15.4	0.0	13.2	3.9

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	11.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	11.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	0.3	0.01	0.037
2	0.3	0.01	0.6	0.02	0.034
3	0.6	0.02	0.8	0.03	0.026
4	0.8	0.03	6.1	0.13	0.021
5	6.1	0.13	6.3	0.18	0.168
6	6.3	0.18	6.6	0.24	0.226
7	6.6	0.24	6.9	0.26	0.083
8	6.9	0.26	7.2	0.27	0.010

9	7.2	0.27	7.4	0.22	-0.178
10	7.4	0.22	7.7	0.17	-0.162
11	7.7	0.17	11.0	0.24	0.021
12	11.0	0.24	13.2	0.29	0.021
13	13.2	0.29	13.5	0.35	0.220
14	13.5	0.35	13.8	0.46	0.386
15	13.8	0.46	14.0	0.51	0.194
16	14.0	0.51	14.3	0.52	0.031
17	14.3	0.52	14.6	0.53	0.026
18	14.6	0.53	14.9	0.53	0.027
19	14.9	0.53	15.1	0.54	0.032
20	15.1	0.54	15.4	0.55	0.028
21	15.4	0.55	15.7	0.56	0.024
22	15.7	0.56	15.9	0.56	0.030
23	15.9	0.56	16.2	0.57	0.032
24	16.2	0.57	16.5	0.58	0.027
25	16.5	0.58	16.8	0.59	0.025
26	16.8	0.59	17.0	0.60	0.027
27	17.0	0.60	17.3	0.61	0.032
28	17.3	0.61	17.6	0.61	0.031
29	17.6	0.61	18.4	0.63	0.026
30	18.4	0.63	18.7	0.64	0.032
31	18.7	0.64	19.0	0.65	0.031
32	19.0	0.65	19.3	0.66	0.022
33	19.3	0.66	20.1	0.68	0.021
34	20.1	0.68	20.4	0.68	0.024
35	20.4	0.68	20.6	0.69	0.028
36	20.6	0.69	20.9	0.70	0.026
37	20.9	0.70	22.5	0.73	0.022
38	22.5	0.73	23.1	0.75	0.027
39	23.1	0.75	25.6	0.80	0.022
40	25.6	0.80	26.1	0.82	0.027
41	26.1	0.82	30.0	0.90	0.023
42	30.0	0.90	30.3	0.91	0.027
43	30.3	0.91	30.5	0.92	0.026
44	30.5	0.92	36.6	1.05	0.022
45	36.6	1.05	36.8	1.07	0.026
46	1035.8	1.07	1035.8	1.34	0.023
47	1035.8	1.33	1035.8	1.35	0.025
48	1035.8	1.35	1035.8	1.47	0.023
49	0.6	0.00	2.9	0.14	0.062
50	2.9	0.14	36.8	0.14	0.000

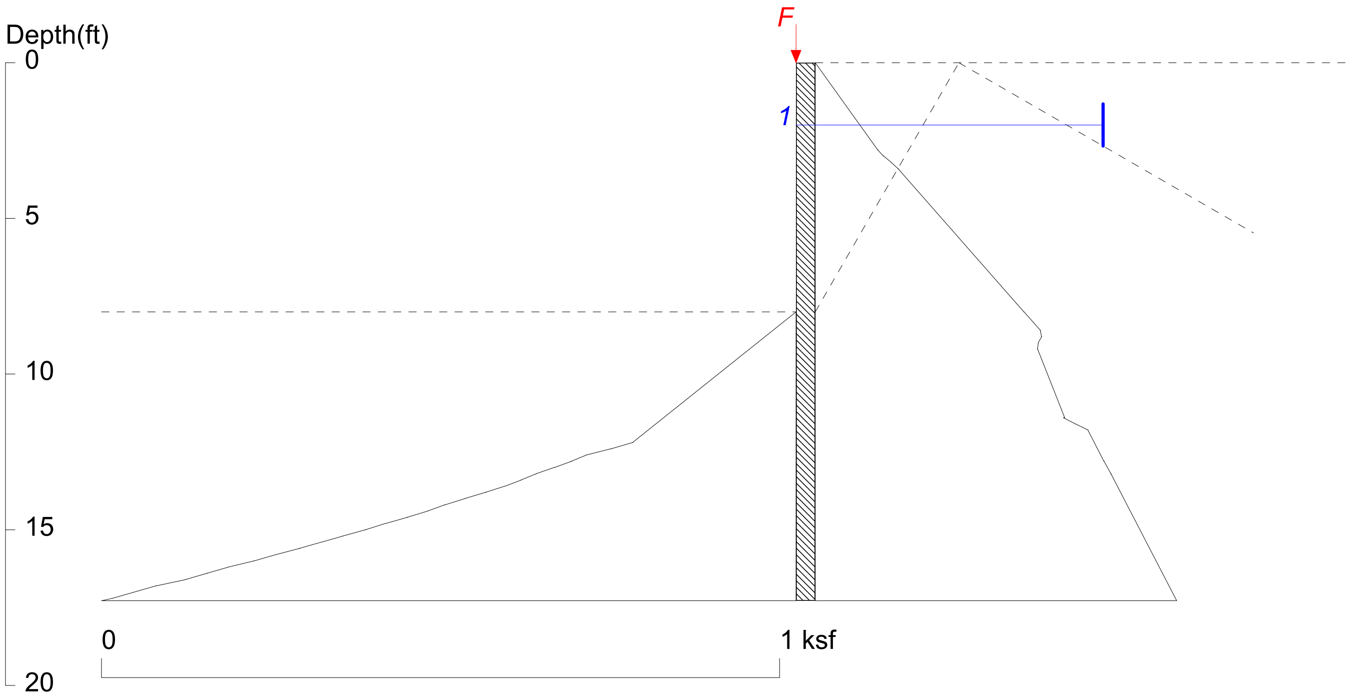
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	11.00	0.00	16.23	0.10	0.0188
2	16.23	0.10	16.50	0.11	0.0264
3	16.50	0.11	16.77	0.12	0.0415
4	16.77	0.12	29.70	0.75	0.0490
5	29.70	0.75	29.98	0.82	0.2588
6	29.98	0.82	30.25	0.84	0.0529
7	30.25	0.84	30.52	0.79	-0.1568
8	30.52	0.79	30.80	0.81	0.0492
9	30.80	0.81	31.08	0.82	0.0559
10	31.08	0.82	31.35	0.89	0.2607
11	31.35	0.89	31.63	0.92	0.1102
12	31.63	0.92	31.90	0.88	-0.1565
13	31.90	0.88	32.17	0.88	-0.0126
14	32.17	0.88	32.45	0.90	0.0689

15	32.45	0.90	32.72	0.95	0.2002
16	32.72	0.95	33.00	1.01	0.2267
17	33.00	1.01	33.28	0.99	-0.0938
18	33.28	0.99	33.55	0.95	-0.1397
19	33.55	0.95	33.83	0.97	0.0820
20	33.83	0.97	34.10	1.02	0.1799
21	34.10	1.02	34.38	1.09	0.2473
22	34.38	1.09	34.65	1.09	-0.0058
23	34.65	1.09	34.92	1.04	-0.1705
24	34.92	1.04	35.20	1.05	0.0291
25	35.20	1.05	35.47	1.10	0.1692
26	35.47	1.10	35.75	1.15	0.2002
27	35.75	1.15	36.03	1.19	0.1417
28	36.03	1.19	36.30	1.15	-0.1293
29	36.30	1.15	36.58	1.13	-0.0975
30	36.58	1.13	36.83	1.17	0.1589
31	1035.83	1.17	1035.83	1.26	0.1710
32	1035.83	1.26	1035.83	1.27	0.0094
33	1035.83	1.27	1035.83	1.24	-0.1127
34	1035.83	1.24	1035.83	1.25	0.0393
35	1035.83	1.25	1035.83	1.37	0.1517
36	1035.83	1.37	1035.83	1.36	-0.0411
37	1035.83	1.36	1035.83	1.34	-0.0897
38	1035.83	1.34	1035.83	1.36	0.0963
39	1035.83	1.36	1035.83	1.48	0.1381
40	1035.83	1.48	1035.83	1.47	-0.0259
41	1035.83	1.47	1035.83	1.45	-0.0709
42	1035.83	1.45	1035.83	1.48	0.0880
43	1035.83	1.48	1035.83	1.58	0.1280
44	1035.83	1.58	1035.83	1.59	0.0400
45	1035.83	1.59	1035.83	1.58	-0.0552
46	1035.83	1.58	1035.83	1.58	0.0288
47	1035.83	1.58	1035.83	1.72	0.1202
48	1035.83	1.72	1035.83	1.71	-0.0133
49	1035.83	1.71	1035.83	1.70	-0.0448
50	1035.83	1.70	1035.83	1.72	0.0857
51	1035.83	1.72	1035.83	1.85	0.1142
52	1035.83	1.85	1035.83	1.85	0.0049
53	1035.83	1.85	1035.83	1.84	-0.0349
54	1035.83	1.84	1035.83	1.86	0.0719
55	1035.83	1.86	1035.83	1.98	0.1093
56	1035.83	1.98	1035.83	2.01	0.0866
57	1035.83	2.01	1035.83	2.00	-0.0254
58	1035.83	2.00	1035.83	2.00	-0.0047
59	1035.83	2.00	1035.83	2.17	0.1054
60	1035.83	2.17	1035.83	2.17	-0.0180

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 12 Existing Geometry Drained



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Wall Height=8.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=9.28, Pile Length=17.28
MOMENT IN PILE: Max. Moment=14.98 per Pile Spacing=6.0 at Depth=7.03

VERTICAL BEARING CAPACITY: Vertical Loading=5.4, Resistance=21.1, Vertical Factor of Safety=3.90

SYSTEM FACTOR OF SAFETY (Approximate)=3.45
The request embedment is 9.3, the user input fixed embedment = 32.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	5.4	5.4	0.0	9.3	1.4

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	8.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	8.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	2.8	0.09	0.033
2	2.8	0.09	3.0	0.10	0.043
3	3.0	0.10	3.2	0.11	0.056
4	3.2	0.11	3.4	0.12	0.050
5	3.4	0.12	8.0	0.31	0.040
6	8.0	0.31	8.6	0.33	0.040

7	8.6	0.33	8.8	0.33	0.009
8	8.8	0.33	9.0	0.33	-0.027
9	9.0	0.33	9.2	0.33	-0.006
10	9.2	0.33	11.4	0.37	0.018
11	11.4	0.37	11.6	0.38	0.089
12	11.6	0.38	11.8	0.40	0.092
13	11.8	0.40	12.8	0.43	0.024
14	12.8	0.43	13.2	0.44	0.025
15	13.2	0.44	17.3	0.88	0.024
16	1016.3	0.88	1016.3	0.85	-0.134
17	1016.3	0.85	1016.3	0.86	0.020
18	1016.3	0.86	1016.3	0.89	0.177
19	1016.3	0.89	1016.3	1.00	0.024
20	1016.3	1.00	1016.3	0.99	-0.066
21	1016.3	0.99	1016.3	0.96	-0.158
22	1016.3	0.96	1016.3	0.95	-0.074
23	1016.3	0.95	1016.3	0.98	0.014

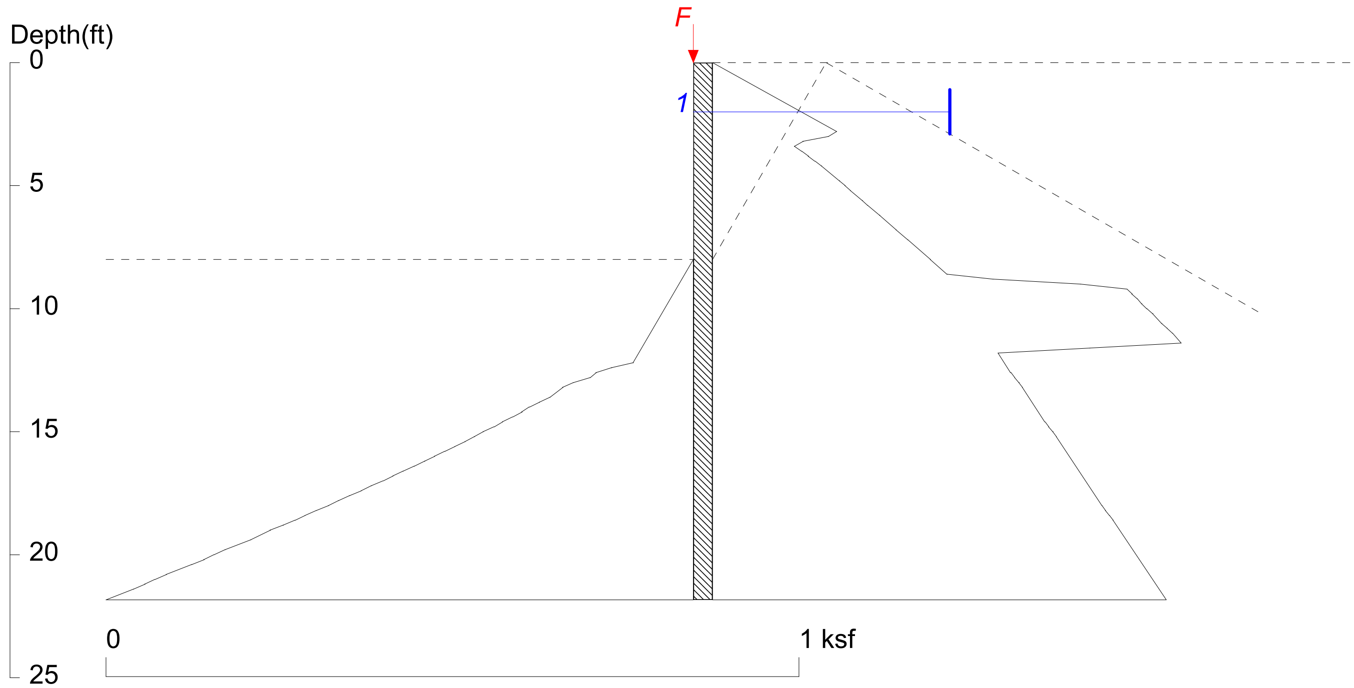
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	8.00	0.00	12.20	0.24	0.0574
2	12.20	0.24	12.40	0.27	0.1574
3	12.40	0.27	12.60	0.31	0.1817
4	12.60	0.31	12.80	0.33	0.1119
5	12.80	0.33	13.00	0.36	0.1260
6	13.00	0.36	13.20	0.38	0.1319
7	13.20	0.38	13.40	0.41	0.1121
8	13.40	0.41	13.60	0.43	0.1178
9	13.60	0.43	13.80	0.46	0.1446
10	13.80	0.46	14.00	0.49	0.1527
11	14.00	0.49	14.20	0.52	0.1482
12	14.20	0.52	14.40	0.54	0.1262
13	14.40	0.54	14.60	0.57	0.1508
14	14.60	0.57	14.80	0.61	0.1618
15	14.80	0.61	15.00	0.63	0.1450
16	15.00	0.63	15.20	0.67	0.1671
17	15.20	0.67	15.40	0.70	0.1575
18	15.40	0.70	15.60	0.73	0.1620
19	15.60	0.73	15.80	0.77	0.1732
20	15.80	0.77	16.00	0.80	0.1596
21	16.00	0.80	16.20	0.84	0.1917
22	16.20	0.84	16.40	0.87	0.1593
23	16.40	0.87	16.60	0.90	0.1580
24	16.60	0.90	16.80	0.94	0.2160
25	16.80	0.94	17.20	1.01	0.1582
26	17.20	1.01	17.28	1.05	0.2143
27	1016.28	1.05	1016.28	1.09	0.1917
28	1016.28	1.09	1016.28	1.12	0.1576
29	1016.28	1.12	1016.28	1.15	0.1781
30	1016.28	1.15	1016.28	1.24	0.2101
31	1016.28	1.24	1016.28	1.27	0.1749
32	1016.28	1.27	1016.28	1.31	0.1587
33	1016.28	1.31	1016.28	1.35	0.1923
34	1016.28	1.35	1016.28	1.47	0.2069
35	1016.28	1.47	1016.28	1.51	0.1990
36	1016.28	1.51	1016.28	1.54	0.1625
37	1016.28	1.54	1016.28	1.58	0.1692
38	1016.28	1.58	1016.28	1.90	0.2045
39	1016.28	1.90	1016.28	1.94	0.1688

40	1016.28	1.94	1016.28	1.97	0.1668
41	1016.28	1.97	1016.28	2.01	0.2018
42	1016.28	2.01	1016.28	2.70	0.2030
43	1016.28	2.70	1016.28	2.74	0.1935
44	1016.28	2.74	1016.28	2.77	0.1752
45	1016.28	2.77	1016.28	2.81	0.1843
46	1016.28	2.81	1016.28	5.56	0.2022

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 12 Existing Geometry Undrained



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Wall Height=8.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=13.83, Pile Length=21.83
MOMENT IN PILE: Max. Moment=19.65 per Pile Spacing=6.0 at Depth=7.52

VERTICAL BEARING CAPACITY: Vertical Loading=5.4, Resistance=28.2, Vertical Factor of Safety=5.22

SYSTEM FACTOR OF SAFETY (Approximate)=3.04
The request embedment is 13.8, the user input fixed embedment = 42.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	7.2	7.2	0.0	9.6	1.8

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	8.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	8.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	2.8	0.18	0.064
2	2.8	0.18	3.0	0.17	-0.059
3	3.0	0.17	3.2	0.13	-0.182
4	3.2	0.13	3.4	0.12	-0.063
5	3.4	0.12	3.6	0.13	0.052
6	3.6	0.13	3.8	0.14	0.048

7	3.8	0.14	4.0	0.15	0.047
8	4.0	0.15	4.2	0.16	0.045
9	4.2	0.16	4.8	0.18	0.043
10	4.8	0.18	5.0	0.19	0.042
11	5.0	0.19	5.2	0.20	0.041
12	5.2	0.20	5.6	0.22	0.042
13	5.6	0.22	5.8	0.22	0.039
14	5.8	0.22	6.2	0.24	0.042
15	6.2	0.24	6.8	0.26	0.040
16	6.8	0.26	7.2	0.28	0.042
17	7.2	0.28	8.0	0.31	0.041
18	8.0	0.31	8.6	0.34	0.040
19	8.6	0.34	8.8	0.41	0.333
20	8.8	0.41	9.0	0.53	0.630
21	9.0	0.53	9.2	0.60	0.332
22	9.2	0.60	9.4	0.61	0.038
23	9.4	0.61	9.6	0.61	0.039
24	9.6	0.61	9.8	0.62	0.031
25	9.8	0.62	10.0	0.63	0.037
26	10.0	0.63	10.2	0.63	0.040
27	10.2	0.63	10.6	0.65	0.033
28	10.6	0.65	10.8	0.66	0.041
29	10.8	0.66	11.0	0.66	0.040
30	11.0	0.66	11.4	0.68	0.031
31	11.4	0.68	11.6	0.55	-0.657
32	11.6	0.55	11.8	0.41	-0.661
33	11.8	0.41	12.6	0.43	0.023
34	12.6	0.43	12.8	0.44	0.026
35	12.8	0.44	13.0	0.44	0.030
36	13.0	0.44	13.2	0.45	0.027
37	13.2	0.45	14.6	0.48	0.023
38	14.6	0.48	14.8	0.49	0.027
39	14.8	0.49	15.0	0.49	0.029
40	15.0	0.49	15.2	0.50	0.026
41	15.2	0.50	18.0	0.56	0.023
42	18.0	0.56	18.2	0.57	0.026
43	18.2	0.57	18.4	0.57	0.028
44	18.4	0.57	18.6	0.58	0.026
45	18.6	0.58	21.8	0.75	0.024
46	1020.8	0.75	1020.8	0.75	0.025
47	1020.8	0.75	1020.8	0.76	0.027
48	1020.8	0.76	1020.8	0.76	0.026
49	1020.8	0.76	1020.8	0.89	0.024
50	1020.8	0.89	1020.8	1.19	1.456
51	1020.8	1.19	1020.8	1.19	0.021
52	1020.8	1.19	1020.8	0.91	-1.411
53	1020.8	0.91	1020.8	1.02	0.024
54	1020.8	1.02	1020.8	1.19	0.845
55	1020.8	1.19	1020.8	1.52	1.665
56	1020.8	1.52	1020.8	1.69	0.844
57	1020.8	1.69	1020.8	1.70	0.023
58	1020.8	1.70	1020.8	1.71	0.045
59	1020.8	1.71	1020.8	1.72	0.060
60	1020.8	1.72	1020.8	1.73	0.039
61	1020.8	1.73	1020.8	1.76	0.024

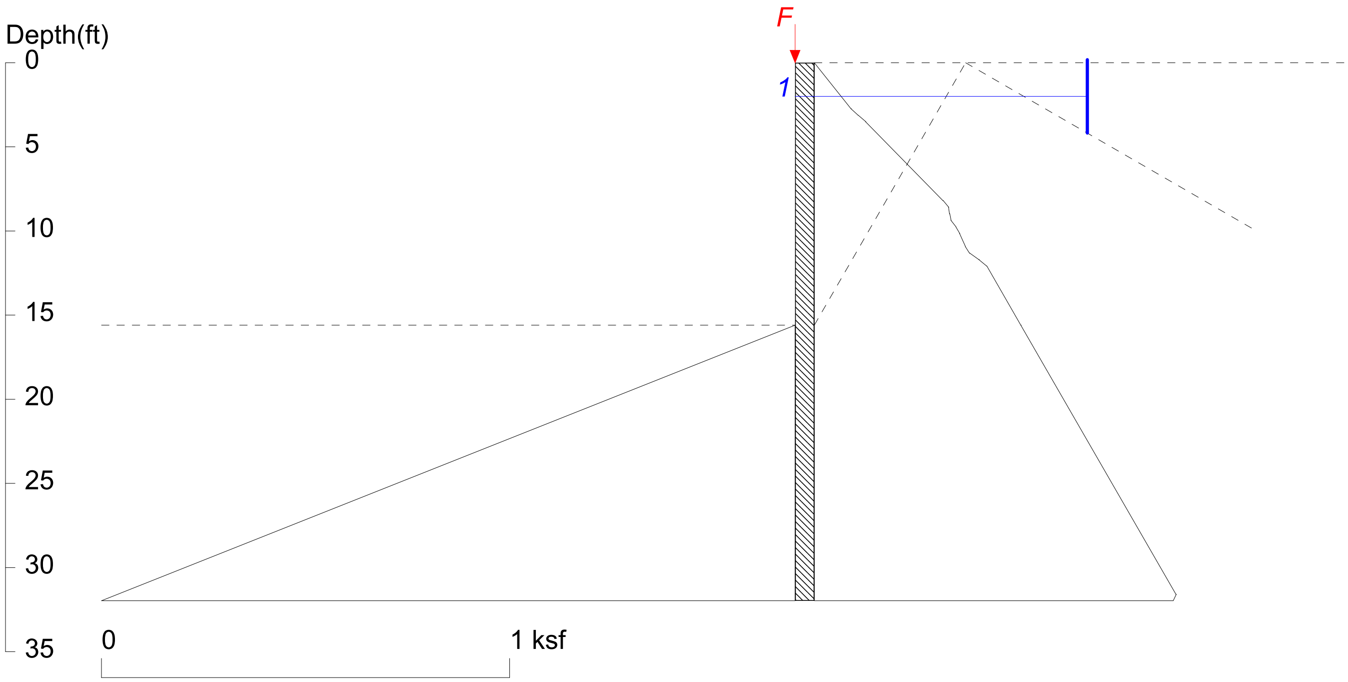
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	8.00	0.00	12.20	0.09	0.0207

2	12.20	0.09	12.40	0.12	0.1549
3	12.40	0.12	12.60	0.14	0.1120
4	12.60	0.14	12.80	0.15	0.0428
5	12.80	0.15	13.00	0.17	0.1190
6	13.00	0.17	13.20	0.19	0.0790
7	13.20	0.19	13.60	0.21	0.0470
8	13.60	0.21	13.80	0.22	0.0759
9	13.80	0.22	14.00	0.24	0.0709
10	14.00	0.24	14.20	0.25	0.0538
11	14.20	0.25	14.40	0.26	0.0667
12	14.40	0.26	14.60	0.28	0.0737
13	14.60	0.28	14.80	0.29	0.0605
14	14.80	0.29	15.00	0.30	0.0766
15	15.00	0.30	15.20	0.32	0.0652
16	15.20	0.32	15.40	0.33	0.0672
17	15.40	0.33	15.60	0.34	0.0753
18	15.60	0.34	15.80	0.36	0.0710
19	15.80	0.36	16.00	0.37	0.0739
20	16.00	0.37	16.20	0.39	0.0751
21	16.20	0.39	16.40	0.40	0.0731
22	16.40	0.40	16.60	0.42	0.0789
23	16.60	0.42	16.80	0.43	0.0733
24	16.80	0.43	17.00	0.45	0.0715
25	17.00	0.45	17.20	0.47	0.0855
26	17.20	0.47	17.40	0.48	0.0718
27	17.40	0.48	17.60	0.50	0.0841
28	17.60	0.50	17.80	0.51	0.0789
29	17.80	0.51	18.00	0.53	0.0715
30	18.00	0.53	18.20	0.54	0.0889
31	18.20	0.54	18.40	0.56	0.0815
32	18.40	0.56	18.60	0.57	0.0718
33	18.60	0.57	18.80	0.59	0.0850
34	18.80	0.59	19.00	0.61	0.0939
35	19.00	0.61	19.40	0.64	0.0725
36	19.40	0.64	19.80	0.68	0.0926
37	19.80	0.68	20.00	0.69	0.0781
38	20.00	0.69	20.20	0.71	0.0726
39	20.20	0.71	20.40	0.72	0.0867
40	20.40	0.72	20.80	0.76	0.0916
41	20.80	0.76	21.00	0.78	0.0816
42	21.00	0.78	21.20	0.79	0.0735
43	21.20	0.79	21.40	0.81	0.0831
44	21.40	0.81	21.83	0.88	0.0908
45	1020.83	0.88	1020.83	0.91	0.0749
46	1020.83	0.91	1020.83	1.02	0.0899
47	1020.83	1.02	1020.83	1.04	0.0888
48	1020.83	1.04	1020.83	1.05	0.0759
49	1020.83	1.05	1020.83	1.07	0.0771
50	1020.83	1.07	1020.83	1.26	0.0897
51	1020.83	1.26	1020.83	1.28	0.0794
52	1020.83	1.28	1020.83	1.30	0.0775
53	1020.83	1.30	1020.83	1.31	0.0876
54	1020.83	1.31	1020.83	1.67	0.0893
55	1020.83	1.67	1020.83	1.69	0.0881
56	1020.83	1.69	1020.83	1.70	0.0799
57	1020.83	1.70	1020.83	1.72	0.0810
58	1020.83	1.72	1020.83	2.45	0.0891

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 12 Proposed Geometry Drained



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Date: 10/17/2006 File Name:

Wall Height=15.6 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=16.37, Pile Length=31.97
MOMENT IN PILE: Max. Moment=112.10 per Pile Spacing=6.0 at Depth=12.73

VERTICAL BEARING CAPACITY: Vertical Loading=5.4, Resistance=38.2, Vertical Factor of Safety=7.07

SYSTEM FACTOR OF SAFETY (Approximate)=2.10
The request embedment is 16.4, the user input fixed embedment = 34.4.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	17.4	17.4	0.0	16.2	4.4

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	15.60	0.50

PASSIVE SPACING:	Z depth	Spacing
1	15.60	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	2.7	0.09	0.033
2	2.7	0.09	3.1	0.11	0.045
3	3.1	0.11	3.5	0.13	0.048
4	3.5	0.13	8.2	0.31	0.040
5	8.2	0.32	8.6	0.33	0.035
6	8.6	0.33	9.0	0.33	0.006

7	9.0	0.33	9.4	0.34	0.008
8	9.4	0.34	9.8	0.35	0.031
9	9.8	0.35	10.1	0.36	0.024
10	10.1	0.36	10.9	0.37	0.018
11	10.9	0.37	11.3	0.38	0.027
12	11.3	0.38	11.7	0.40	0.057
13	11.7	0.40	12.1	0.42	0.050
14	12.1	0.42	15.6	0.51	0.024
15	15.6	0.51	31.6	0.89	0.024
16	31.6	0.89	32.0	0.88	-0.019
17	1031.0	0.88	1031.0	0.89	0.022
18	1031.0	0.89	1031.0	0.91	0.065
19	1031.0	0.91	1031.0	1.01	0.024
20	1031.0	1.01	1031.0	0.99	-0.056
21	1031.0	0.99	1031.0	0.96	-0.075
22	1031.0	0.96	1031.0	0.96	0.000
23	1031.0	0.96	1031.0	1.15	0.014
24	1031.0	1.15	1031.0	1.23	0.013
25	1031.0	1.23	1031.0	1.23	0.017
26	1031.0	1.23	1031.0	1.24	0.018
27	1031.0	1.24	1031.0	1.25	0.014
28	1031.0	1.25	1031.0	1.48	0.012

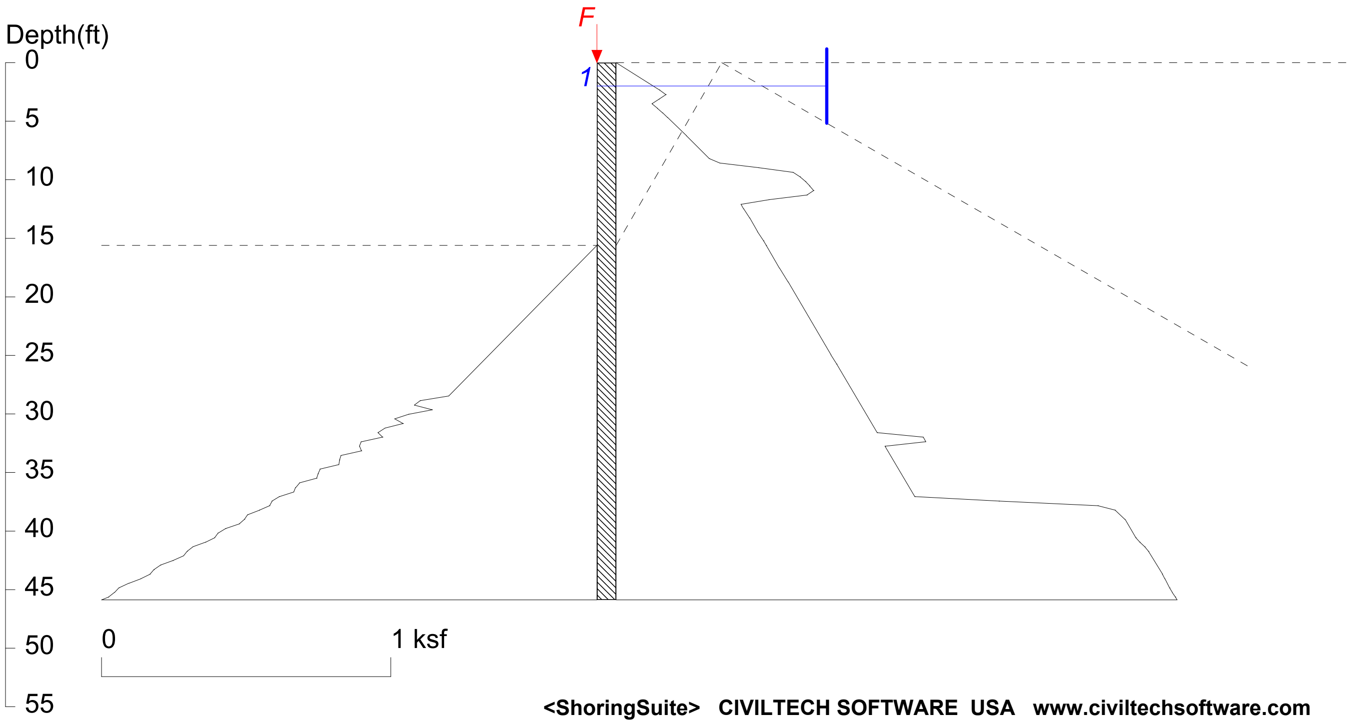
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	15.60	0.00	31.97	2.02	0.1038
2	1030.97	2.02	1030.97	2.07	0.1112
3	1030.97	2.07	1030.97	2.11	0.1041
4	1030.97	2.11	1030.97	2.15	0.1166
5	1030.97	2.15	1030.97	2.24	0.2136
6	1030.97	2.24	1030.97	2.28	0.1122
7	1030.97	2.28	1030.97	2.31	0.0649
8	1030.97	2.31	1030.97	2.40	0.2316
9	1030.97	2.40	1030.97	2.46	0.1768
10	1030.97	2.46	1030.97	2.49	0.0702
11	1030.97	2.49	1030.97	2.56	0.1596
12	1030.97	2.56	1030.97	2.65	0.2580
13	1030.97	2.65	1030.97	2.70	0.1042
14	1030.97	2.70	1030.97	2.72	0.0705
15	1030.97	2.72	1030.97	2.81	0.2178
16	1030.97	2.81	1030.97	2.90	0.2450
17	1030.97	2.90	1030.97	2.95	0.1159
18	1030.97	2.95	1030.97	2.98	0.0743
19	1030.97	2.98	1030.97	3.06	0.1983
20	1030.97	3.06	1030.97	3.15	0.2347
21	1030.97	3.15	1030.97	3.23	0.2103
22	1030.97	3.23	1030.97	3.26	0.0808
23	1030.97	3.26	1030.97	3.30	0.1011
24	1030.97	3.30	1030.97	3.57	0.2263
25	1030.97	3.57	1030.97	3.61	0.1112
26	1030.97	3.61	1030.97	3.64	0.0827
27	1030.97	3.64	1030.97	3.72	0.1944
28	1030.97	3.72	1030.97	3.97	0.2196
29	1030.97	3.97	1030.97	4.03	0.1585
30	1030.97	4.03	1030.97	4.07	0.0890
31	1030.97	4.07	1030.97	4.13	0.1475
32	1030.97	4.13	1030.97	4.55	0.2143
33	1030.97	4.55	1030.97	4.60	0.1342
34	1030.97	4.60	1030.97	4.63	0.0948

35	1030.97	4.63	1030.97	4.70	0.1728
36	1030.97	4.70	1030.97	5.28	0.2101
37	1030.97	5.28	1030.97	5.33	0.1431
38	1030.97	5.33	1030.97	5.37	0.1027
39	1030.97	5.37	1030.97	5.44	0.1681
40	1030.97	5.44	1030.97	6.32	0.2069
41	1030.97	6.32	1030.97	6.38	0.1411
42	1030.97	6.38	1030.97	6.42	0.1125
43	1030.97	6.42	1030.97	6.49	0.1771
44	1030.97	6.49	1030.97	8.01	0.2045
45	1030.97	8.01	1030.97	8.06	0.1339
46	1030.97	8.06	1030.97	8.11	0.1253
47	1030.97	8.11	1030.97	8.19	0.1951
48	1030.97	8.19	1030.97	9.93	0.2030

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 12 Proposed Geometry Undrained



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Date: 10/17/2006 File Name:

Wall Height=15.6 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=30.28, Pile Length=45.88
MOMENT IN PILE: Max. Moment=175.91 per Pile Spacing=6.0 at Depth=13.44

VERTICAL BEARING CAPACITY: Vertical Loading=5.4, Resistance=60.0, Vertical Factor of Safety=11.11

SYSTEM FACTOR OF SAFETY (Approximate)=1.14
The request embedment is 30.3, the user input fixed embedment = 34.4.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	25.4	25.4	0.0	18.0	6.3

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	15.60	0.50

PASSIVE SPACING:	Z depth	Spacing
1	15.60	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	2.3	0.15	0.064
2	2.3	0.15	2.7	0.17	0.058
3	2.7	0.17	3.1	0.15	-0.063
4	3.1	0.15	3.5	0.12	-0.062
5	3.5	0.12	3.9	0.14	0.050
6	3.9	0.14	4.3	0.16	0.045

7	4.3	0.16	4.7	0.18	0.043
8	4.7	0.18	6.2	0.24	0.042
9	6.2	0.24	8.2	0.32	0.041
10	8.2	0.32	8.6	0.36	0.094
11	8.6	0.36	9.0	0.49	0.345
12	9.0	0.49	9.4	0.61	0.304
13	9.4	0.61	9.8	0.64	0.062
14	9.8	0.64	10.1	0.65	0.049
15	10.1	0.65	10.5	0.67	0.037
16	10.5	0.67	10.9	0.68	0.036
17	10.9	0.68	11.3	0.66	-0.060
18	11.3	0.66	11.7	0.53	-0.337
19	11.7	0.53	12.1	0.43	-0.247
20	12.1	0.43	12.5	0.44	0.023
21	12.5	0.44	13.3	0.46	0.026
22	13.3	0.46	14.4	0.49	0.023
23	14.4	0.49	15.2	0.51	0.027
24	15.2	0.51	15.6	0.52	0.023
25	15.6	0.52	17.5	0.56	0.023
26	17.5	0.56	18.7	0.60	0.025
27	18.7	0.60	25.0	0.74	0.024
28	25.0	0.74	25.7	0.76	0.026
29	25.7	0.76	31.6	0.90	0.024
30	31.6	0.90	32.0	1.06	0.406
31	32.0	1.06	32.4	1.07	0.022
32	32.4	1.07	32.8	0.93	-0.360
33	32.8	0.93	37.0	1.03	0.024
34	37.0	1.03	37.4	1.32	0.747
35	37.4	1.32	37.8	1.67	0.877
36	37.8	1.67	38.2	1.73	0.155
37	38.2	1.73	39.0	1.76	0.043
38	39.0	1.76	40.6	1.80	0.024
39	40.6	1.80	41.0	1.81	0.036
40	41.0	1.81	41.3	1.83	0.044
41	41.3	1.83	41.7	1.84	0.033
42	41.7	1.84	43.7	1.89	0.025
43	43.7	1.89	44.1	1.90	0.022
44	44.1	1.90	44.8	1.91	0.020
45	44.8	1.91	45.2	1.92	0.025
46	45.2	1.92	45.6	1.93	0.028
47	45.6	1.93	45.9	1.94	0.024
48	1044.9	1.94	1044.9	2.01	0.021
49	1044.9	2.01	1044.9	2.11	0.023
50	1044.9	2.11	1044.9	2.12	0.029
51	1044.9	2.12	1044.9	2.13	0.033
52	1044.9	2.13	1044.9	2.14	0.026
53	1044.9	2.14	1044.9	2.18	0.022
54	1044.9	2.18	1044.9	2.33	0.024
55	1044.9	2.34	1044.9	2.35	0.026
56	1044.9	2.35	1044.9	2.36	0.036
57	1044.9	2.36	1044.9	2.37	0.034
58	1044.9	2.37	1044.9	2.59	0.024
59	1044.9	2.59	1044.9	2.60	0.026
60	1044.9	2.60	1044.9	2.62	0.036
61	1044.9	2.62	1044.9	2.63	0.034
62	1044.9	2.63	1044.9	2.72	0.025

PASSIVE PRESSURES:

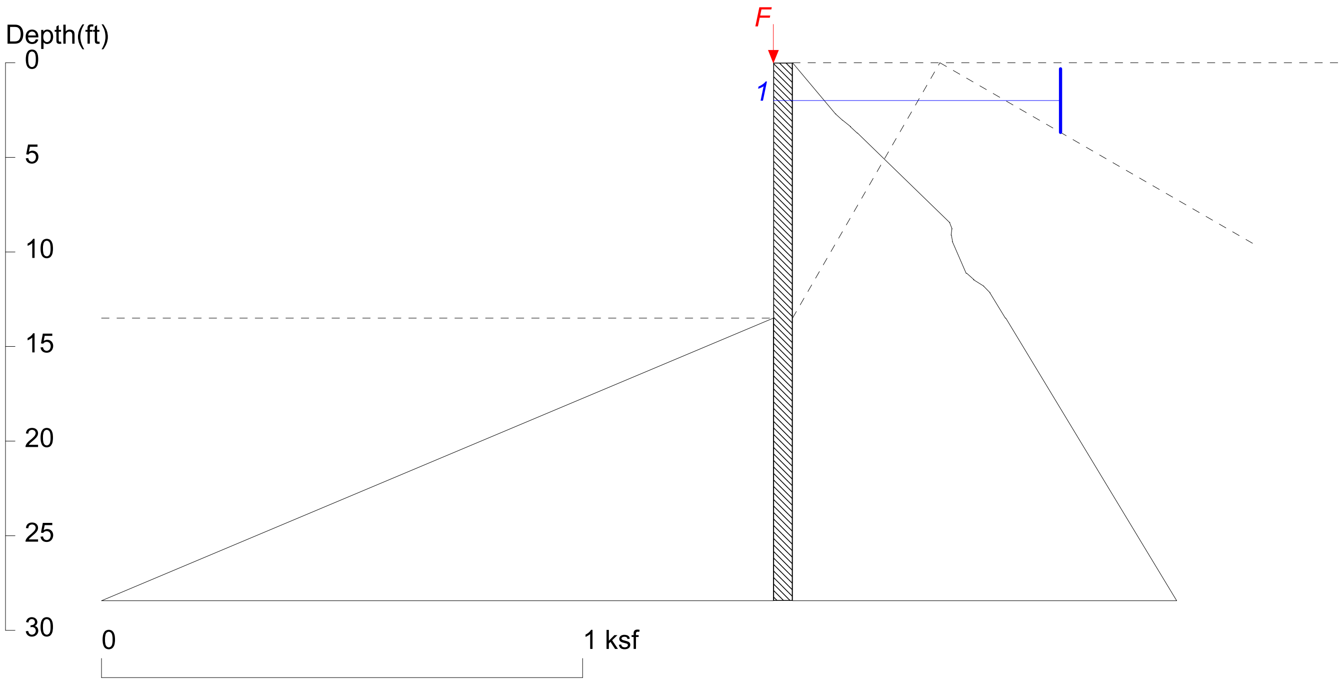
No.	Z1	P1	Z2	P2	Slope

1	15.60	0.00	28.47	0.51	0.0398
2	28.47	0.51	28.86	0.61	0.2508
3	28.86	0.61	29.25	0.63	0.0521
4	29.25	0.63	29.64	0.57	-0.1580
5	29.64	0.57	30.03	0.65	0.2085
6	30.03	0.65	30.42	0.70	0.1242
7	30.42	0.70	30.81	0.67	-0.0737
8	30.81	0.67	31.20	0.73	0.1579
9	31.20	0.73	31.59	0.76	0.0649
10	31.59	0.76	31.98	0.74	-0.0402
11	31.98	0.74	32.37	0.81	0.1875
12	32.37	0.81	32.76	0.82	0.0159
13	32.76	0.82	33.15	0.81	-0.0173
14	33.15	0.81	33.54	0.88	0.1829
15	33.54	0.88	33.93	0.89	0.0122
16	33.93	0.89	34.32	0.89	0.0062
17	34.32	0.89	34.71	0.96	0.1653
18	34.71	0.96	35.10	0.96	0.0178
19	35.10	0.96	35.49	0.97	0.0138
20	35.49	0.97	35.88	1.03	0.1517
21	35.88	1.03	36.27	1.04	0.0337
22	36.27	1.04	36.66	1.05	0.0161
23	36.66	1.05	37.05	1.10	0.1273
24	37.05	1.10	37.44	1.12	0.0652
25	37.44	1.12	37.83	1.13	0.0226
26	37.83	1.13	38.22	1.17	0.0904
27	38.22	1.17	38.61	1.21	0.1052
28	38.61	1.21	39.00	1.22	0.0279
29	39.00	1.22	39.39	1.24	0.0468
30	39.39	1.24	39.78	1.28	0.1202
31	39.78	1.28	40.17	1.31	0.0654
32	40.17	1.31	40.56	1.32	0.0296
33	40.56	1.32	40.95	1.35	0.0814
34	40.95	1.35	41.34	1.40	0.1142
35	41.34	1.40	41.73	1.42	0.0512
36	41.73	1.42	42.12	1.43	0.0319
37	42.12	1.43	42.51	1.47	0.0925
38	42.51	1.47	42.90	1.51	0.1093
39	42.90	1.51	43.29	1.53	0.0595
40	43.29	1.53	43.68	1.54	0.0347
41	43.68	1.54	44.07	1.58	0.0826
42	44.07	1.58	44.46	1.62	0.1054
43	44.46	1.62	44.85	1.65	0.0882
44	44.85	1.65	45.24	1.67	0.0377
45	45.24	1.67	45.63	1.69	0.0533
46	45.63	1.69	45.88	1.77	0.1021
47	1044.88	1.77	1044.88	1.80	0.0749
48	1044.88	1.80	1044.88	1.81	0.0396
49	1044.88	1.81	1044.88	1.84	0.0655
50	1044.88	1.84	1044.88	1.92	0.0995
51	1044.88	1.92	1044.88	1.95	0.0913
52	1044.88	1.95	1044.88	1.97	0.0421
53	1044.88	1.97	1044.88	1.99	0.0491
54	1044.88	1.99	1044.88	2.10	0.0973
55	1044.88	2.10	1044.88	2.13	0.0846
56	1044.88	2.13	1044.88	2.15	0.0440
57	1044.88	2.15	1044.88	2.17	0.0558
58	1044.88	2.17	1044.88	2.32	0.0954
59	1044.88	2.32	1044.88	2.35	0.0680

60	1044.88	2.35	1044.88	2.37	0.0460

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 12 Min. Passing Geometry Drained



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Date: 10/17/2006 File Name:

Wall Height=13.5 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=14.94, Pile Length=28.44
MOMENT IN PILE: Max. Moment=72.56 per Pile Spacing=6.0 at Depth=11.14

VERTICAL BEARING CAPACITY: Vertical Loading=5.4, Resistance=34.3, Vertical Factor of Safety=6.34

SYSTEM FACTOR OF SAFETY (Approximate)=2.44
The request embedment is 14.9, the user input fixed embedment = 36.5.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	13.5	13.5	0.0	14.2	3.4

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	13.50	0.50

PASSIVE SPACING:	Z depth	Spacing
1	13.50	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	2.7	0.09	0.033
2	2.7	0.09	3.0	0.10	0.044
3	3.0	0.10	3.4	0.12	0.049
4	3.4	0.12	3.7	0.14	0.042
5	3.7	0.14	8.4	0.32	0.040
6	8.4	0.33	8.8	0.33	0.016

7	8.8	0.33	9.1	0.33	-0.005
8	9.1	0.33	9.4	0.33	0.007
9	9.4	0.33	11.1	0.36	0.017
10	11.1	0.36	11.5	0.38	0.044
11	11.5	0.38	11.8	0.40	0.062
12	11.8	0.40	12.1	0.41	0.039
13	12.1	0.41	13.5	0.44	0.024
14	13.5	0.44	28.4	0.87	0.024
15	1027.4	0.87	1027.4	0.87	0.007
16	1027.4	0.87	1027.4	0.87	-0.016
17	1027.4	0.87	1027.4	0.88	0.038
18	1027.4	0.88	1027.4	0.90	0.061
19	1027.4	0.90	1027.4	1.00	0.024
20	1027.4	1.00	1027.4	0.98	-0.072
21	1027.4	0.98	1027.4	0.95	-0.088
22	1027.4	0.95	1027.4	0.95	0.003
23	1027.4	0.95	1027.4	1.14	0.014
24	1027.4	1.14	1027.4	1.14	0.013
25	1027.4	1.14	1027.4	1.22	0.012
26	1027.4	1.22	1027.4	1.22	0.016
27	1027.4	1.22	1027.4	1.23	0.019
28	1027.4	1.23	1027.4	1.24	0.015
29	1027.4	1.24	1027.4	1.34	0.012

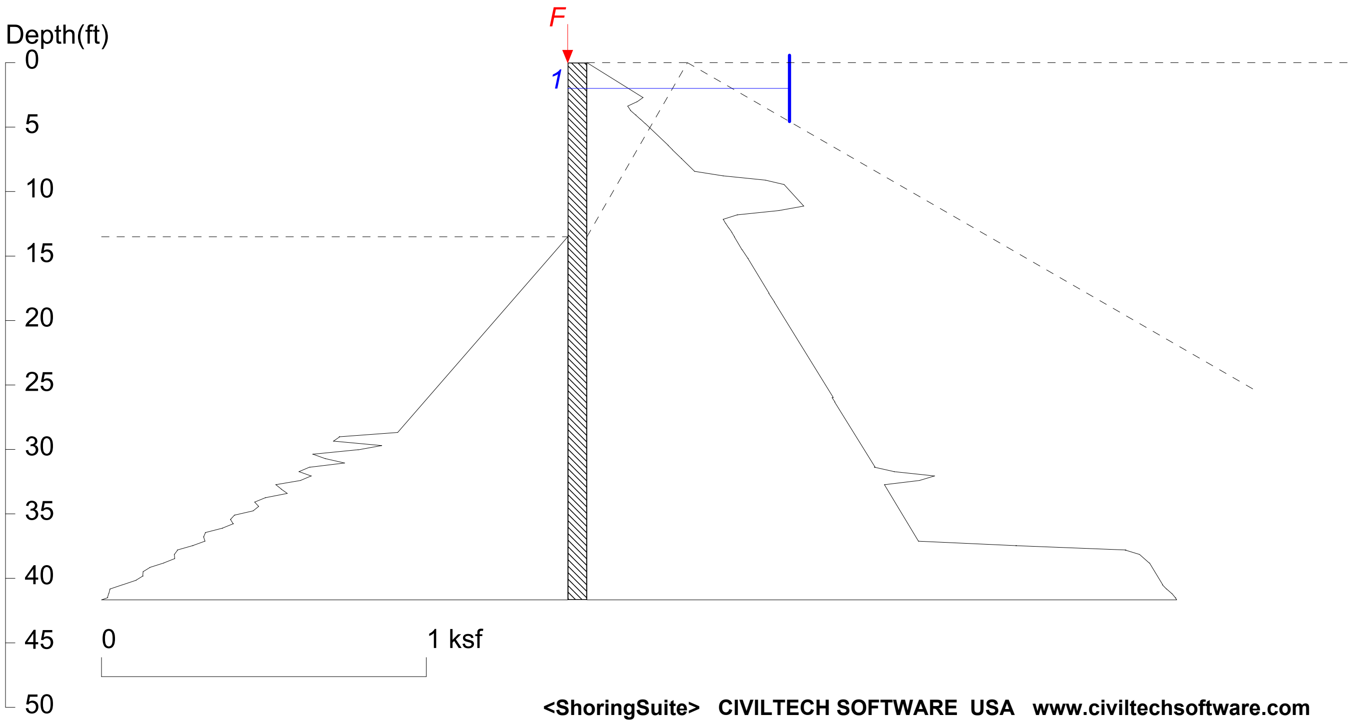
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	13.50	0.00	28.44	1.83	0.0935
2	1027.44	1.83	1027.44	1.86	0.1006
3	1027.44	1.86	1027.44	1.93	0.1896
4	1027.44	1.93	1027.44	1.96	0.0898
5	1027.44	1.96	1027.44	1.97	0.0236
6	1027.44	1.97	1027.44	2.05	0.2384
7	1027.44	2.05	1027.44	2.11	0.1818
8	1027.44	2.11	1027.44	2.11	-0.0002
9	1027.44	2.11	1027.44	2.16	0.1473
10	1027.44	2.16	1027.44	2.27	0.3221
11	1027.44	2.27	1027.44	2.27	0.0201
12	1027.44	2.27	1027.44	2.27	0.0009
13	1027.44	2.27	1027.44	2.37	0.2902
14	1027.44	2.37	1027.44	2.45	0.2387
15	1027.44	2.45	1027.44	2.46	0.0186
16	1027.44	2.46	1027.44	2.48	0.0649
17	1027.44	2.48	1027.44	2.57	0.2745
18	1027.44	2.57	1027.44	2.66	0.2501
19	1027.44	2.66	1027.44	2.67	0.0260
20	1027.44	2.67	1027.44	2.68	0.0421
21	1027.44	2.68	1027.44	2.86	0.2580
22	1027.44	2.86	1027.44	2.90	0.1301
23	1027.44	2.90	1027.44	2.91	0.0289
24	1027.44	2.91	1027.44	2.96	0.1504
25	1027.44	2.96	1027.44	3.12	0.2450
26	1027.44	3.12	1027.44	3.17	0.1392
27	1027.44	3.17	1027.44	3.18	0.0360
28	1027.44	3.18	1027.44	3.23	0.1366
29	1027.44	3.23	1027.44	3.47	0.2347
30	1027.44	3.47	1027.44	3.50	0.0867
31	1027.44	3.50	1027.44	3.51	0.0417
32	1027.44	3.51	1027.44	3.57	0.1854
33	1027.44	3.57	1027.44	3.80	0.2263

34	1027.44	3.80	1027.44	3.87	0.2012
35	1027.44	3.87	1027.44	3.89	0.0512
36	1027.44	3.89	1027.44	3.91	0.0730
37	1027.44	3.91	1027.44	4.28	0.2196
38	1027.44	4.28	1027.44	4.34	0.1773
39	1027.44	4.34	1027.44	4.36	0.0586
40	1027.44	4.36	1027.44	4.39	0.0982
41	1027.44	4.39	1027.44	4.90	0.2143
42	1027.44	4.90	1027.44	4.95	0.1292
43	1027.44	4.95	1027.44	4.97	0.0667
44	1027.44	4.97	1027.44	5.02	0.1497
45	1027.44	5.02	1027.44	5.66	0.2101
46	1027.44	5.66	1027.44	5.72	0.1970
47	1027.44	5.72	1027.44	5.75	0.0780
48	1027.44	5.75	1027.44	5.78	0.0895
49	1027.44	5.78	1027.44	6.83	0.2069
50	1027.44	6.83	1027.44	6.86	0.1141
51	1027.44	6.86	1027.44	6.90	0.0898
52	1027.44	6.90	1027.44	6.96	0.1814
53	1027.44	6.96	1027.44	7.85	0.2045

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 12 Min. Passing Geometry Undrained



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Date: 10/17/2006 File Name:

Wall Height=13.5 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=28.17, Pile Length=41.67

MOMENT IN PILE: Max. Moment=125.04 per Pile Spacing=6.0 at Depth=11.79

VERTICAL BEARING CAPACITY: Vertical Loading=5.4, Resistance=55.0, Vertical Factor of Safety=10.19

SYSTEM FACTOR OF SAFETY (Approximate)=1.30

The request embedment is 28.2, the user input fixed embedment = 36.5.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	20.5	20.5	0.0	15.7	5.1

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	13.50	0.50

PASSIVE SPACING:	Z depth	Spacing
1	13.50	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	2.7	0.17	0.064
2	2.7	0.17	3.0	0.15	-0.055
3	3.0	0.15	3.4	0.13	-0.085
4	3.4	0.13	3.7	0.13	0.026
5	3.7	0.13	4.1	0.15	0.047
6	4.1	0.15	4.4	0.17	0.044

7	4.4	0.17	4.7	0.18	0.043
8	4.7	0.18	6.4	0.25	0.042
9	6.4	0.25	6.8	0.26	0.040
10	6.8	0.26	7.4	0.29	0.042
11	7.4	0.29	8.4	0.33	0.040
12	8.4	0.33	8.8	0.42	0.260
13	8.8	0.42	9.1	0.55	0.388
14	9.1	0.55	9.4	0.61	0.168
15	9.4	0.61	11.1	0.67	0.036
16	11.1	0.67	11.5	0.59	-0.226
17	11.5	0.59	11.8	0.46	-0.380
18	11.8	0.46	12.1	0.42	-0.128
19	12.1	0.42	12.5	0.43	0.023
20	12.5	0.43	12.8	0.44	0.026
21	12.8	0.44	13.2	0.45	0.027
22	13.2	0.45	13.5	0.45	0.024
23	13.5	0.45	14.5	0.48	0.023
24	14.5	0.48	15.2	0.50	0.026
25	15.2	0.50	17.9	0.56	0.024
26	17.9	0.56	18.6	0.58	0.026
27	18.6	0.58	26.0	0.76	0.024
28	26.0	0.75	26.3	0.76	0.026
29	26.3	0.76	31.4	0.89	0.025
30	31.4	0.88	31.7	0.95	0.181
31	31.7	0.95	32.1	1.07	0.369
32	32.1	1.07	32.4	1.02	-0.135
33	32.4	1.02	32.7	0.92	-0.322
34	32.7	0.92	37.1	1.02	0.024
35	37.1	1.02	37.5	1.32	0.888
36	37.5	1.32	37.8	1.66	0.996
37	37.8	1.66	38.1	1.70	0.131
38	38.1	1.70	38.8	1.73	0.045
39	38.8	1.73	40.5	1.77	0.024
40	40.5	1.77	40.8	1.78	0.038
41	40.8	1.78	41.2	1.80	0.046
42	41.2	1.80	41.5	1.81	0.032
43	41.5	1.81	41.7	1.86	0.025
44	1040.7	1.86	1040.7	1.87	0.023
45	1040.7	1.87	1040.7	1.88	0.021
46	1040.7	1.88	1040.7	1.89	0.026
47	1040.7	1.89	1040.7	1.90	0.029
48	1040.7	1.90	1040.7	1.91	0.024
49	1040.7	1.91	1040.7	1.98	0.021
50	1040.7	1.98	1040.7	2.00	0.022
51	1040.7	2.00	1040.7	2.08	0.023
52	1040.7	2.08	1040.7	2.11	0.035
53	1040.7	2.11	1040.7	2.15	0.022
54	1040.7	2.15	1040.7	2.31	0.023
55	1040.7	2.31	1040.7	2.32	0.034
56	1040.7	2.32	1040.7	2.34	0.038
57	1040.7	2.34	1040.7	2.35	0.028
58	1040.7	2.35	1040.7	2.44	0.024

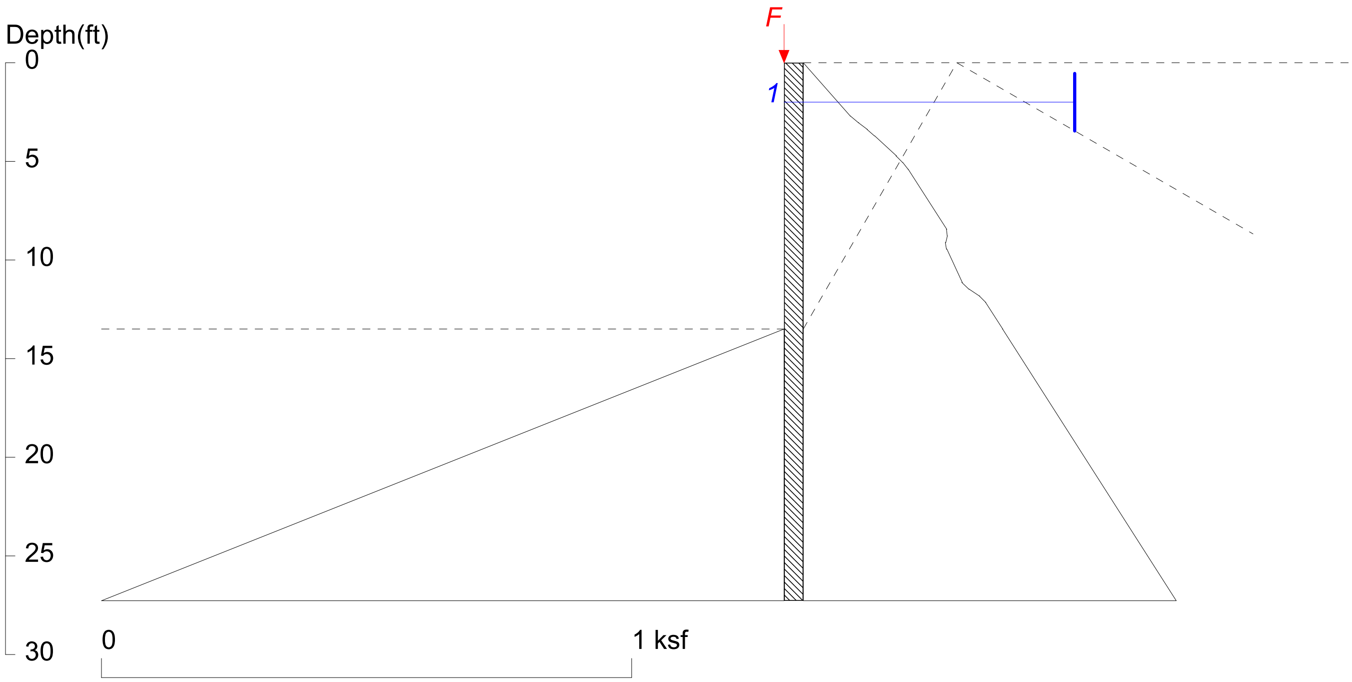
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	13.50	0.00	28.68	0.52	0.0345
2	28.68	0.52	29.02	0.70	0.5293
3	29.02	0.70	29.36	0.72	0.0558
4	29.36	0.72	29.70	0.57	-0.4374

5	29.70	0.57	30.03	0.65	0.2142
6	30.03	0.65	30.37	0.78	0.4089
7	30.37	0.78	30.71	0.75	-0.1092
8	30.71	0.75	31.05	0.69	-0.1773
9	31.05	0.69	31.38	0.80	0.3192
10	31.38	0.80	31.72	0.83	0.0946
11	31.72	0.83	32.06	0.79	-0.1088
12	32.06	0.79	32.40	0.82	0.0949
13	32.40	0.82	32.73	0.90	0.2280
14	32.73	0.90	33.07	0.88	-0.0514
15	33.07	0.88	33.41	0.86	-0.0547
16	33.41	0.86	33.75	0.93	0.2002
17	33.75	0.93	34.08	0.96	0.0974
18	34.08	0.96	34.42	0.95	-0.0373
19	34.42	0.95	34.76	0.97	0.0509
20	34.76	0.97	35.10	1.03	0.1710
21	35.10	1.03	35.43	1.04	0.0370
22	35.43	1.04	35.77	1.03	-0.0246
23	35.77	1.03	36.11	1.06	0.0997
24	36.11	1.06	36.45	1.12	0.1517
25	36.45	1.12	36.78	1.12	0.0188
26	36.78	1.12	37.12	1.12	-0.0138
27	37.12	1.12	37.46	1.15	0.1123
28	37.46	1.15	37.80	1.20	0.1381
29	37.80	1.20	38.13	1.21	0.0296
30	38.13	1.21	38.47	1.21	-0.0047
31	38.47	1.21	38.81	1.24	0.0988
32	38.81	1.24	39.15	1.29	0.1280
33	39.15	1.29	39.48	1.31	0.0628
34	39.48	1.31	39.82	1.31	0.0032
35	39.82	1.31	40.16	1.33	0.0645
36	40.16	1.33	40.50	1.37	0.1202
37	40.50	1.37	40.83	1.41	0.1149
38	40.83	1.41	41.17	1.41	0.0102
39	41.17	1.41	41.51	1.42	0.0125
40	41.51	1.42	41.67	1.49	0.1142
41	1040.67	1.49	1040.67	1.52	0.0861
42	1040.67	1.52	1040.67	1.53	0.0140
43	1040.67	1.53	1040.67	1.54	0.0396
44	1040.67	1.54	1040.67	1.62	0.1093
45	1040.67	1.62	1040.67	1.65	0.0924
46	1040.67	1.65	1040.67	1.65	0.0182
47	1040.67	1.65	1040.67	1.66	0.0331
48	1040.67	1.66	1040.67	1.77	0.1054
49	1040.67	1.77	1040.67	1.79	0.0480
50	1040.67	1.79	1040.67	1.79	0.0209
51	1040.67	1.79	1040.67	1.82	0.0767
52	1040.67	1.82	1040.67	1.92	0.1021
53	1040.67	1.92	1040.67	1.94	0.0479
54	1040.67	1.94	1040.67	1.95	0.0244
55	1040.67	1.95	1040.67	1.97	0.0773
56	1040.67	1.97	1040.67	2.07	0.0995
57	1040.67	2.07	1040.67	2.11	0.0906
58	1040.67	2.11	1040.67	2.11	0.0283
59	1040.67	2.11	1040.67	2.13	0.0361
60	1040.67	2.13	1040.67	2.29	0.0973

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 12 Min. Passing Geometry Drained High Water



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Date: 10/17/2006 File Name:

Wall Height=13.5 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=13.77, Pile Length=27.27
MOMENT IN PILE: Max. Moment=59.41 per Pile Spacing=6.0 at Depth=10.99

VERTICAL BEARING CAPACITY: Vertical Loading=5.4, Resistance=32.4, Vertical Factor of Safety=6.01

SYSTEM FACTOR OF SAFETY (Approximate)=2.65
The request embedment is 13.8, the user input fixed embedment = 36.5.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	11.6	11.6	0.0	13.8	2.9

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	13.50	0.50

PASSIVE SPACING:	Z depth	Spacing
1	13.50	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	2.7	0.09	0.033
2	2.7	0.09	3.0	0.10	0.044
3	3.0	0.10	3.4	0.12	0.049
4	3.4	0.12	3.7	0.14	0.042
5	3.7	0.14	4.7	0.17	0.040
6	4.7	0.17	5.1	0.19	0.037

7	5.1	0.19	5.4	0.20	0.029
8	5.4	0.20	8.4	0.27	0.024
9	8.4	0.27	8.8	0.27	0.004
10	8.8	0.27	9.1	0.27	-0.010
11	9.1	0.27	9.4	0.27	0.006
12	9.4	0.27	11.1	0.30	0.017
13	11.1	0.30	11.5	0.31	0.040
14	11.5	0.31	11.8	0.33	0.056
15	11.8	0.33	12.1	0.34	0.036
16	12.1	0.34	13.5	0.38	0.024
17	13.5	0.38	27.3	0.80	0.024
18	1026.3	0.80	1026.3	0.81	0.008
19	1026.3	0.81	1026.3	0.80	-0.014
20	1026.3	0.80	1026.3	0.81	0.038
21	1026.3	0.81	1026.3	0.83	0.059
22	1026.3	0.83	1026.3	0.94	0.024
23	1026.3	0.94	1026.3	0.91	-0.067
24	1026.3	0.91	1026.3	0.89	-0.083
25	1026.3	0.89	1026.3	0.89	0.003
26	1026.3	0.89	1026.3	0.90	0.014
27	1026.3	0.90	1026.3	0.91	0.017
28	1026.3	0.91	1026.3	1.07	0.014
29	1026.3	1.07	1026.3	1.08	0.013
30	1026.3	1.08	1026.3	1.18	0.012
31	1026.3	1.18	1026.3	1.19	0.019
32	1026.3	1.19	1026.3	1.28	0.013

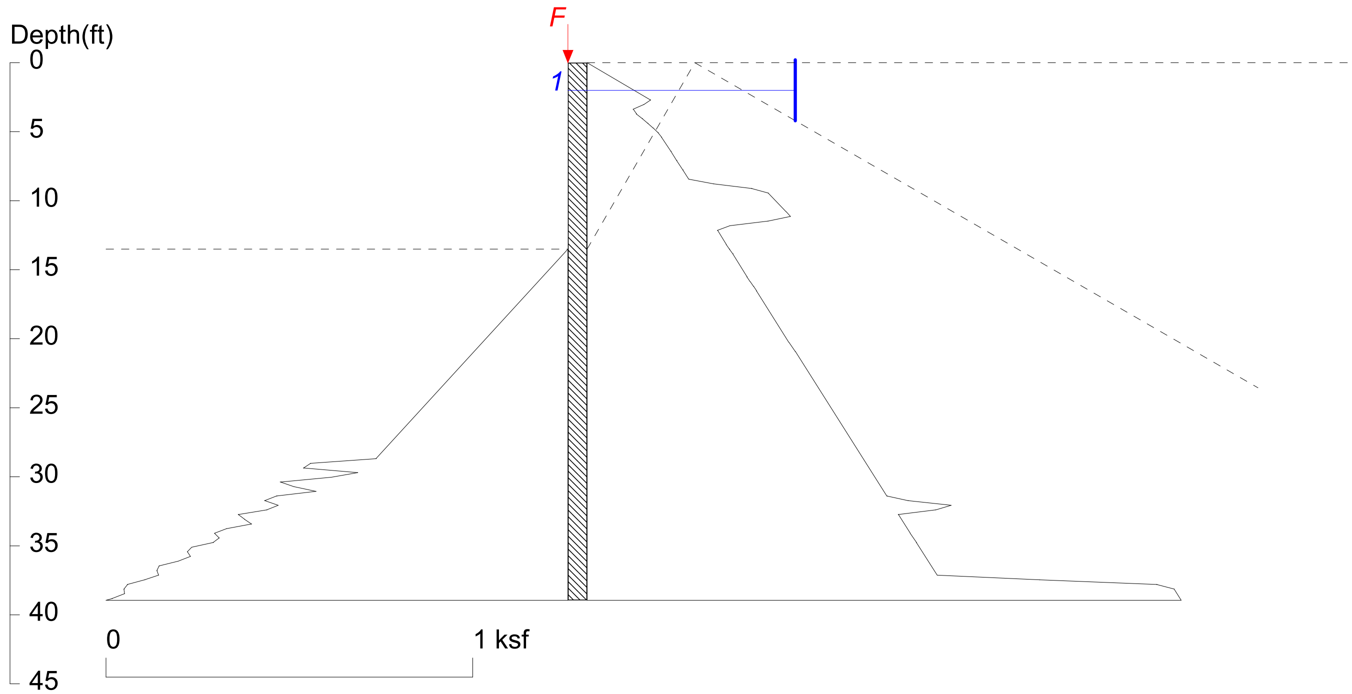
PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	13.50	0.00	27.27	1.83	0.0935
2	1026.27	1.83	1026.27	1.86	0.1006
3	1026.27	1.86	1026.27	1.93	0.1896
4	1026.27	1.93	1026.27	1.96	0.0898
5	1026.27	1.96	1026.27	1.97	0.0236
6	1026.27	1.97	1026.27	2.05	0.2384
7	1026.27	2.05	1026.27	2.11	0.1818
8	1026.27	2.11	1026.27	2.11	-0.0002
9	1026.27	2.11	1026.27	2.16	0.1473
10	1026.27	2.16	1026.27	2.27	0.3221
11	1026.27	2.27	1026.27	2.27	0.0201
12	1026.27	2.27	1026.27	2.27	0.0009
13	1026.27	2.27	1026.27	2.37	0.2902
14	1026.27	2.37	1026.27	2.45	0.2387
15	1026.27	2.45	1026.27	2.46	0.0186
16	1026.27	2.46	1026.27	2.48	0.0649
17	1026.27	2.48	1026.27	2.57	0.2745
18	1026.27	2.57	1026.27	2.66	0.2501
19	1026.27	2.66	1026.27	2.67	0.0260
20	1026.27	2.67	1026.27	2.68	0.0421
21	1026.27	2.68	1026.27	2.86	0.2580
22	1026.27	2.86	1026.27	2.90	0.1301
23	1026.27	2.90	1026.27	2.91	0.0289
24	1026.27	2.91	1026.27	2.96	0.1504
25	1026.27	2.96	1026.27	3.12	0.2450
26	1026.27	3.12	1026.27	3.17	0.1392
27	1026.27	3.17	1026.27	3.18	0.0360
28	1026.27	3.18	1026.27	3.23	0.1366
29	1026.27	3.23	1026.27	3.47	0.2347
30	1026.27	3.47	1026.27	3.50	0.0867

31	1026.27	3.50	1026.27	3.51	0.0417
32	1026.27	3.51	1026.27	3.57	0.1854
33	1026.27	3.57	1026.27	3.80	0.2263
34	1026.27	3.80	1026.27	3.87	0.2012
35	1026.27	3.87	1026.27	3.89	0.0512
36	1026.27	3.89	1026.27	3.91	0.0730
37	1026.27	3.91	1026.27	4.28	0.2196
38	1026.27	4.28	1026.27	4.34	0.1773
39	1026.27	4.34	1026.27	4.36	0.0586
40	1026.27	4.36	1026.27	4.39	0.0982
41	1026.27	4.39	1026.27	4.90	0.2143
42	1026.27	4.90	1026.27	4.95	0.1292
43	1026.27	4.95	1026.27	4.97	0.0667
44	1026.27	4.97	1026.27	5.02	0.1497
45	1026.27	5.02	1026.27	5.66	0.2101
46	1026.27	5.66	1026.27	5.72	0.1970
47	1026.27	5.72	1026.27	5.75	0.0780
48	1026.27	5.75	1026.27	5.78	0.0895
49	1026.27	5.78	1026.27	6.83	0.2069
50	1026.27	6.83	1026.27	6.86	0.1141
51	1026.27	6.86	1026.27	6.90	0.0898
52	1026.27	6.90	1026.27	6.96	0.1814
53	1026.27	6.96	1026.27	7.85	0.2045

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 12 Min. Passing Geometry Undrained High Water



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Date: 10/17/2006 File Name:

Wall Height=13.5 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=25.45, Pile Length=38.95
MOMENT IN PILE: Max. Moment=102.46 per Pile Spacing=6.0 at Depth=11.65

VERTICAL BEARING CAPACITY: Vertical Loading=5.4, Resistance=50.8, Vertical Factor of Safety=9.40

SYSTEM FACTOR OF SAFETY (Approximate)=1.43
The request embedment is 25.4, the user input fixed embedment = 36.5.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	17.6	17.6	0.0	15.1	4.4

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	13.50	0.50

PASSIVE SPACING:	Z depth	Spacing
1	13.50	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	2.7	0.17	0.064
2	2.7	0.17	3.0	0.15	-0.055
3	3.0	0.15	3.4	0.13	-0.085
4	3.4	0.13	3.7	0.13	0.026
5	3.7	0.13	4.1	0.15	0.047
6	4.1	0.15	4.4	0.17	0.044

7	4.4	0.17	4.7	0.18	0.043
8	4.7	0.18	5.1	0.19	0.039
9	5.1	0.19	5.4	0.20	0.031
10	5.4	0.20	6.4	0.23	0.025
11	6.4	0.23	7.1	0.24	0.024
12	7.1	0.24	7.8	0.26	0.025
13	7.8	0.26	8.4	0.28	0.024
14	8.4	0.28	8.8	0.34	0.199
15	8.8	0.34	9.1	0.45	0.307
16	9.1	0.45	9.4	0.49	0.137
17	9.4	0.49	10.8	0.54	0.036
18	10.8	0.54	11.1	0.55	0.034
19	11.1	0.55	11.5	0.49	-0.180
20	11.5	0.49	11.8	0.39	-0.308
21	11.8	0.39	12.1	0.36	-0.100
22	12.1	0.36	13.2	0.38	0.023
23	13.2	0.38	13.5	0.39	0.026
24	13.5	0.39	13.8	0.40	0.026
25	13.8	0.40	15.5	0.44	0.023
26	15.5	0.44	15.9	0.44	0.025
27	15.9	0.44	16.2	0.45	0.026
28	16.2	0.45	16.5	0.46	0.025
29	16.5	0.46	20.3	0.55	0.024
30	20.3	0.55	20.9	0.57	0.026
31	20.9	0.57	31.4	0.82	0.024
32	31.4	0.82	31.7	0.88	0.172
33	31.7	0.88	32.1	0.99	0.348
34	32.1	0.99	32.4	0.95	-0.125
35	32.4	0.95	32.7	0.85	-0.302
36	32.7	0.85	34.1	0.88	0.024
37	34.1	0.88	34.8	0.90	0.026
38	34.8	0.90	37.1	0.95	0.024
39	37.1	0.95	37.5	1.23	0.827
40	37.5	1.23	37.8	1.55	0.946
41	37.8	1.55	38.1	1.60	0.143
42	38.1	1.60	38.9	1.63	0.024
43	1037.9	1.63	1037.9	1.64	0.028
44	1037.9	1.64	1037.9	1.66	0.045
45	1037.9	1.66	1037.9	1.67	0.041
46	1037.9	1.67	1037.9	1.71	0.025
47	1037.9	1.71	1037.9	1.72	0.026
48	1037.9	1.72	1037.9	1.74	0.038
49	1037.9	1.74	1037.9	1.75	0.035
50	1037.9	1.75	1037.9	1.87	0.020
51	1037.9	1.87	1037.9	1.88	0.022
52	1037.9	1.88	1037.9	1.93	0.023
53	1037.9	1.93	1037.9	1.94	0.033
54	1037.9	1.94	1037.9	1.95	0.036
55	1037.9	1.95	1037.9	1.96	0.026
56	1037.9	1.96	1037.9	1.98	0.024
57	1037.9	1.98	1037.9	2.04	0.022
58	1037.9	2.04	1037.9	2.15	0.023
59	1037.9	2.16	1037.9	2.17	0.035
60	1037.9	2.17	1037.9	2.18	0.037
61	1037.9	2.18	1037.9	2.19	0.026
62	1037.9	2.19	1037.9	2.32	0.024

PASSIVE PRESSURES:

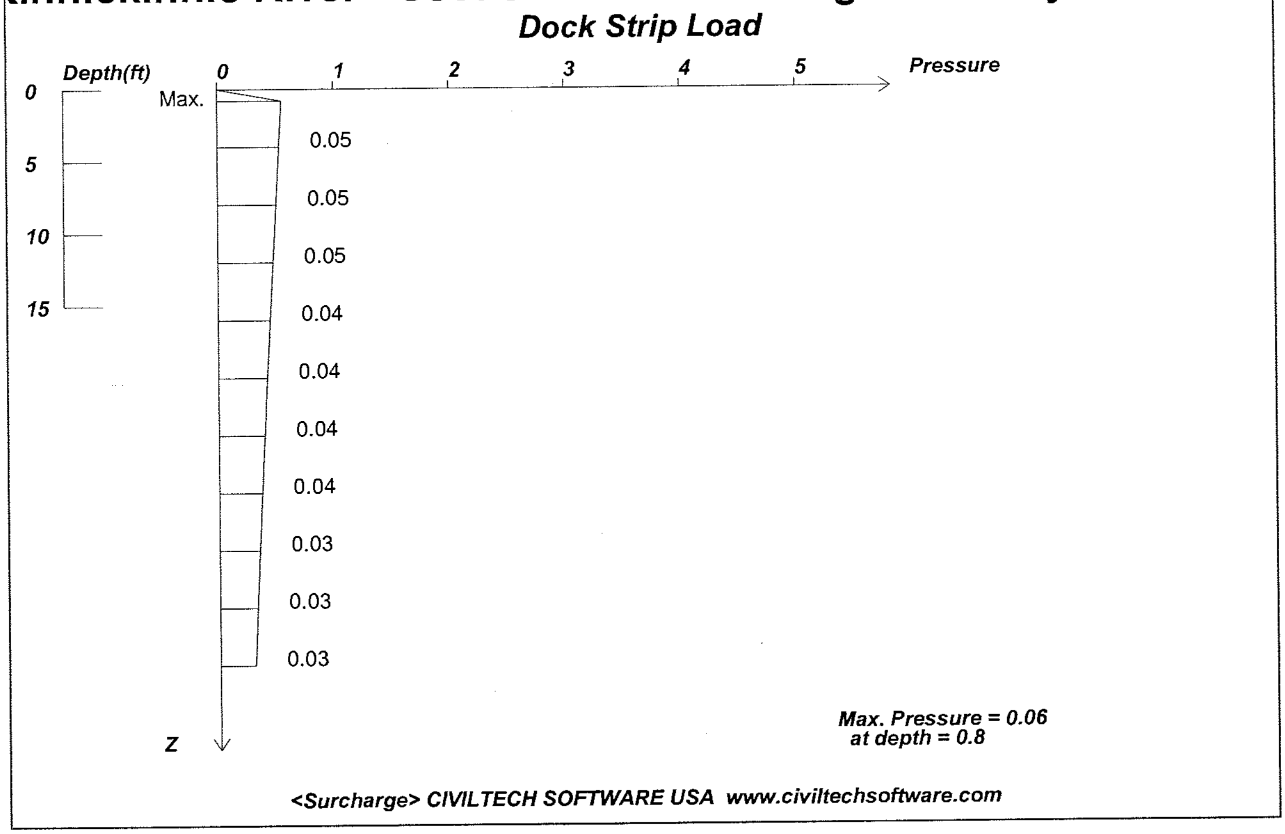
No.	Z1	P1	Z2	P2	Slope

1	13.50	0.00	28.69	0.52	0.0345
2	28.69	0.52	29.02	0.70	0.5293
3	29.02	0.70	29.36	0.72	0.0558
4	29.36	0.72	29.70	0.57	-0.4374
5	29.70	0.57	30.04	0.65	0.2142
6	30.04	0.65	30.38	0.78	0.4089
7	30.38	0.78	30.71	0.75	-0.1092
8	30.71	0.75	31.05	0.69	-0.1773
9	31.05	0.69	31.39	0.80	0.3192
10	31.39	0.80	31.73	0.83	0.0946
11	31.73	0.83	32.06	0.79	-0.1088
12	32.06	0.79	32.40	0.82	0.0949
13	32.40	0.82	32.74	0.90	0.2280
14	32.74	0.90	33.08	0.88	-0.0514
15	33.08	0.88	33.41	0.86	-0.0547
16	33.41	0.86	33.75	0.93	0.2002
17	33.75	0.93	34.09	0.96	0.0974
18	34.09	0.96	34.42	0.95	-0.0373
19	34.42	0.95	34.76	0.97	0.0509
20	34.76	0.97	35.10	1.03	0.1710
21	35.10	1.03	35.44	1.04	0.0370
22	35.44	1.04	35.78	1.03	-0.0246
23	35.78	1.03	36.11	1.06	0.0997
24	36.11	1.06	36.45	1.12	0.1517
25	36.45	1.12	36.79	1.12	0.0188
26	36.79	1.12	37.13	1.12	-0.0138
27	37.13	1.12	37.46	1.15	0.1123
28	37.46	1.15	37.80	1.20	0.1381
29	37.80	1.20	38.14	1.21	0.0296
30	38.14	1.21	38.47	1.21	-0.0047
31	38.47	1.21	38.81	1.24	0.0988
32	38.81	1.24	38.95	1.29	0.1280
33	1037.95	1.29	1037.95	1.31	0.0628
34	1037.95	1.31	1037.95	1.31	0.0032
35	1037.95	1.31	1037.95	1.33	0.0645
36	1037.95	1.33	1037.95	1.37	0.1202
37	1037.95	1.37	1037.95	1.41	0.1149
38	1037.95	1.41	1037.95	1.41	0.0102
39	1037.95	1.41	1037.95	1.42	0.0125
40	1037.95	1.42	1037.95	1.49	0.1142
41	1037.95	1.49	1037.95	1.52	0.0861
42	1037.95	1.52	1037.95	1.53	0.0140
43	1037.95	1.53	1037.95	1.54	0.0396
44	1037.95	1.54	1037.95	1.62	0.1093
45	1037.95	1.62	1037.95	1.65	0.0924
46	1037.95	1.65	1037.95	1.65	0.0182
47	1037.95	1.65	1037.95	1.66	0.0331
48	1037.95	1.66	1037.95	1.77	0.1054
49	1037.95	1.77	1037.95	1.79	0.0480
50	1037.95	1.79	1037.95	1.79	0.0209
51	1037.95	1.79	1037.95	1.82	0.0767
52	1037.95	1.82	1037.95	1.92	0.1021
53	1037.95	1.92	1037.95	1.94	0.0479
54	1037.95	1.94	1037.95	1.95	0.0244
55	1037.95	1.95	1037.95	1.97	0.0773
56	1037.95	1.97	1037.95	2.07	0.0995
57	1037.95	2.07	1037.95	2.11	0.0906
58	1037.95	2.11	1037.95	2.11	0.0283
59	1037.95	2.11	1037.95	2.13	0.0361

60	1037.95	2.13	1037.95	2.29	0.0973

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 7 Min. Passing Geometry Undrained



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Date: 11/30/2006

Wall Height, H= 10 Load Depth at Surface, D= 0

Load Factor of Surcharge Loading = 1

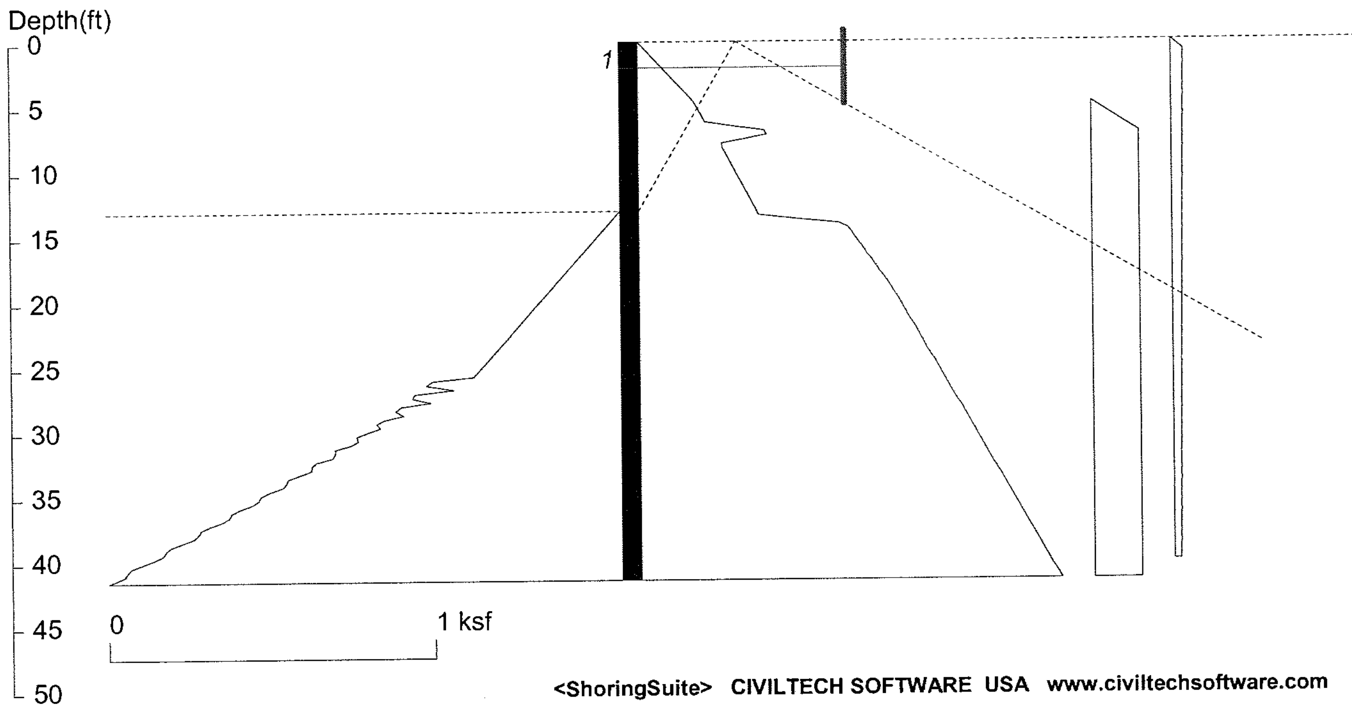
Semi-flexible Wall Condition -- Very small movement or deflection are allowed.

Max. Pressure = 0.06 at depth = 0.8

X	Width	Strip Load
.0	100.0	.08

UNITS: LENGTH/DEPTH: ft, Qpoint: kip, Qline: kip/ft, Qstrip/Qarea/PRESSURE: ksf

Kinnickinnic River - Section 7 Min. Passing Geometry Undrained



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Date: 11/30/2006 File Name:

Wall Height=13.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=28.43, Pile Length=41.43
MOMENT IN PILE: Max. Moment=130.38 per Pile Spacing=6.0 at Depth=12.03

VERTICAL BEARING CAPACITY: Vertical Loading=0.0, Resistance=55.1, Vertical Factor of Safety=999.00

SYSTEM FACTOR OF SAFETY (Approximate)=1.30
The request embedment is 28.4, the user input fixed embedment = 37.

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	22.4	22.4	0.0	15.8	5.6

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	13.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	13.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	4.2	0.16	0.037
2	4.2	0.16	4.6	0.17	0.036
3	4.6	0.17	4.9	0.18	0.028
4	4.9	0.18	6.2	0.20	0.021
5	6.2	0.20	6.5	0.29	0.277
6	6.5	0.29	6.8	0.38	0.281

7	6.8	0.38	7.2	0.39	0.028
8	7.2	0.39	7.5	0.33	-0.202
9	7.5	0.33	7.8	0.25	-0.224
10	7.8	0.25	8.1	0.26	0.003
11	8.1	0.26	13.0	0.36	0.021
12	13.0	0.36	13.3	0.37	0.021
13	13.3	0.37	13.6	0.48	0.347
14	13.6	0.48	14.0	0.61	0.408
15	14.0	0.61	14.3	0.64	0.090
16	14.3	0.64	14.6	0.65	0.030
17	14.6	0.65	14.9	0.66	0.023
18	14.9	0.66	15.6	0.68	0.031
19	15.6	0.68	15.9	0.69	0.024
20	15.9	0.69	16.3	0.69	0.027
21	16.3	0.69	16.6	0.71	0.032
22	16.6	0.71	16.9	0.71	0.029
23	16.9	0.71	17.2	0.72	0.025
24	17.2	0.72	17.5	0.73	0.026
25	17.5	0.73	18.2	0.75	0.033
26	18.2	0.75	18.9	0.77	0.026
27	18.9	0.77	19.2	0.78	0.024
28	19.2	0.78	19.8	0.80	0.028
29	19.8	0.80	21.1	0.82	0.021
30	21.1	0.82	21.5	0.83	0.026
31	21.5	0.83	21.8	0.84	0.028
32	21.8	0.84	22.1	0.85	0.023
33	22.1	0.85	23.7	0.88	0.022
34	23.7	0.88	24.0	0.89	0.025
35	24.0	0.89	24.4	0.90	0.028
36	24.4	0.90	24.7	0.91	0.024
37	24.7	0.91	27.3	0.96	0.022
38	27.3	0.96	27.6	0.97	0.026
39	27.6	0.97	28.0	0.98	0.027
40	28.0	0.98	28.3	0.99	0.024
41	28.3	0.99	32.2	1.08	0.022
42	32.2	1.08	32.5	1.09	0.024
43	32.5	1.09	32.8	1.09	0.027
44	32.8	1.09	33.2	1.10	0.025
45	33.2	1.10	40.0	1.25	0.022
46	40.0	1.25	40.3	1.26	0.024
47	40.3	1.26	40.6	1.27	0.026
48	40.6	1.27	41.0	1.28	0.025
49	41.0	1.28	41.4	1.59	0.022
50	1040.4	1.59	1040.4	1.60	0.025
51	1040.4	1.60	1040.4	1.82	0.023
52	4.7	0.00	7.0	0.14	0.062
53	7.0	0.14	41.4	0.14	0.000
54	0.0	0.00	0.8	0.04	0.046
55	0.8	0.04	1.6	0.04	0.000
56	1.6	0.04	2.4	0.04	0.000
57	2.4	0.04	3.2	0.04	0.000
58	3.2	0.04	4.0	0.04	0.000
59	4.0	0.04	4.8	0.04	0.000
60	4.8	0.04	5.6	0.04	0.000
61	5.6	0.04	6.4	0.03	0.000
62	6.4	0.03	7.2	0.03	0.000
63	7.2	0.03	8.0	0.03	0.000
64	8.0	0.03	8.8	0.03	0.000
65	8.8	0.03	9.6	0.03	0.000

66	9.6	0.03	10.4	0.03	0.000
67	10.4	0.03	11.2	0.03	0.000
68	11.2	0.03	12.0	0.03	0.000
69	12.0	0.03	12.8	0.03	0.000
70	12.8	0.03	13.6	0.03	0.000
71	13.6	0.03	14.4	0.03	0.000
72	14.4	0.03	15.2	0.03	0.000
73	15.2	0.03	16.0	0.03	0.000
74	16.0	0.03	16.8	0.03	0.000
75	16.8	0.03	17.6	0.03	0.000
76	17.6	0.03	18.4	0.03	0.000
77	18.4	0.03	19.2	0.03	0.000
78	19.2	0.03	20.0	0.03	0.000
79	20.0	0.03	20.8	0.03	0.000
80	20.8	0.03	21.6	0.03	0.000
81	21.6	0.03	22.4	0.03	0.000
82	22.4	0.03	23.2	0.03	0.000
83	23.2	0.03	24.0	0.03	0.000
84	24.0	0.03	24.8	0.03	0.000
85	24.8	0.03	25.6	0.03	0.000
86	25.6	0.03	26.4	0.03	0.000
87	26.4	0.03	27.2	0.03	0.000
88	27.2	0.03	28.0	0.03	0.000
89	28.0	0.03	28.8	0.02	0.000
90	28.8	0.02	29.6	0.02	0.000
91	29.6	0.02	30.4	0.02	0.000
92	30.4	0.02	31.2	0.02	0.000
93	31.2	0.02	32.0	0.02	0.000
94	32.0	0.02	32.8	0.02	0.000
95	32.8	0.02	33.6	0.02	0.000
96	33.6	0.02	34.4	0.02	0.000
97	34.4	0.02	35.2	0.02	0.000
98	35.2	0.02	36.0	0.02	0.000
99	36.0	0.02	36.8	0.02	0.000
100	36.8	0.02	37.6	0.02	0.000
101	37.6	0.02	38.4	0.02	0.000
102	38.4	0.02	39.2	0.02	0.000
103	39.2	0.02	40.0	0.02	0.000

PASSIVE PRESSURES:

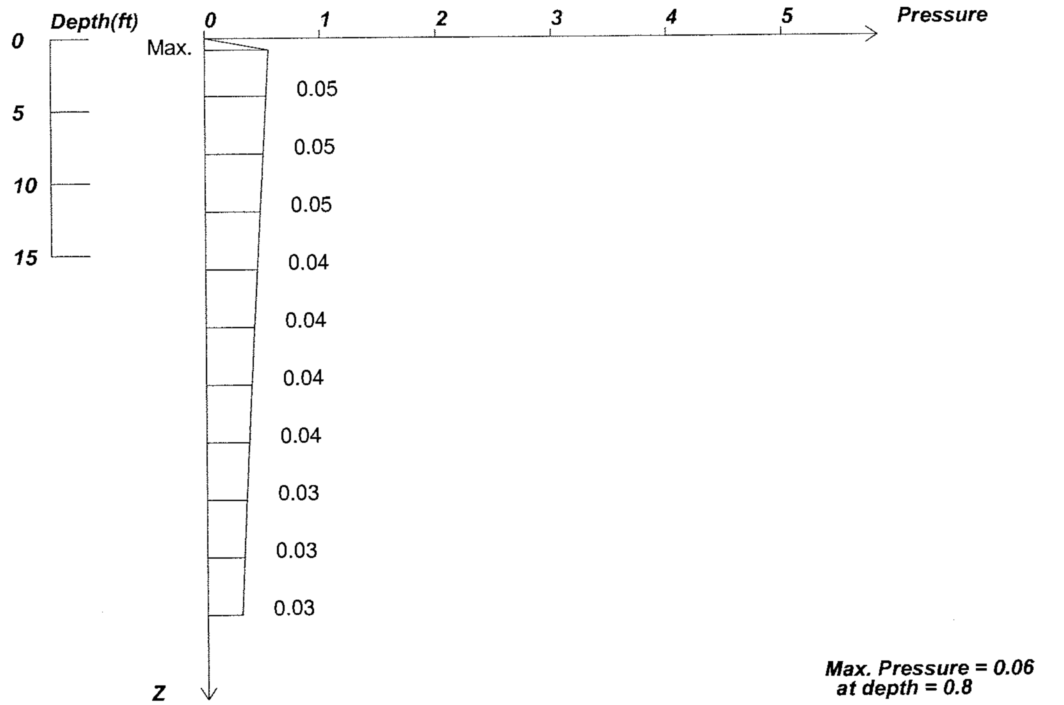
No.	Z1	P1	Z2	P2	Slope
1	13.00	0.00	25.67	0.45	0.0358
2	25.67	0.45	26.00	0.58	0.3943
3	26.00	0.58	26.32	0.60	0.0535
4	26.32	0.60	26.65	0.52	-0.2529
5	26.65	0.52	26.97	0.64	0.3652
6	26.97	0.64	27.30	0.64	0.0187
7	27.30	0.64	27.62	0.59	-0.1704
8	27.62	0.59	27.95	0.68	0.2800
9	27.95	0.68	28.27	0.69	0.0505
10	28.27	0.69	28.60	0.67	-0.0705
11	28.60	0.67	28.92	0.73	0.1772
12	28.92	0.73	29.25	0.75	0.0721
13	29.25	0.75	29.57	0.74	-0.0323
14	29.57	0.74	29.90	0.78	0.1202
15	29.90	0.78	30.22	0.81	0.1027
16	30.22	0.81	30.55	0.81	-0.0114
17	30.55	0.81	30.87	0.83	0.0715
18	30.87	0.83	31.20	0.88	0.1401

19	31.20	0.88	31.52	0.88	0.0022
20	31.52	0.88	31.85	0.89	0.0234
21	31.85	0.89	32.17	0.94	0.1517
22	32.17	0.94	32.50	0.95	0.0439
23	32.50	0.95	32.82	0.95	0.0051
24	32.82	0.95	33.15	0.99	0.1061
25	33.15	0.99	33.47	1.02	0.1145
26	33.47	1.02	33.80	1.03	0.0144
27	33.80	1.03	34.12	1.04	0.0330
28	34.12	1.04	34.45	1.08	0.1280
29	34.45	1.08	34.77	1.11	0.0799
30	34.77	1.11	35.10	1.11	0.0178
31	35.10	1.11	35.42	1.13	0.0620
32	35.42	1.13	35.75	1.17	0.1202
33	35.75	1.17	36.07	1.20	0.0728
34	36.07	1.20	36.40	1.20	0.0216
35	36.40	1.20	36.72	1.22	0.0660
36	36.72	1.22	37.05	1.26	0.1142
37	37.05	1.26	37.37	1.29	0.0889
38	37.37	1.29	37.70	1.30	0.0256
39	37.70	1.30	38.02	1.32	0.0484
40	38.02	1.32	38.67	1.39	0.1093
41	38.67	1.39	39.00	1.40	0.0457
42	39.00	1.40	39.32	1.41	0.0276
43	39.32	1.41	39.65	1.44	0.0892
44	39.65	1.44	40.30	1.51	0.1054
45	40.30	1.51	40.62	1.52	0.0357
46	40.62	1.52	40.95	1.53	0.0303
47	40.95	1.53	41.27	1.56	0.0984
48	41.27	1.56	41.43	1.63	0.1021
49	1040.43	1.63	1040.43	1.64	0.0567
50	1040.43	1.64	1040.43	1.66	0.0334
51	1040.43	1.66	1040.43	1.68	0.0775
52	1040.43	1.68	1040.43	1.78	0.0995
53	1040.43	1.78	1040.43	1.79	0.0452
54	1040.43	1.79	1040.43	1.80	0.0358
55	1040.43	1.80	1040.43	1.83	0.0891
56	1040.43	1.83	1040.43	1.93	0.0973
57	1040.43	1.93	1040.43	1.95	0.0741
58	1040.43	1.95	1040.43	1.97	0.0389
59	1040.43	1.97	1040.43	1.99	0.0611
60	1040.43	1.99	1040.43	2.11	0.0954

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Kinnickinnic River - Section 9 Minimum Passing Geometry Undrained

Concrete Slab Strip Load



<Surcharge> CIVILTECH SOFTWARE USA www.civiltechsoftware.com

Licensed to Geotechnical User Barr Engineering Company

Date: 11/30/2006

Wall Height, H= 10 Load Depth at Surface, D= 0

Load Factor of Surcharge Loading = 1

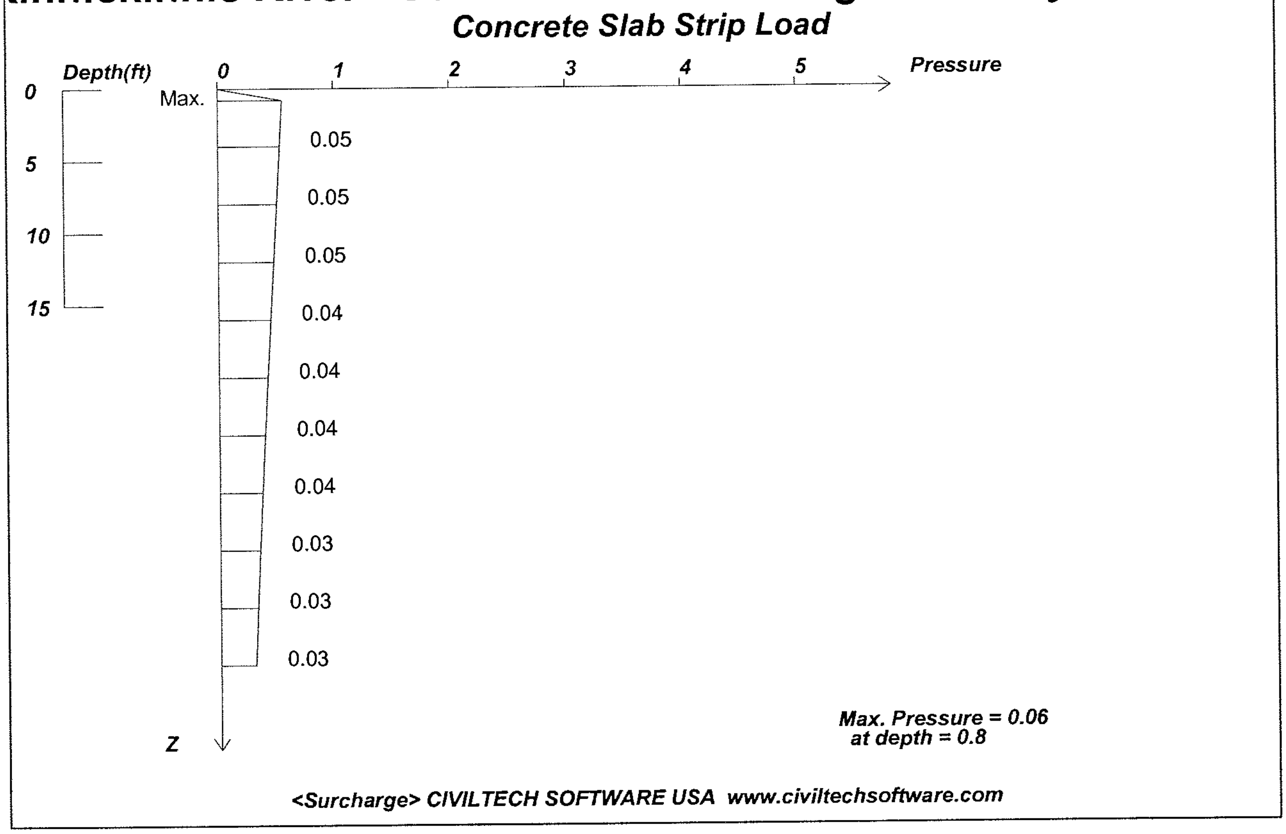
Semi-flexible Wall Condition -- Very small movement or deflection are allowed.

Max. Pressure = 0.06 at depth = 0.8

X	Width	Strip Load
.0	100.0	.08

UNITS: LENGTH/DEPTH: ft, Qpoint: kip, Qline: kip/ft, Qstrip/Qarea/PRESSURE: ksf

Kinnickinnic River - Section 9 Min. Passing Geometry Undrained



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Date: 11/30/2006

Wall Height, H= 10 Load Depth at Surface, D= 0

Load Factor of Surcharge Loading = 1

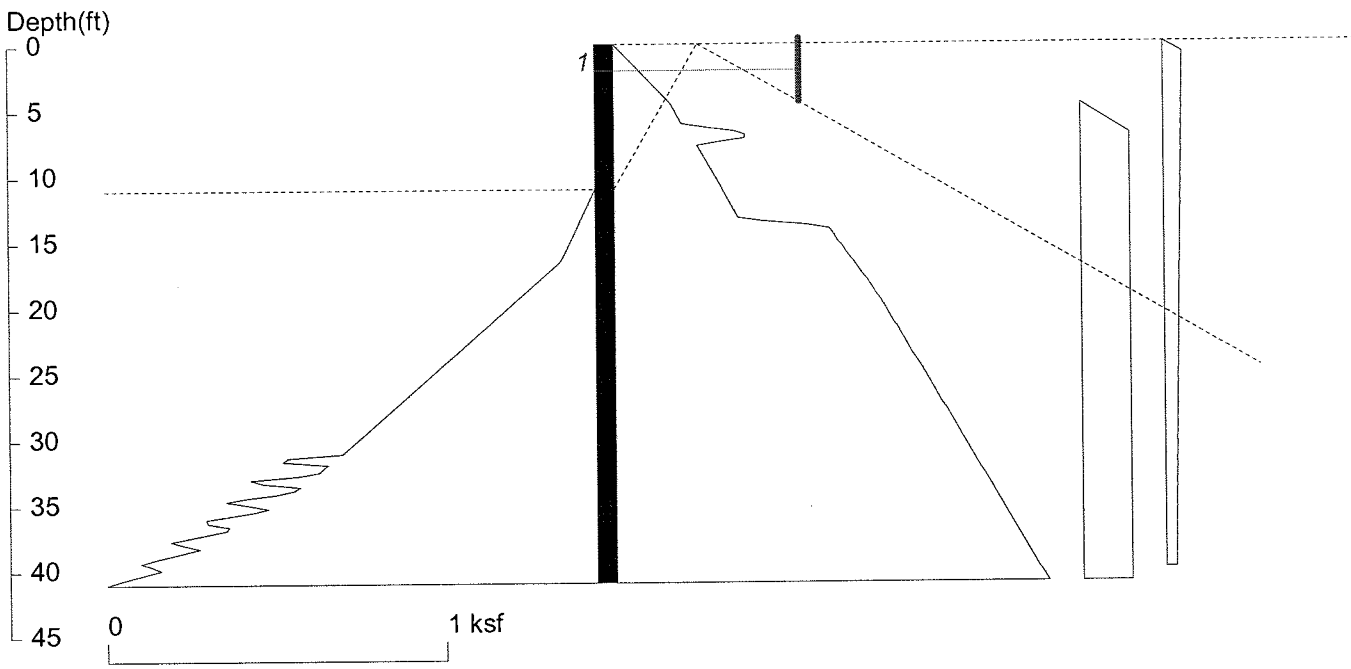
Semi-flexible Wall Condition -- Very small movement or deflection are allowed.

Max. Pressure = 0.06 at depth = 0.8

X	Width	Strip Load
.0	100.0	.08

UNITS: LENGTH/DEPTH: ft, Qpoint: kip, Qline: kip/ft, Qstrip/Qarea/PRESSURE: ksf

Kinnickinnic River - Section 9 Min. Passing Geometry Undrained



<ShoringSuite> **CIVILTECH SOFTWARE USA www.civiltechsoftware.com**

Licensed to Geotechnical User Barr Engineering Company
Date: 11/30/2006 File Name:

Wall Height=11.0 Pile Diameter=0.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Embedment=29.99, Pile Length=40.99
MOMENT IN PILE: Max. Moment=95.27 per Pile Spacing=6.0 at Depth=10.62

VERTICAL BEARING CAPACITY: Vertical Loading=0.0, Resistance=55.9, Vertical Factor of Safety=999.00

SYSTEM FACTOR OF SAFETY (Approximate)=1.30
The request embedment is 30.0, the user input fixed embedment = 39.

PILE SELECTION:
Request Min. Section Modulus = 48.1 in3/pile, Fy= 36 ksi = 248 MPa, Fb/Fy=0.66
-> Pile meet Min. Section Requirements:
W8X58 HP10X57 W10X45 HP12X53 W12X40
HP13X60 HP14X73 W14X34 W16X36 W18X35
W21X44 W24X55 W27X84 W30X90

BRACE FORCE: Strut, Tieback, Plate Anchor, and Deadman

No. & Type	Depth	Angle	Total F.	Horiz. F.	Vert. F.	L_free	Anchor Height
1. Deadman	2.0	0.0	19.4	19.4	0.0	14.0	4.8

UNITS: Width/Diameter/Spacing/Length/Depth/Height - ft, Force - kip, Bond Strength/Pressure - ksf

ACTIVE SPACING:	Z depth	Spacing
1	0.00	6.00
2	11.00	0.50

PASSIVE SPACING:	Z depth	Spacing
1	11.00	1.00

ACTIVE PRESSURES (ACTIVE, WATER, & SURCHARGE):

No.	Z1	P1	Z2	P2	Slope
1	0.0	0.00	4.4	0.16	0.037

2	4.4	0.16	4.7	0.17	0.030
3	4.7	0.17	4.9	0.18	0.023
4	4.9	0.18	6.1	0.20	0.020
5	6.1	0.20	6.3	0.26	0.236
6	6.3	0.26	6.6	0.35	0.320
7	6.6	0.35	6.9	0.38	0.110
8	6.9	0.38	7.2	0.38	0.002
9	7.2	0.38	7.4	0.31	-0.263
10	7.4	0.31	7.7	0.24	-0.239
11	7.7	0.24	11.0	0.32	0.022
12	11.0	0.31	13.2	0.36	0.021
13	13.2	0.36	13.5	0.44	0.267
14	13.5	0.44	13.8	0.56	0.472
15	13.8	0.56	14.0	0.63	0.232
16	14.0	0.63	14.3	0.64	0.032
17	14.3	0.64	14.6	0.64	0.028
18	14.6	0.64	14.9	0.65	0.023
19	14.9	0.65	15.1	0.66	0.032
20	15.1	0.66	15.4	0.67	0.033
21	15.4	0.67	15.9	0.68	0.025
22	15.9	0.68	16.2	0.69	0.030
23	16.2	0.69	16.5	0.70	0.034
24	16.5	0.70	16.8	0.71	0.028
25	16.8	0.71	17.3	0.72	0.025
26	17.3	0.72	17.6	0.73	0.031
27	17.6	0.73	17.9	0.74	0.034
28	17.9	0.74	18.1	0.75	0.028
29	18.1	0.75	18.7	0.76	0.026
30	18.7	0.76	19.0	0.77	0.024
31	19.0	0.77	19.3	0.78	0.027
32	19.3	0.78	19.5	0.78	0.029
33	19.5	0.78	19.8	0.79	0.023
34	19.8	0.79	20.9	0.81	0.021
35	20.9	0.81	21.2	0.82	0.023
36	21.2	0.82	21.5	0.83	0.029
37	21.5	0.83	21.7	0.83	0.027
38	21.7	0.83	23.6	0.88	0.022
39	23.6	0.88	23.9	0.88	0.027
40	23.9	0.88	24.2	0.89	0.029
41	24.2	0.89	24.5	0.90	0.024
42	24.5	0.90	27.2	0.96	0.022
43	27.2	0.96	27.8	0.98	0.028
44	27.8	0.98	32.2	1.07	0.022
45	32.2	1.07	32.7	1.09	0.028
46	32.7	1.09	39.9	1.25	0.022
47	39.9	1.25	40.4	1.26	0.027
48	40.4	1.26	41.0	1.57	0.022
49	1040.0	1.57	1040.0	1.59	0.026
50	1040.0	1.59	1040.0	1.59	0.023
51	4.6	0.00	6.9	0.14	0.062
52	6.9	0.14	41.0	0.14	0.000
53	0.0	0.00	0.8	0.06	0.070
54	0.8	0.06	1.6	0.05	-0.001
55	1.6	0.05	2.4	0.05	-0.001
56	2.4	0.05	3.2	0.05	-0.001
57	3.2	0.05	4.0	0.05	-0.001
58	4.0	0.05	4.8	0.05	-0.001
59	4.8	0.05	5.6	0.05	-0.001
60	5.6	0.05	6.4	0.05	-0.001

61	6.4	0.05	7.2	0.05	-0.001
62	7.2	0.05	8.0	0.05	-0.001
63	8.0	0.05	8.8	0.05	-0.001
64	8.8	0.05	9.6	0.05	-0.001
65	9.6	0.05	10.4	0.05	-0.001
66	10.4	0.05	11.2	0.05	-0.001
67	11.2	0.05	12.0	0.05	-0.001
68	12.0	0.05	12.8	0.05	-0.001
69	12.8	0.05	13.6	0.05	-0.001
70	13.6	0.05	14.4	0.05	-0.001
71	14.4	0.05	15.2	0.05	-0.001
72	15.2	0.05	16.0	0.05	-0.001
73	16.0	0.05	16.8	0.04	-0.001
74	16.8	0.04	17.6	0.04	-0.001
75	17.6	0.04	18.4	0.04	-0.001
76	18.4	0.04	19.2	0.04	-0.001
77	19.2	0.04	20.0	0.04	-0.001
78	20.0	0.04	20.8	0.04	-0.001
79	20.8	0.04	21.6	0.04	-0.001
80	21.6	0.04	22.4	0.04	-0.001
81	22.4	0.04	23.2	0.04	-0.001
82	23.2	0.04	24.0	0.04	-0.001
83	24.0	0.04	24.8	0.04	-0.001
84	24.8	0.04	25.6	0.04	-0.001
85	25.6	0.04	26.4	0.04	-0.001
86	26.4	0.04	27.2	0.04	-0.001
87	27.2	0.04	28.0	0.04	-0.001
88	28.0	0.04	28.8	0.04	-0.001
89	28.8	0.04	29.6	0.04	-0.001
90	29.6	0.04	30.4	0.04	-0.001
91	30.4	0.04	31.2	0.04	-0.001
92	31.2	0.04	32.0	0.04	-0.001
93	32.0	0.04	32.8	0.03	-0.001
94	32.8	0.03	33.6	0.03	-0.001
95	33.6	0.03	34.4	0.03	-0.001
96	34.4	0.03	35.2	0.03	-0.001
97	35.2	0.03	36.0	0.03	-0.001
98	36.0	0.03	36.8	0.03	-0.001
99	36.8	0.03	37.6	0.03	-0.001
100	37.6	0.03	38.4	0.03	-0.001
101	38.4	0.03	39.2	0.03	-0.001
102	39.2	0.03	40.0	0.03	-0.001

PASSIVE PRESSURES:

No.	Z1	P1	Z2	P2	Slope
1	11.00	0.00	16.22	0.10	0.0188
2	16.22	0.10	16.50	0.10	0.0252
3	16.50	0.10	16.77	0.12	0.0380
4	16.77	0.12	31.07	0.75	0.0444
5	31.07	0.75	31.35	0.91	0.5830
6	31.35	0.91	31.62	0.93	0.0586
7	31.62	0.93	31.90	0.80	-0.4798
8	31.90	0.80	32.17	0.81	0.0449
9	32.17	0.81	32.45	0.82	0.0471
10	32.45	0.82	32.72	0.88	0.2308
11	32.72	0.88	33.00	1.02	0.4895
12	33.00	1.02	33.27	0.98	-0.1253
13	33.27	0.98	33.55	0.88	-0.3860
14	33.55	0.88	33.82	0.89	0.0587

15	33.82	0.89	34.10	0.94	0.1845
16	34.10	0.94	34.37	1.03	0.3222
17	34.37	1.03	34.65	1.09	0.2063
18	34.65	1.09	34.92	1.03	-0.2277
19	34.92	1.03	35.20	0.97	-0.2114
20	35.20	0.97	35.47	1.02	0.1694
21	35.47	1.02	35.75	1.08	0.2450
22	35.75	1.08	36.02	1.15	0.2491
23	36.02	1.15	36.30	1.15	-0.0174
24	36.30	1.15	36.57	1.09	-0.2237
25	36.57	1.09	36.85	1.09	0.0184
26	36.85	1.09	37.67	1.26	0.2002
27	37.67	1.26	37.95	1.22	-0.1368
28	37.95	1.22	38.22	1.17	-0.1692
29	38.22	1.17	38.50	1.21	0.1531
30	38.50	1.21	39.05	1.31	0.1710
31	39.05	1.31	39.32	1.35	0.1346
32	39.32	1.35	39.60	1.31	-0.1215
33	39.60	1.31	39.87	1.29	-0.0947
34	39.87	1.29	40.70	1.41	0.1517
35	40.70	1.41	40.97	1.45	0.1315
36	40.97	1.45	40.99	1.42	-0.0959
37	1039.99	1.42	1039.99	1.40	-0.0825
38	1039.99	1.40	1039.99	1.55	0.1381
39	1039.99	1.55	1039.99	1.54	-0.0278
40	1039.99	1.54	1039.99	1.52	-0.0806
41	1039.99	1.52	1039.99	1.54	0.0802
42	1039.99	1.54	1039.99	1.65	0.1280
43	1039.99	1.65	1039.99	1.67	0.0988
44	1039.99	1.67	1039.99	1.66	-0.0626
45	1039.99	1.66	1039.99	1.65	-0.0373
46	1039.99	1.65	1039.99	1.78	0.1202
47	1039.99	1.78	1039.99	1.80	0.0918
48	1039.99	1.80	1039.99	1.79	-0.0506
49	1039.99	1.79	1039.99	1.78	-0.0251
50	1039.99	1.78	1039.99	1.94	0.1142
51	1039.99	1.94	1039.99	1.94	-0.0009
52	1039.99	1.94	1039.99	1.93	-0.0419
53	1039.99	1.93	1039.99	1.95	0.0707
54	1039.99	1.95	1039.99	2.10	0.1093
55	1039.99	2.10	1039.99	2.10	-0.0044
56	1039.99	2.10	1039.99	2.09	-0.0331
57	1039.99	2.09	1039.99	2.11	0.0786
58	1039.99	2.11	1039.99	2.26	0.1054
59	1039.99	2.26	1039.99	2.28	0.0736
60	1039.99	2.28	1039.99	2.27	-0.0244

UNITS: Width/Spacing/Diameter/Length/Depth - ft, Force - kip, Moment - kip-ft,
UNITS: Friction/Bearing/Pressure - ksf, Pres. Slope - kip/ft3, Deflection - in

Appendix C – Concrete Wall Calculations

Note:

Wall elevations used in these calculations are in NGVD29.

IGLD85 = NGVD29 – 0.53 ft

BARR ENGINEERING CO.

KK River Walls

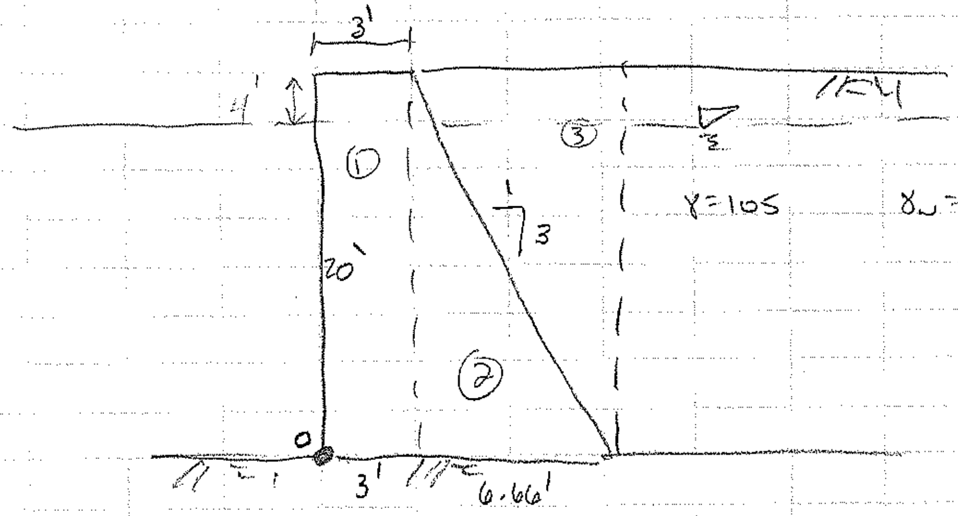
CHECKED BY JEF
DATE 12-1-06

NAME TSH
DATE 10-16-06
SHEET 1 IN SET
PAGE IN FILE

CHECK STABILITY OF CONCRETE WALL

GEOMETRY OF WALL IS ASSUMED (NO AVAILABLE DATA)

DETERMINE DEAD LOAD + RESISTING MOMENT



$$① = 3 \times 20 \times 150 \text{ PCF} = 9\,000 \text{ PLF}$$

$$② = 6.66 \times 20 \times \tfrac{1}{2} \times 150 = 9{,}990 \text{ PLF}$$

$$③ = 6.66 \times 20 \times \tfrac{1}{2} \times (105) = 6{,}990 \text{ PLF}$$

$$\Sigma W = 26^{\text{KIPS}}/\text{Ft}$$

UPLIFT $= 16 \times 62.4$
$= 1000 \text{ psf} \times 9.66$
$= 9.66^{k}/\text{ft}$

$$\Sigma M_R = 9^k \times 1.5' + 9.99 \times (3+2.22) + 6.99 \times (3+4.44)$$

$$= 117.65 \ \text{ft}\cdot\text{k}/\text{ft}$$

$$\Sigma M_O = .127^k \times 18.3' + 1.36^k \times 12.65' + 6.66^k \times 5.87'$$ See attached

$$= 58.62 \ \text{ft}\cdot\text{k}$$

$$FS_{\text{over}} = \frac{117.65}{58.62} = 2.0 \quad \text{OK!}$$

BARR ENGINEERING CO.

KK River Walls

CHECKED BY JES
DATE 12-1-06

NAME TSH
DATE 10-16-06
SHEET 2 IN SET
PAGE IN FILE

CHECK WALL SLIDING

$\Sigma H = .227 + 1.36 + 6.66 = 8.15^{k}/ft$

SLIDING RESISTANCE $= \mu \Sigma W$

FROM "REINFORCE CONCRETE DESIGN" WANG & SALMON 5TH ed.
TABLE 12-3.1

$\mu_{SILT} = .35$ (CONC. ON SILT)

$.35 \times \underset{-9.66}{26^{k}} = \cancel{9.1^{k}/ft}\ 5.72$

$FS = \dfrac{\cancel{9.1}\ 5.7}{8.15} = \cancel{1.12}\ .7 < 1.50$, NO GOOD

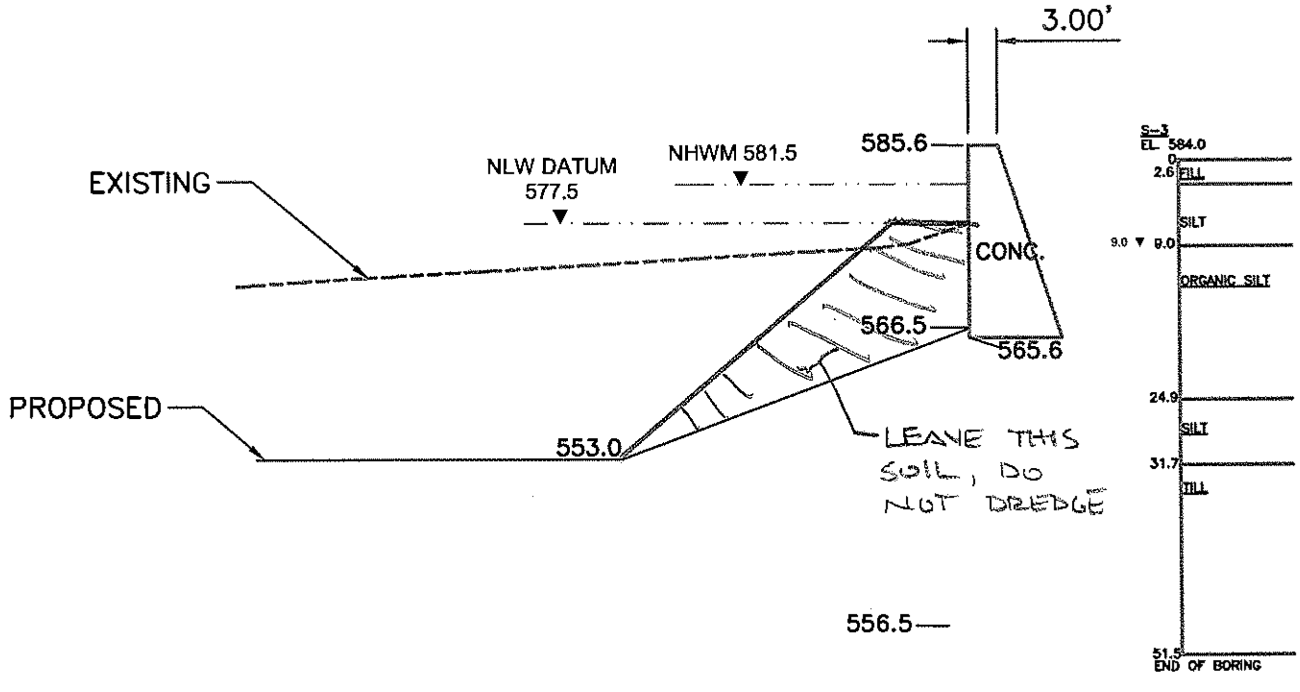
ADD 10' DEEP BENCH IN FRONT

PASSIVE SOIL $= \cancel{9}\,7^{k}/ft$ (see attached)

$FS = \dfrac{\cancel{9.1+9}\ 5.7 + 7}{8.15} = \cancel{2.22}\ \cancel{1.80}\ 1.56$, OKAY

LEAVE 10' BENCH INFRONT OF WALL

VERTICAL DATUM
IGLD85 577.5fT



CADD USER: Tor S. Hansen FILE: M:\CAD\4941023\24638_1.DWG PLOT SCALE: 1:1 PLOT DATE: 10/16/2006 1:57 PM

0 20 40
SCALE IN FEET

PARCEL 437
KINNICKINNICK RIVER DREDGING
CROSS SECTION 10 of 17
Milwaukee, Wi

BARR — MINNEAPOLIS, MINNESOTA - HIBBING, MINNESOTA, DULUTH, MINNESOTA, ANN ARBOR, MICHIGAN - JEFFERSON CITY, MISSOURI			DATE 10/16/06	SHEET NO.
COMPUTED	CHECKED	SUBMITTED	PROJECT NAME Kinnickinnic	
BY JDG	BY TSH	TO	PROJECT NUMBER 49/43-023	
DATE	DATE 11/30/06	DATE	SUBJECT	

$A_1 = \frac{1}{2} b \cdot h = \frac{1}{2}(101.7 psf)(2.5 ft) = 127.1\ lb/ft$
@ 582.3 ft

$A_2 = \frac{1}{2} b \cdot h = \frac{1}{2}(461.3 psf)(4.0 ft) = 922.6\ lb/ft$
@ 577.2 ft

$A_3 = b \cdot h = (461.3 psf)(0.9 ft) = 415.2\ lb/ft$
@ 575.5 ft

$A_4 = \frac{1}{2} b \cdot h = \frac{1}{2}(56.5 psf)(0.9 ft) = 25.4\ lb/ft$
@ 575.3 ft

$A_5 = b \cdot h = (517.8 psf)(9.4 ft) = 4{,}867.3\ lb/ft$
@ 570.3 ft

$A_6 = \frac{1}{2} b \cdot h = \frac{1}{2}(381.6 psf)(9.4 ft) = 1{,}793.5\ lb/ft$
@ 568.7 ft

Force 1 → $\boxed{F_1 = 127.1\ lb/ft \quad @\ el.\ 582.3 ft}$

Force 2 → $F_2 \rightarrow \dfrac{922.6\ lb/ft(577.2 ft - 565.6 ft) + 415.2\ lb/ft(575.5 ft - 565.6 ft) + 25.4\ lb/ft(575.3 ft - 565.6 ft)}{(922.6\ lb/ft + 415.2\ lb/ft + 25.4\ lb/ft)} + 565.6$

$\boxed{F_2 = 1{,}363.2\ lb/ft \quad @\ 576.65 ft}$

BARR

MINNEAPOLIS, MINNESOTA - HIBBING, MINNESOTA
DULUTH, MINNESOTA
ANN ARBOR, MICHIGAN - JEFFERSON CITY, MISSOURI

DATE	SHEET NO.
PROJECT NAME	
PROJECT NUMBER	
SUBJECT	

COMPUTED	CHECKED	SUBMITTED
BY SDG	BY BH	TO
DATE	DATE 11/30/06	DATE

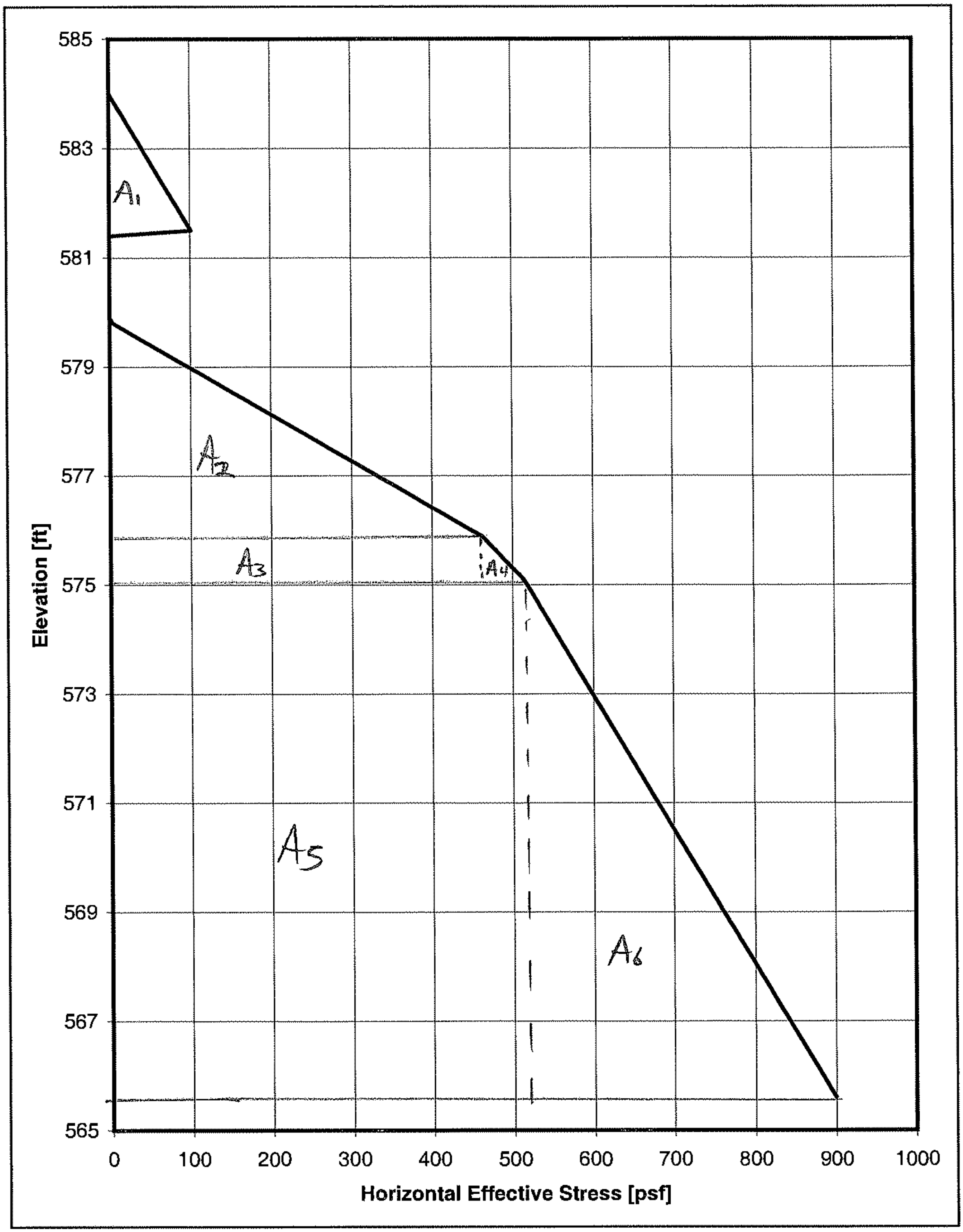
Force 3 → F_3 → $\dfrac{4{,}867.3\ \text{lb/ft}\,(570.3\ \text{ft} - 565.6\ \text{ft}) + 1{,}793.5\ \text{lb/ft}\,(568.7\ \text{ft} - 565.6\ \text{ft})}{(4{,}867.3\ \text{lb/ft} + 1{,}793.5\ \text{lb/ft})}$ + 565.6 ft

$\boxed{F_3 = 6{,}660.8\ \text{lb/ft} \ @\ 569.87\ \text{ft}}$

H:\RLG\INHOUSE\COMPPADS.CDR

10 Squares per Inch

REV.12/1/98



585
583
581
579
577
575
573
571
569
567
565
0
100
200
300
400
500
600
700
800
900
1000
Elevation [ft]
Horizontal Effective Stress [psf]
A1
A2
A3
A4
A5
A6

MINNEAPOLIS, MINNESOTA - HIBBING, MINNESOTA
DULUTH, MINNESOTA
ANN ARBOR, MICHIGAN - JEFFERSON CITY, MISSOURI

DATE	SHEET NO.
PROJECT NAME	
PROJECT NUMBER	
SUBJECT	

COMPUTED	CHECKED	SUBMITTED
BY SDG	BY TSH	TO
DATE	DATE 11/30/06	DATE

Passive

$A_1 = b \cdot h = (500\text{ psf})(10\text{ ft}) = 5{,}000\text{ lb/ft}$

@ 570.6 ft

$A_2 = \frac{1}{2} b \cdot h = \frac{1}{2}(406.0\text{ psf})(10\text{ ft}) = \cancel{4{,}060}\ 2030\text{ lb/ft}$

@ 568.9 ft

$\boxed{F = \cancel{9{,}060}\ 7030\text{ lb/ft} \quad @\ 569.85\text{ ft}}$

H:\RLG\INHOUSE\COMPPADS.CDR

10 Squares per Inch

REV.12/1/98

BARR	MINNEAPOLIS, MINNESOTA - HIBBING, MINNESOTA DULUTH, MINNESOTA ANN ARBOR, MICHIGAN - JEFFERSON CITY, MISSOURI	DATE 11/28/06 SHEET NO.
		PROJECT NAME Kinnickinnic
COMPUTED	CHECKED	SUBMITTED
BY JDG	BY TSH	TO
DATE	DATE 11/30/06	DATE

PROJECT NUMBER 49/41-023

SUBJECT

For Calculation of Active Earth Pressures

σ_a = total horizontal stress (active)

$\sigma_a = \sigma_a' + u$

where σ_a' = effective horizontal stress (active)

u = porewater pressure

$\sigma_a' = \sigma_{vo}' \cdot \tan^2(45° - \frac{\phi'}{2}) - 2 \cdot c' \cdot \tan(45° - \frac{\phi'}{2})$

where σ_{vo}' = effective vertical stress (computed from $\gamma \cdot z$ for each layer)

ϕ' = effective friction angle

c' = cohesion

The figure shows σ_a' versus elevation; σ_a' is shown because the water pressures are assumed to act equally on both sides of the wall (no flow). Unit weights for each material type were used to compute σ_{vo}' versus depth (elevation). Strength parameters for each material type were then used to compute σ_a' versus depth (elevation) in a spreadsheet.

The above equations are referenced in Das, Braja M., "Principles of Geotechnical Engineering", Fourth Edition, PWS Publishing, Boston, 1998. Page 440.

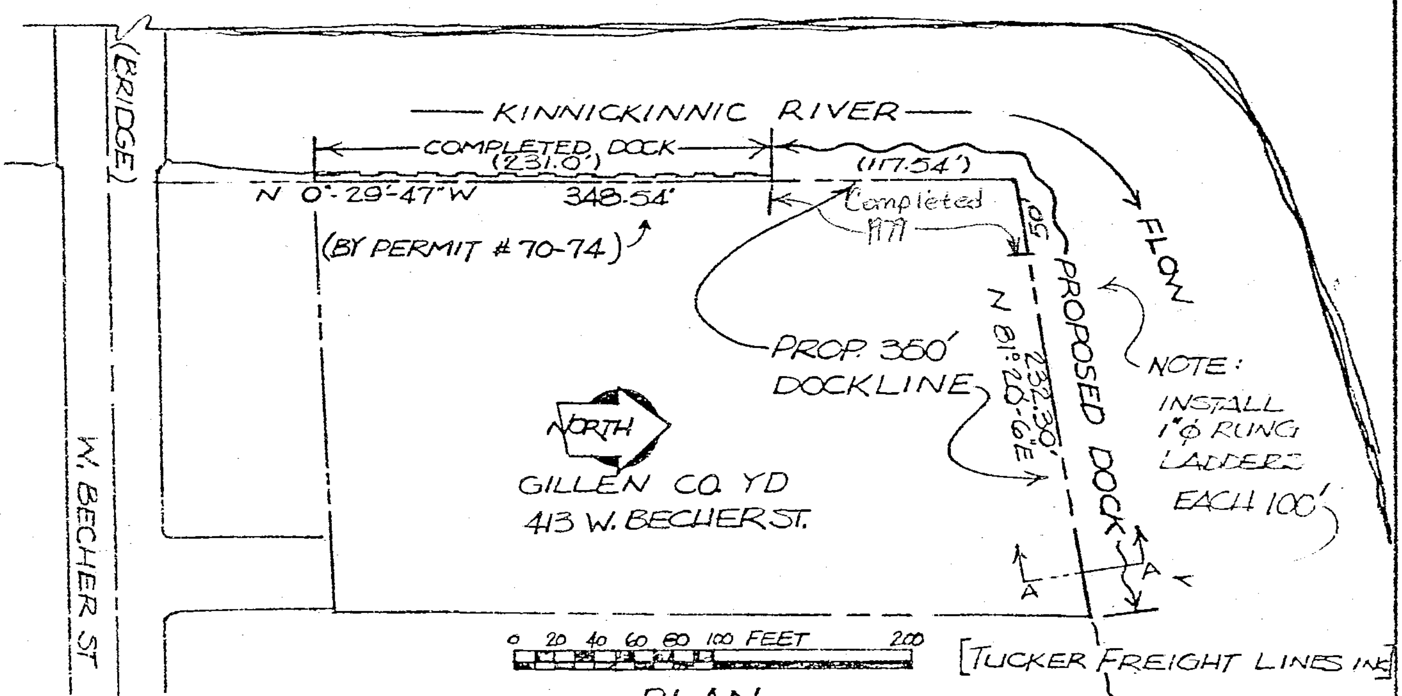
H:\RL\G\INHOUSE\COMPPADS.CDR

10 Squares per Inch

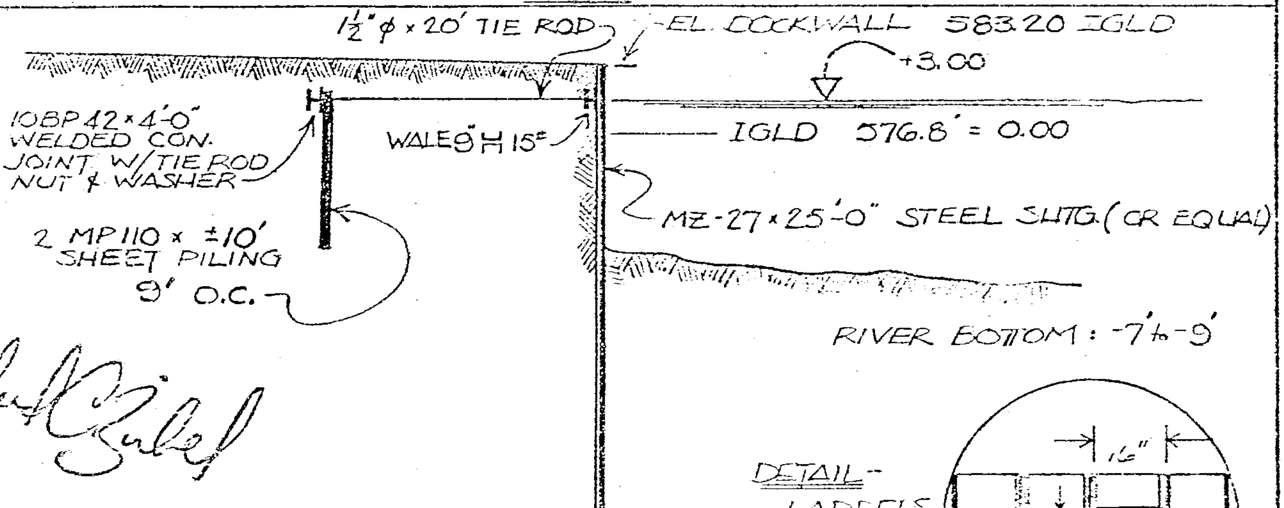
REV.12/1/98

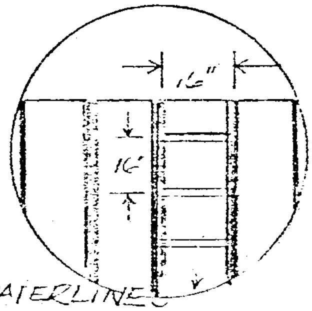
Appendix D – Steel Sheet Pile Record Drawings

DHM: For your information for on-site inspection.
(Ask For As Built Plans)



PLAN





DETAIL - LADDERS

TO WATERLINE

PURPOSE: DOCKING FACILITY
DATUM: I.G.L.D.
ADJ. PROPERTY OWNERS:

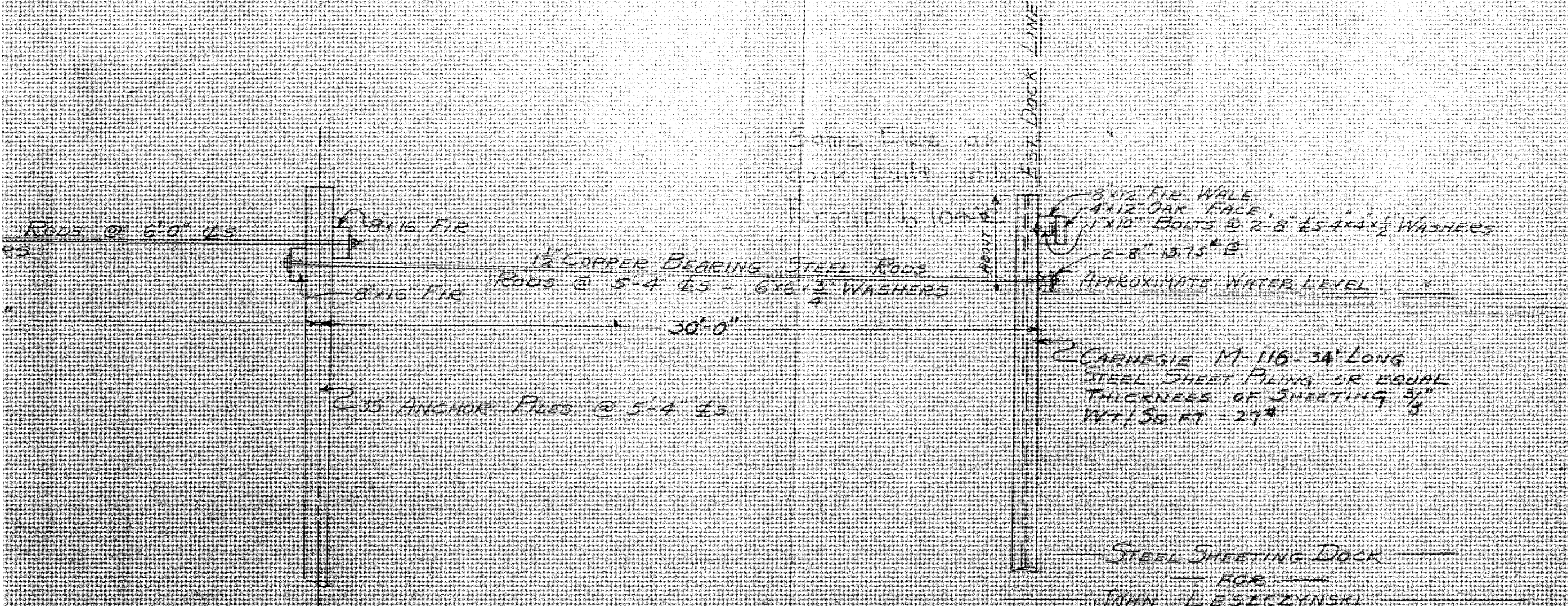
1. TUCKER FREIGHT LINES

SECTION A-A

0 100 FEET 200

PROPOSED DOCK RECON.
E.E. GILLEN COMPANY
ON THE KINNICKINNIC RIVER IN MILWAUKEE, WISC. 25 JULY 1979
SHT. 1 of 2

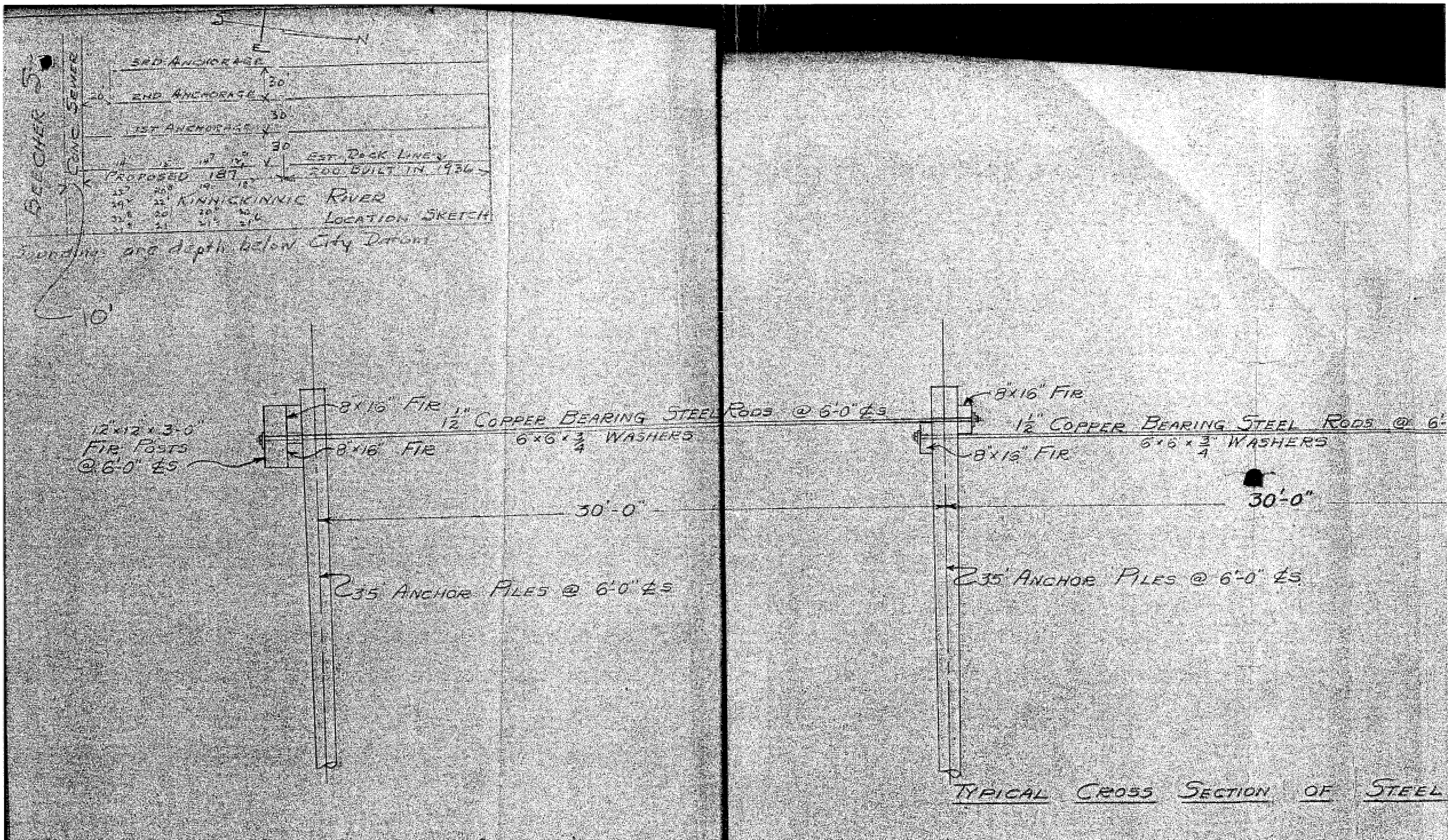
NOTE: CONSTRUCTION OF DOCK TO INCLUDE 3-OAK HITCHING PILES TO BE DRIVEN AT DIRECTION OF OWNER



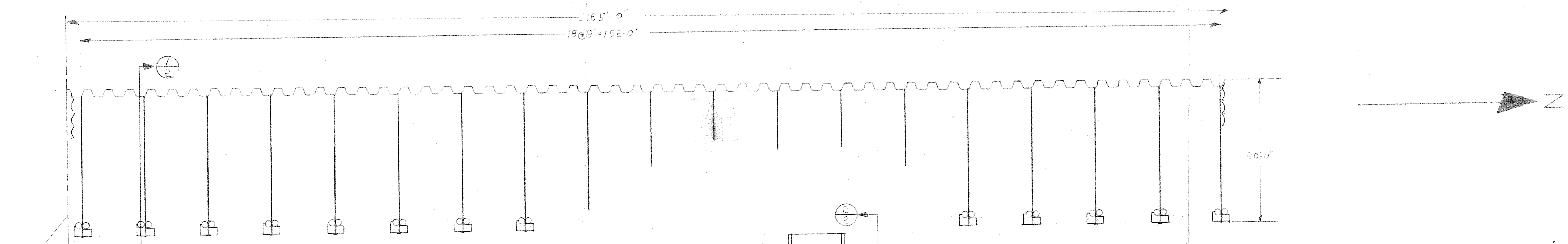
OF STEEL SHEETING DOCK

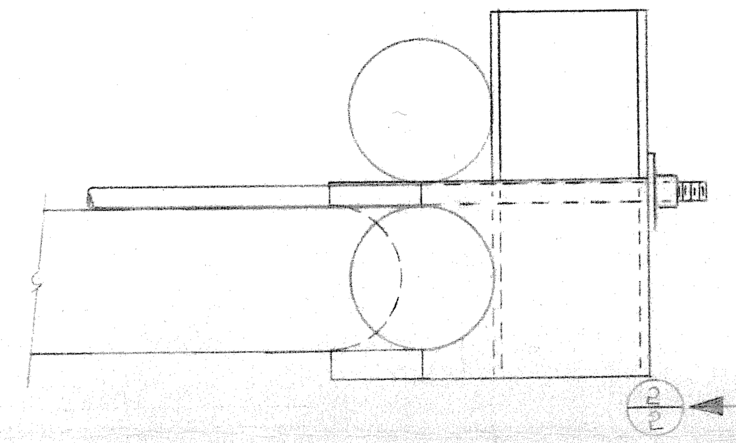
STEEL SHEETING DOCK
FOR
JOHN LESZCZYNSKI
KINNICKINNIC RIVER - MILWAUKEE, WIS
EDW. E. GILLEN CO
MILWAUKEE, WIS
4-16-36 SCALE ¼" = 1'-0" A.E.J.

D-200-A

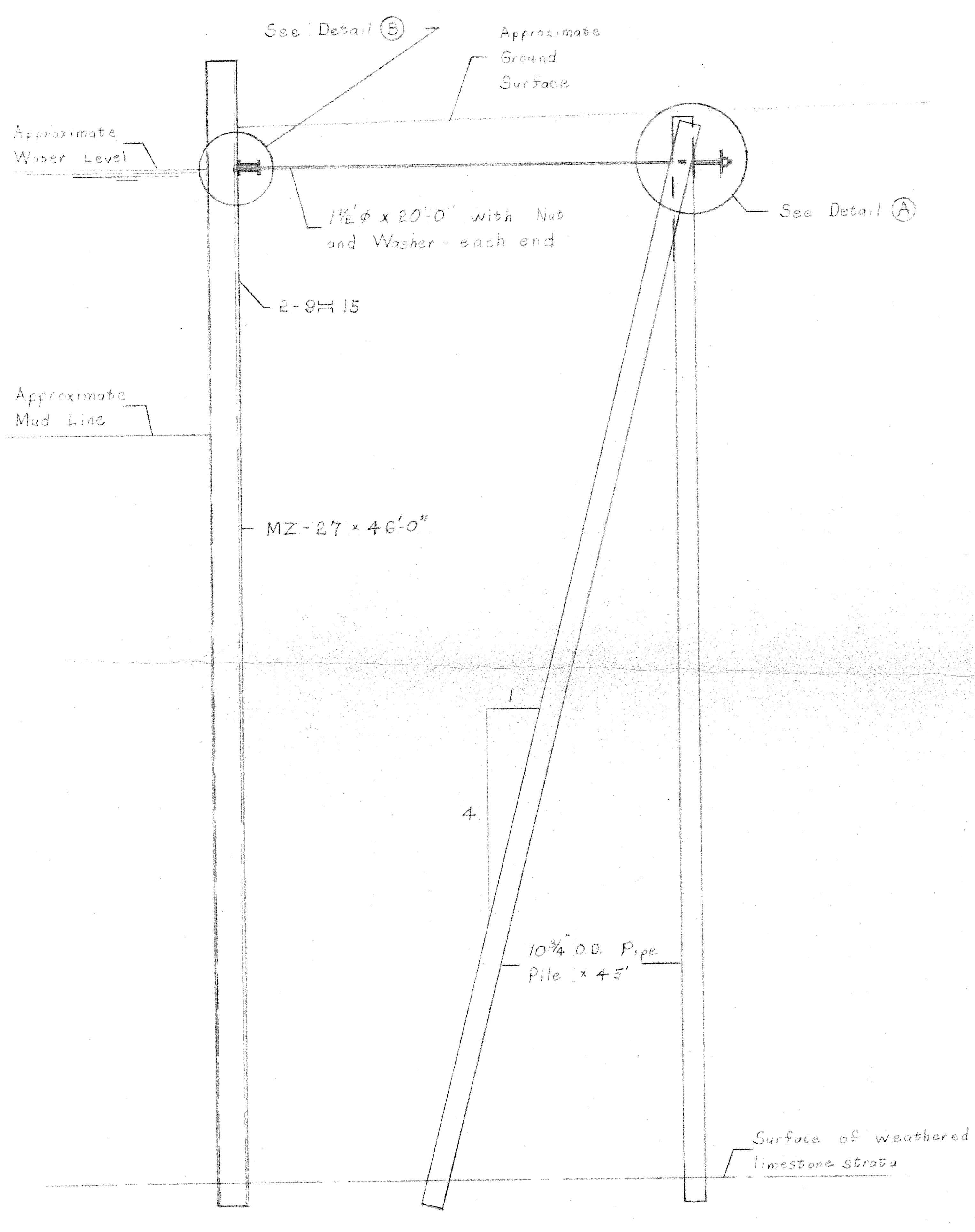


LENGTH OF PROPOSED WORK - 200 FEET (4-16-36)
LENGTH OF SOUTHERLY EXTENSION - 187'

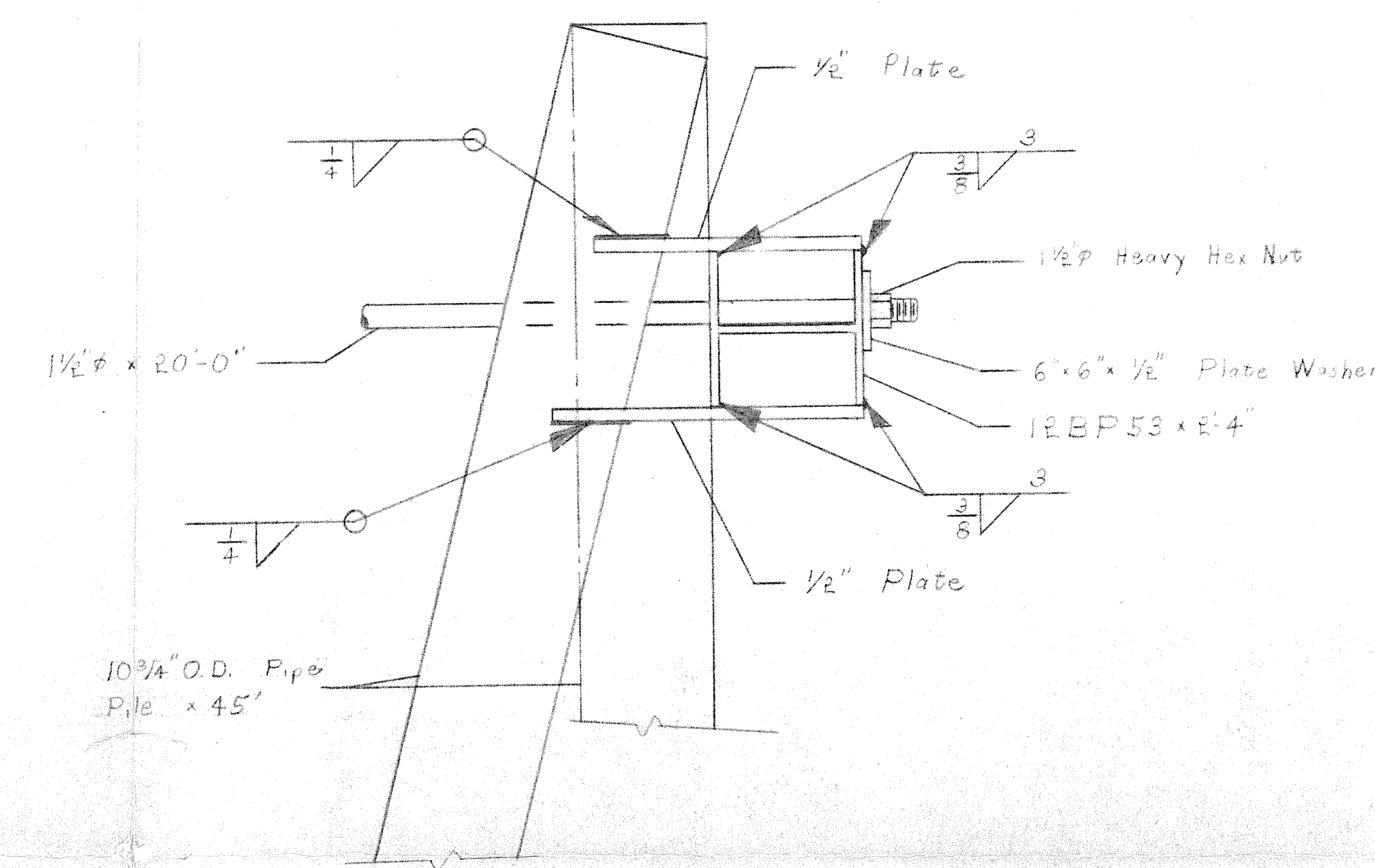




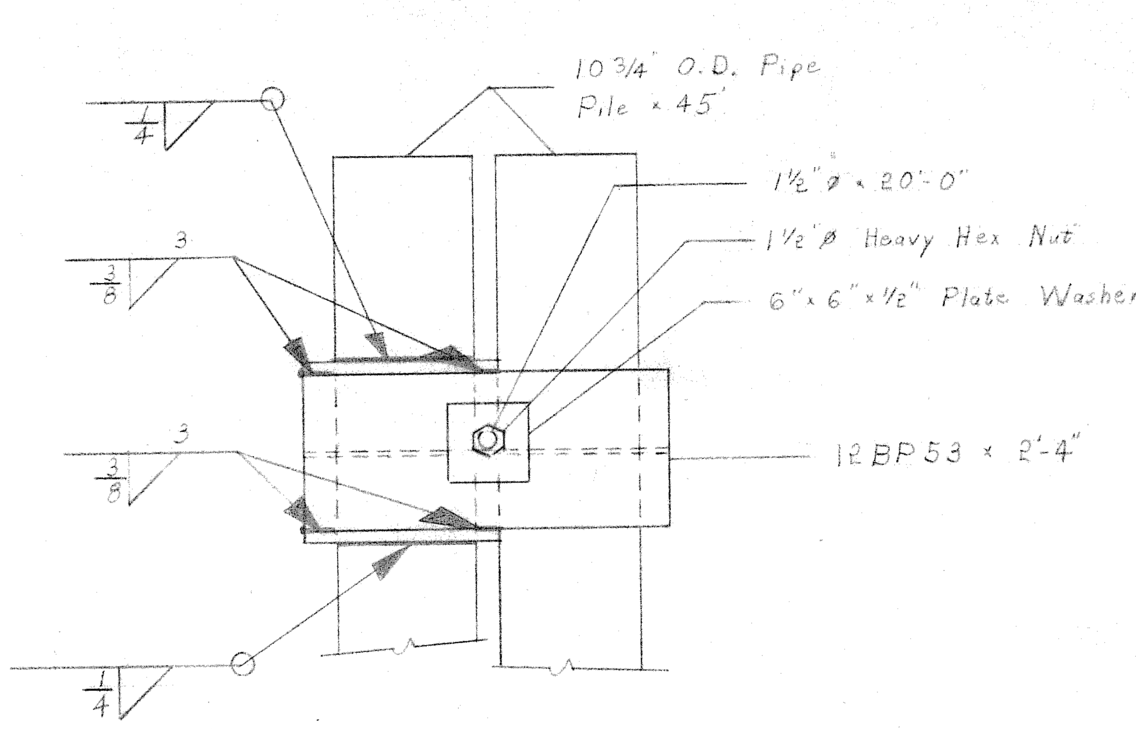
Top View



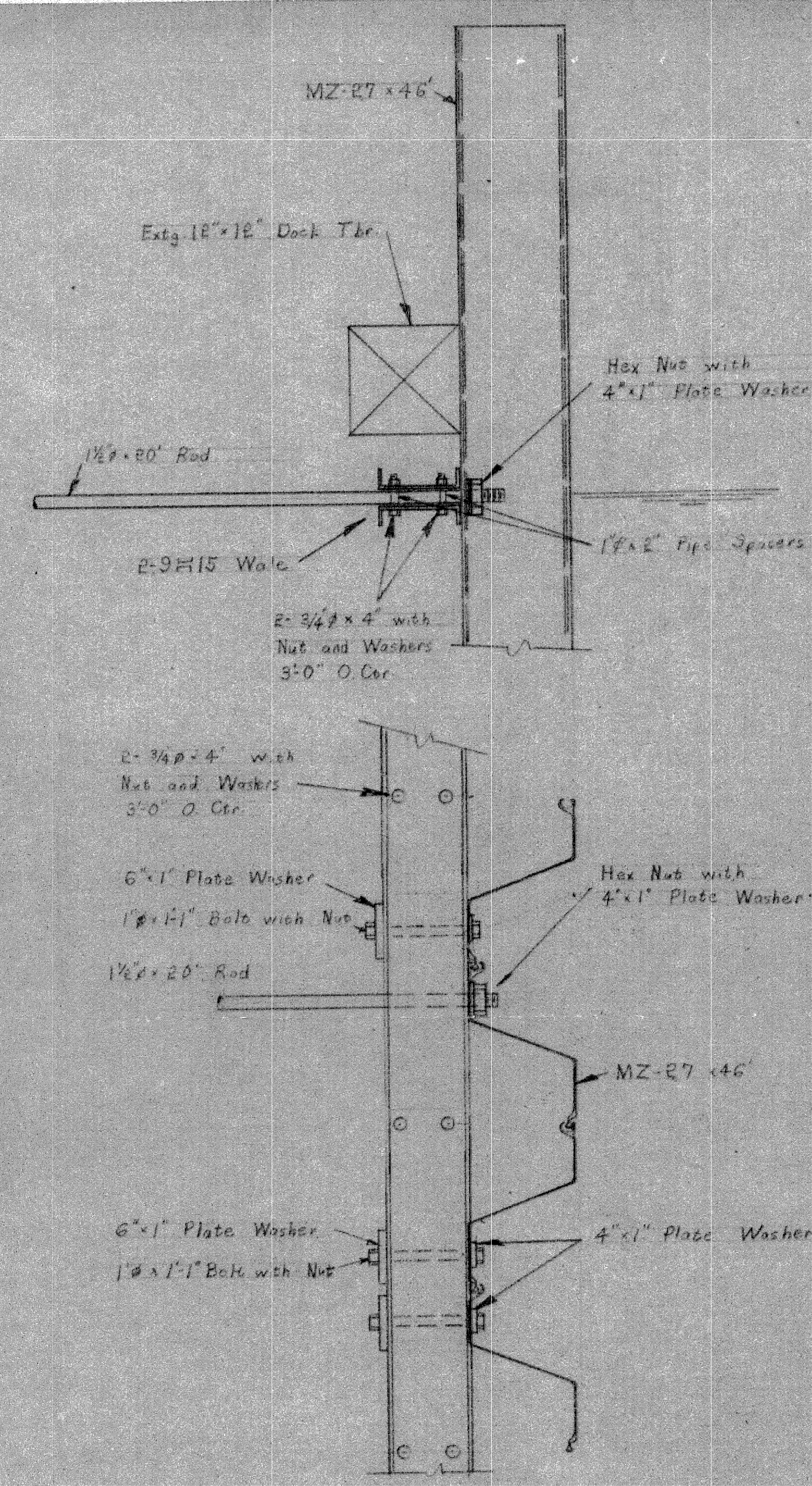
Scale: 1 inch = 4 feet



A Scale: 1 inch = 1 foot



Scale: 1 inch = 1 foot



B Scale: 1 inch = 1 foot

APPROVED

HARBOR ENGINEER

[redacted]

Appendix E – Steel Sheet Pile Wall Calculations

Note:

Sheet pile wall elevations and geometric descriptions used in these calculations are in NGVD29.

IGLD85 = NGVD29 – 0.53 ft

Summary of CWALSHT Analyses for Kinnickinnic SSP River Wall Global Stability

Parcel Number	Section No.	Wall Length (ft)		Drained Design Passive (FS)	Undrained Design Passive (FS)	Design Length Drained(ft)	Design Length Undrained (ft)
		Geophysical Study	Permit Drawings				
432	1	33	NA	2.0	1.3	29.68	27.41
429	2	30	34	2.0	1.3	21.45	13.81
433	3	30	46	2.0	1.3	25.09	22.67
433	6	30	25	2.0	1.3	22.14	19.84
440	14	NA	NA	2.0	1.3	29.63	24.85

Notes:

1. Free earth analysis results presented.
2. Iterations completed in 0.5 foot bench elevation increments until computed design length was less than actual length in undrained condition.
3. Once geometry set with undrained conditions, the sections were checked for drained conditions with passive FS = 2.0.
4. Wall adhesion for cohesive layers not included as results were non-conservative and unrealistic.
5. For example of results with wall adhesion included see CWALSHT output file included in computations Appendix E labelled "Example section w/ adhesion included."
6. Design lengths less than geophysical study documented lengths means wall condition is globally stable.

CWALSHT

DESIGN MODE

FOR SSP LENGTH

UNDRAINED CONDITION

S1 574_95 TO PROP BENCHED UND REV NOAD OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 13:33:23

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - UNDRAINED REV
'LOW WATER

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.30

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.20 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-9.65
10.00	-9.65
75.00	-27.40

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-3.20	0.00	DEF	DEF
112.00	102.00	0.00	250.00	0.00	0.00	-7.00	0.00	DEF	DEF
103.00	93.00	0.00	250.00	0.00	0.00	-19.80	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	0.00	250.00	0.00	0.00	-19.80	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

VI.--WATER DATA

S1 574_95 TO PROP BENCHED UND REV NOAD OUT

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -6.90 (FT)
LEFTSIDE ELEVATION = -6.90 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 13:33:34

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - UNDRAINED REV
'LOW WATER

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

		<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	NET WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-0.8	0.0	0.0	0.0	28.1	316.7	28.1	316.7
-1.8	0.0	0.0	0.0	63.3	712.5	63.3	712.5
-2.8	0.0	0.0	0.0	98.5	1108.3	98.5	1108.3
-3.2+	0.0	0.0	0.0	112.5	1266.7	112.5	1266.7
-3.2-	0.0	0.0	0.0	0.0	775.0	0.0	775.0
-3.8	0.0	0.0	0.0	0.0	836.2	0.0	836.2
-4.3	0.0	0.0	0.0	0.0	884.6	0.0	884.6
-4.8	0.0	0.0	0.0	53.6	938.2	53.6	938.2
-5.8	0.0	0.0	0.0	155.6	1040.2	155.6	1040.2
-6.8	0.0	0.0	0.0	257.6	1142.2	257.6	1142.2
-6.9	0.0	0.0	0.0	267.8	1152.4	267.8	1152.4
-7.0	0.0	0.0	0.0	272.8	1157.4	272.8	1157.4
-7.8	0.0	0.0	0.0	305.2	1189.9	305.2	1189.9
-8.8	0.0	0.0	0.0	345.8	1230.5	345.8	1230.5
-9.7+	0.0	0.0	0.0	380.4	1265.0	380.4	1265.0

S1 574_95 TO PROP BENCHED UND REV NOAD OUT

-9.7-	0.0	384.6	0.0	-4.3	1265.0	380.4	1265.0
-9.8	0.0	390.7	0.0	-4.3	1271.1	386.4	1271.1
-10.7	0.0	425.2	0.0	-4.3	1305.6	421.0	1305.6
-10.8	0.0	431.3	0.0	-4.3	1311.7	427.0	1311.7
-11.8	0.0	471.9	0.0	-4.3	1352.3	467.6	1352.3
-12.8	0.0	512.5	0.0	-4.3	1392.9	508.2	1392.9
-13.8	0.0	553.1	0.0	-4.3	1433.5	548.8	1433.5
-14.8	0.0	593.7	0.0	-4.3	1474.1	589.4	1474.1
-15.8	0.0	634.3	0.0	-4.3	1514.7	630.0	1514.7
-16.8	0.0	674.9	0.0	-4.3	1555.3	670.6	1555.3
-17.8	0.0	715.5	0.0	-4.3	1595.9	711.2	1595.9
-18.8	0.0	672.4	0.0	79.4	1636.5	751.8	1636.5
-19.8+	0.0	1063.6	0.0	-667.4	2061.7	792.4	1677.1
-19.8-	0.0	1063.6	0.0	-667.4	2061.7	0.0	2446.3
-20.8	0.0	1544.4	0.0	-1544.4	2518.9	0.0	2518.9
-21.8	0.0	1601.4	0.0	-1601.4	2591.5	0.0	2591.5
-22.7	0.0	1654.5	0.0	-1654.5	2653.8	0.0	2653.8
-22.8	0.0	1663.1	0.0	-1652.9	2664.1	10.2	2664.1
-23.8	0.0	1722.9	0.0	-1640.1	2736.7	82.8	2736.7
-24.8	0.0	1783.4	0.0	-1627.9	2809.3	155.4	2809.3
-25.8	0.0	1845.7	0.0	-1617.7	2881.9	228.0	2881.9
-26.8	0.0	1908.1	0.0	-1607.4	2954.5	300.6	2954.5
-27.8	0.0	1970.4	0.0	-1597.2	3027.1	373.2	3027.1
-28.8	0.0	2032.8	0.0	-1587.0	3099.7	445.8	3099.7
-29.8	0.0	2095.2	0.0	-1576.7	3172.3	518.4	3172.3
-30.8	0.0	2157.5	0.0	-1566.5	3244.9	591.0	3244.9
-31.8	0.0	2219.9	0.0	-1556.2	3317.5	663.6	3317.5
-32.8	0.0	2282.2	0.0	-1546.0	3390.1	736.2	3390.1
-33.8	0.0	2344.6	0.0	-1535.8	3462.7	808.8	3462.7
-34.8	0.0	2407.0	0.0	-1525.5	3535.3	881.4	3535.3
-35.8	0.0	2469.3	0.0	-1515.3	3607.9	954.0	3607.9
-36.8	0.0	2531.7	0.0	-1505.0	3680.5	1026.6	3680.5
-37.8	0.0	2592.6	0.0	-1493.4	3753.1	1099.2	3753.1
-38.8	0.0	2652.6	0.0	-1480.8	3825.7	1171.8	3825.7
-39.8	0.0	2713.8	0.0	-1469.3	3898.3	1244.4	3898.3

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 13:33:35

```
****************************
*  SUMMARY OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
****************************
```

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - UNDRAINED REV
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS

S1 574_95 TO PROP BENCHED UND REV NOAD OUT
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

```
WALL BOTTOM ELEV. (FT)       :      -27.41
     PENETRATION (FT)        :       17.76

MAX. BEND. MOMENT (LB-FT)    :  1.8645E+04
     AT ELEVATION (FT)       :      -20.82

MAX. SCALED DEFL. (LB-IN^3):  6.4500E+09
     AT ELEVATION (FT)       :        0.20
```

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 13:33:35

```
****************************
* COMPLETE OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
****************************
```

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - UNDRAINED REV
'LOW WATER

II.--RESULTS690. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.20	0.0000E+00	0.	6.4500E+09	0.00
0.00	-2.7641E-08	0.	6.3797E+09	0.00
-0.80	3.0009E+00	11.	6.0984E+09	28.13
-1.80	3.4183E+01	57.	5.7469E+09	63.30
-2.80	1.2867E+02	138.	5.3954E+09	98.47
-3.20	1.9206E+02	180.	5.2549E+09	112.54
-3.20	1.9206E+02	180.	5.2549E+09	0.00
-3.80	3.0009E+02	180.	5.0442E+09	0.00
-4.27	3.8553E+02	180.	4.8776E+09	0.00
-4.80	4.8262E+02	194.	4.6934E+09	53.60
-5.80	7.2056E+02	299.	4.3436E+09	155.60
-6.80	1.1141E+03	505.	3.9949E+09	257.60
-6.90	1.1659E+03	532.	3.9602E+09	267.80
-7.00	1.2204E+03	559.	3.9254E+09	272.76
-7.80	1.7581E+03	790.	3.6483E+09	305.24
-8.80	2.7073E+03	1115.	3.3047E+09	345.84
-9.65	3.7845E+03	1424.	3.0163E+09	380.35
-9.65	3.7845E+03	1424.	3.0163E+09	-4.27
-9.80	3.9980E+03	1423.	2.9659E+09	-4.27
-10.65	5.2064E+03	1420.	2.6832E+09	-4.27
-10.80	5.4193E+03	1419.	2.6340E+09	-4.27

-11.80	6.8362E+03	1415.	2.3114E+09	-4.27
-12.80	8.2489E+03	1411.	2.0007E+09	-4.27
-13.80	9.6574E+03	1406.	1.7042E+09	-4.27
-14.80	1.1062E+04	1402.	1.4244E+09	-4.27
-15.80	1.2461E+04	1398.	1.1637E+09	-4.27
-16.80	1.3857E+04	1394.	9.2453E+08	-4.27
-17.80	1.5248E+04	1389.	7.0931E+08	-4.27
-18.80	1.6650E+04	1427.	5.2045E+08	79.44
-19.80	1.7992E+04	1133.	3.6036E+08	-667.40
-20.80	1.8645E+04	27.	2.3126E+08	-1544.36
-21.80	1.7890E+04	-1546.	1.3417E+08	-1601.37
-22.66	1.5965E+04	-2944.	7.5394E+07	-1654.46
-22.77	1.5630E+04	-3126.	6.9386E+07	-1653.23
-22.80	1.5533E+04	-3177.	6.7763E+07	-1622.32
-23.80	1.1712E+04	-4299.	2.7974E+07	-620.91
-24.80	7.2697E+03	-4419.	8.3337E+06	380.49
-25.80	3.2080E+03	-3538.	1.3104E+06	1381.90
-26.80	5.2829E+02	-1655.	2.9615E+04	2383.31
-27.41	0.0000E+00	0.	0.0000E+00	2999.13

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.20	0.	0.	0.	0.	0.
0.00	0.	0.	0.	0.	0.
-0.80	0.	0.	0.	28.	317.
-1.80	0.	0.	0.	63.	712.
-2.80	0.	0.	0.	98.	1108.
-3.20+	0.	0.	0.	113.	1267.
-3.20+	0.	0.	0.	0.	775.
-3.80	0.	0.	0.	0.	836.
-4.27	0.	0.	0.	0.	885.
-4.80	0.	0.	0.	54.	938.
-5.80	0.	0.	0.	156.	1040.
-6.80	0.	0.	0.	258.	1142.
-6.90	0.	0.	0.	268.	1152.
-7.00	0.	0.	0.	273.	1157.
-7.80	0.	0.	0.	305.	1190.
-8.80	0.	0.	0.	346.	1230.
-9.65+	0.	0.	0.	380.	1265.
-9.65+	0.	385.	0.	380.	1265.
-9.80	0.	391.	0.	386.	1271.
-10.65	0.	425.	0.	421.	1306.
-10.80	0.	431.	0.	427.	1312.
-11.80	0.	472.	0.	468.	1352.
-12.80	0.	513.	0.	508.	1393.
-13.80	0.	553.	0.	549.	1433.
-14.80	0.	594.	0.	589.	1474.
-15.80	0.	634.	0.	630.	1515.
-16.80	0.	675.	0.	671.	1555.
-17.80	0.	716.	0.	711.	1596.
-18.80	0.	672.	0.	752.	1636.
-19.80+	0.	1064.	0.	792.	1677.
-19.80+	0.	1064.	0.	0.	2446.
-20.80	0.	1544.	0.	0.	2519.

S1 574_95 TO PROP BENCHED UND REV NOAD OUT

-21.80	0.	1601.	0.	0.	2591.
-22.66	0.	1654.	0.	0.	2654.
-22.77	0.	1661.	0.	8.	2662.
-22.80	0.	1663.	0.	10.	2664.
-23.80	0.	1723.	0.	83.	2737.
-24.80	0.	1783.	0.	155.	2809.
-25.80	0.	1846.	0.	228.	2882.
-26.80	0.	1908.	0.	301.	2954.
-27.41	0.	1970.	0.	373.	3027.
-28.80	0.	2033.	0.	446.	3100.

S2 573_63 TO PROP BENCHED10 UND REV NOAD OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 13:58:52

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - UNDRAINED
'LOW WATER

II.--CONTROL
ANCHORED WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.30

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.
ELEVATION AT ANCHOR = -4.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-8.87
10.00	-8.87
48.00	-25.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

		ANGLE OF		ANGLE OF		<--BOTTOM-->		<-SAFETY-> <-FACTOR->	
SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	INTERNAL FRICTION (DEG)	COH-ESION (PSF)	WALL FRICTION (DEG)	ADH-ESION (PSF)	ELEV. (FT)	SLOPE (FT/FT)	ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-6.60	0.00	DEF	DEF
103.00	93.00	0.00	250.00	0.00	0.00	-39.90	0.00	DEF	DEF
128.00	117.00	28.00	0.00	15.10	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

		ANGLE OF		ANGLE OF		<--BOTTOM-->		<-SAFETY-> <-FACTOR->	
SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	INTERNAL FRICTION (DEG)	COH-ESION (PSF)	WALL FRICTION (DEG)	ADH-ESION (PSF)	ELEV. (FT)	SLOPE (FT/FT)	ACT.	PASS.
103.00	93.00	0.00	250.00	0.00	0.00	-39.90	0.00	DEF	DEF
128.00	117.00	28.00	0.00	15.10	0.00			DEF	DEF

VI.--WATER DATA

S2 573_63 TO PROP BENCHED10 UND REV NOAD OUT

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -4.70 (FT)
LEFTSIDE ELEVATION = -5.00 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 13:59:23

****
* SOIL PRESSURES FOR *
* ANCHORED WALL DESIGN *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - UNDRAINED
'LOW WATER

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

ELEV. (FT)	NET WATER (PSF)	<---LEFTSIDE---> PASSIVE (PSF)	ACTIVE (PSF)	<------NET------> (SOIL + WATER) ACTIVE (PSF)	<--RIGHTSIDE---> ACTIVE (PSF)	PASSIVE (PSF)
0.0	0.0	0.0	0.0	0.0	0.0	0.0
-1.0	0.0	0.0	0.0	35.2	35.2	395.8
-2.0	0.0	0.0	0.0	70.3	70.3	791.7
-3.0	0.0	0.0	0.0	105.5	105.5	1187.5
-4.0	0.0	0.0	0.0	140.7	140.7	1583.3
-4.7	0.0	0.0	0.0	165.3	165.3	1860.4
-5.0	18.7	0.0	0.0	189.9	171.1	1926.2
-6.0	18.7	0.0	0.0	209.3	190.6	2145.5
-6.6+	18.7	0.0	0.0	221.0	202.3	2277.1
-6.6-	18.7	0.0	0.0	220.6	201.8	1086.5
-7.0	18.7	0.0	0.0	236.8	218.1	1102.7
-8.0	18.7	0.0	0.0	277.4	258.7	1143.3
-8.9+	18.7	0.0	0.0	312.7	294.0	1178.6
-8.9-	18.7	384.6	0.0	-71.9	294.0	1178.6
-9.0	18.7	389.9	0.0	-71.9	299.3	1183.9
-9.9	18.7	425.2	0.0	-71.9	334.6	1219.2
-10.0	18.7	430.5	0.0	-71.9	339.9	1224.5

S2 573_63 TO PROP BENCHED10 UND REV NOAD OUT

-11.0	18.7	471.1	0.0	-71.9	380.5	1265.1
-12.0	18.7	511.7	0.0	-71.9	421.1	1305.7
-13.0	18.7	552.3	0.0	-71.9	461.7	1346.3
-14.0	18.7	592.9	0.0	-71.9	502.3	1386.9
-15.0	18.7	633.5	0.0	-71.9	542.9	1427.5
-16.0	18.7	674.1	0.0	-71.9	583.5	1468.1
-17.0	18.7	714.7	0.0	-71.9	624.1	1508.7
-18.0	18.7	538.2	0.0	145.2	664.7	1549.3
-19.0	18.7	450.5	0.0	273.5	705.3	1589.9
-20.0	18.7	562.6	0.0	202.0	745.9	1630.5
-21.0	18.7	567.0	0.0	238.2	786.5	1671.1
-22.0	18.7	566.6	0.0	279.2	827.1	1711.7
-23.0	18.7	573.7	0.0	312.7	867.7	1752.3
-24.0	18.7	614.3	0.0	312.7	908.3	1792.9
-25.0	18.7	654.9	0.0	312.7	948.9	1833.5
-26.0	18.7	695.5	0.0	312.7	989.5	1874.1
-27.0	18.7	736.1*	0.0	312.7	1030.1	1914.7
-28.0	18.7	776.7	0.0	312.7	1070.7	1955.3
-29.0	18.7	817.3	0.0	312.7	1111.3	1995.9
-30.0	18.7	857.9	0.0	312.7	1151.9	2036.5
-31.0	18.7	898.5	120.8	312.7	1192.5	2077.1
-32.0	18.7	939.1	337.2	312.7	1233.1	2117.7
-33.0	18.7	979.7	450.7	312.7	1273.7	2158.3
-34.0	18.7	1020.3	484.2	312.7	1314.3	2198.9
-35.0	18.7	1060.9	513.7	312.7	1354.9	2239.5
-36.0	18.7	1101.5	542.0	312.7	1395.5	2280.1
-37.0	18.7	1142.1	570.2	312.7	1436.1	2320.7
-38.0	18.7	1182.7	601.8	312.7	1476.7	2361.3
-39.0	18.7	1223.3	636.5	312.7	1517.3	2401.9

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE FOR THIS ELEVATION.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 13:59:26

****
* SUMMARY OF RESULTS FOR *
* ANCHORED WALL DESIGN *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - UNDRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

S2 573_63 TO PROP BENCHED10 UND REV NOAD OUT
*****WARNING: STANDARD WEDGE SOLUTION DOES NOT EXIST
AT ALL ELEVATIONS. SEE COMPLETE OUTPUT.

METHOD	:	FREE EARTH	FIXED EARTH
WALL BOTTOM ELEVATION (FT)	:	-13.81	-17.32
PENETRATION (FT)	:	4.94	8.45
MAXIMUM BENDING MOMENT (LB-FT)	:	-1.0905E+03	-9.7221E+02
AT ELEVATION (FT)	:	-7.64	-7.51
MAXIMUM SCALED DEFLECTION (LB-IN^3)	:	-1.7425E+07	-1.4538E+07
AT ELEVATION (FT)	:	0.00	0.00
ANCHOR FORCE (LB)	:	1.0204E+03	9.8734E+02

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 13:59:27

****
* COMPLETE OF RESULTS FOR *
* ANCHORED WALL DESIGN *
* BY FREE EARTH METHOD *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - UNDRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 1020. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-1.7425E+07	0.00
-1.00	5.8612E+00	18.	-1.3198E+07	35.17
-2.00	4.6890E+01	70.	-8.9556E+06	70.33
-3.00	1.5825E+02	158.	-4.6221E+06	105.50
-4.00	3.7512E+02	281.	0.0000E+00	140.67
-4.00	3.7512E+02	-739.	0.0000E+00	140.67
-4.70	-1.0579E+02	-632.	3.5007E+06	165.29
-5.00	-2.8760E+02	-579.	4.9967E+06	189.85
-6.00	-7.6819E+02	-379.	9.5230E+06	209.34
-6.60	-9.5731E+02	-250.	1.1654E+07	221.03
-6.60	-9.5731E+02	-250.	1.1654E+07	220.56
-7.00	-1.0393E+03	-159.	1.2752E+07	236.80
-8.00	-1.0727E+03	99.	1.4219E+07	277.40
-8.87	-8.7753E+02	355.	1.4011E+07	312.72
-8.87	-8.7753E+02	355.	1.4011E+07	-71.89
-9.00	-8.3196E+02	346.	1.3873E+07	-71.89
-9.87	-5.5826E+02	283.	1.2387E+07	-71.89

S2 573_63 TO PROP BENCHED10 UND REV NOAD OUT

-10.00	-5.2204E+02	274.	1.2094E+07	-71.89
-11.00	-2.8401E+02	202.	9.4030E+06	-71.89
-12.00	-1.1788E+02	130.	6.2107E+06	-71.89
-13.00	-2.3635E+01	58.	2.8044E+06	-71.89
-13.81	0.0000E+00	0.	0.0000E+00	-71.89

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	396.
-2.00	0.	0.	0.	70.	792.
-3.00	0.	0.	0.	106.	1187.
-4.00	0.	0.	0.	141.	1583.
-4.70	0.	0.	0.	165.	1860.
-5.00	19.	0.	0.	171.	1926.
-6.00	19.	0.	0.	191.	2146.
-6.60+	19.	0.	0.	202.	2277.
-6.60+	19.	0.	0.	202.	1086.
-7.00	19.	0.	0.	218.	1103.
-8.00	19.	0.	0.	259.	1143.
-8.87+	19.	0.	0.	294.	1179.
-8.87+	19.	385.	0.	294.	1179.
-9.00	19.	390.	0.	299.	1184.
-9.87	19.	425.	0.	335.	1219.
-10.00	19.	430.	0.	340.	1224.
-11.00	19.	471.	0.	380.	1265.
-12.00	19.	512.	0.	421.	1306.
-13.00	19.	552.	0.	462.	1346.
-14.00	19.	593.	0.	502.	1387.

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE AT THIS ELEVATION.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 13:59:28

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******************************
* COMPLETE OF RESULTS FOR    *
*   ANCHORED WALL DESIGN     *
*   BY FIXED EARTH METHOD    *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - UNDRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 987. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-1.4538E+07	0.00
-1.00	5.8612E+00	18.	-1.1033E+07	35.17
-2.00	4.6890E+01	70.	-7.5122E+06	70.33
-3.00	1.5825E+02	158.	-3.9004E+06	105.50
-4.00	3.7512E+02	281.	0.0000E+00	140.67
-4.00	3.7512E+02	-706.	0.0000E+00	140.67
-4.70	-8.2613E+01	-599.	2.9988E+06	165.29
-5.00	-2.5448E+02	-546.	4.2845E+06	189.85
-6.00	-7.0196E+02	-346.	8.1559E+06	209.34
-6.60	-8.7121E+02	-217.	9.9456E+06	221.03
-6.60	-8.7121E+02	-217.	9.9456E+06	220.56
-7.00	-9.3991E+02	-125.	1.0844E+07	236.80
-8.00	-9.4022E+02	132.	1.1943E+07	277.40
-8.87	-7.1627E+02	388.	1.1598E+07	312.72
-8.87	-7.1627E+02	388.	1.1598E+07	-71.89
-9.00	-6.6640E+02	379.	1.1457E+07	-71.89
-9.87	-3.6389E+02	316.	1.0080E+07	-71.89
-10.00	-3.2336E+02	307.	9.8240E+06	-71.89
-11.00	-5.2219E+01	235.	7.6222E+06	-71.89
-12.00	1.4703E+02	163.	5.3199E+06	-71.89
-13.00	2.7438E+02	91.	3.2613E+06	-71.89
-14.00	3.2985E+02	20.	1.6665E+06	-71.89
-15.00	3.1342E+02	-52.	6.3126E+05	-71.89
-16.00	2.2509E+02	-124.	1.2729E+05	-71.89
-17.00	6.4872E+01	-196.	1.9162E+03	-71.89
-18.00	0.0000E+00	-208.	0.0000E+00	-2.69

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES------------>			
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	396.
-2.00	0.	0.	0.	70.	792.
-3.00	0.	0.	0.	106.	1187.
-4.00	0.	0.	0.	141.	1583.
-4.70	0.	0.	0.	165.	1860.
-5.00	19.	0.	0.	171.	1926.
-6.00	19.	0.	0.	191.	2146.
-6.60+	19.	0.	0.	202.	2277.
-6.60+	19.	0.	0.	202.	1086.
-7.00	19.	0.	0.	218.	1103.
-8.00	19.	0.	0.	259.	1143.
-8.87+	19.	0.	0.	294.	1179.
-8.87+	19.	385.	0.	294.	1179.
-9.00	19.	390.	0.	299.	1184.
-9.87	19.	425.	0.	335.	1219.
-10.00	19.	430.	0.	340.	1224.
-11.00	19.	471.	0.	380.	1265.
-12.00	19.	512.	0.	421.	1306.
-13.00	19.	552.	0.	462.	1346.
-14.00	19.	593.	0.	502.	1387.

	S2 573_63 TO PROP BENCHED10 UND REV NOAD OUT				
-15.00	19.	633.	0.	543.	1427.
-16.00	19.	674.	0.	583.	1468.
-17.00	19.	715.	0.	624.	1509.
-18.00	19.	538.	0.	665.	1549.

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE AT THIS ELEVATION.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 13:59:49

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* PRELIMINARY DESIGN DATA FOR *
*  FREE EARTH DESIGN IN CLAY   *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - UNDRAINED
'LOW WATER

II.--DESIGN PARAMETERS
WALL HEIGHT RATIO (ALPHA) = 0.64
ANCHOR HEIGHT RATIO (BETA) = 0.29
STABILITY NUMBER = 0.24

SHEET PILE DATA:

SHEET PILE NAME	<SECTION PROPERTIES> (PER FOOT OF WALL) SECTION MODULUS (IN^3)	MOMENT OF INERTIA (IN^4)	ALLOWABLE STRESS (PSI)	MODULUS OF ELASTICITY (PSI)
PZ40	60.70	490.80	24000.00	2.90E+07
PZ38	46.80	280.80	24000.00	2.90E+07
PZ35	48.50	361.20	24000.00	2.90E+07
PZ32	38.30	220.40	24000.00	2.90E+07
PZ27	30.20	184.20	24000.00	2.90E+07
PZ22	18.10	84.40	24000.00	2.90E+07
PLZ25	32.80	223.25	24000.00	2.90E+07
PLZ23	30.20	203.75	24000.00	2.90E+07
M116	10.70	42.11	24000.00	2.90E+07

III.--PRELIMINARY DESIGN DATA

SHEET PILE NAME	LOG(H^4/EI)	ROWE'S MOMENT REDUCTION COEF.	RATIO OF ALLOWABLE MOMENT TO FREE EARTH MOMENT
PZ40	-5.59	1.0 (***)	111.33
PZ38	-5.35	1.0 (***)	85.83
PZ35	-5.46	1.0 (***)	88.95
PZ32	-5.24	1.0 (***)	70.24

	S2 573_63 TO PROP BENCHED10 UND REV NOAD OUT		
PZ27	-5.17	1.0 (***)	55.39
PZ22	-4.83	1.0 (***)	33.20
PLZ25	-5.25	1.0 (***)	60.16
PLZ23	-5.21	1.0 (***)	55.39
M116	-4.53	1.0 (***)	19.62

*** REDUCTION NOT APPLICABLE DUE TO STABILITY NUMBER LESS THAN 0.5.

S3 568_85 TO PROP BENCHED10 UND REV NOAD OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 14:07:39

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH UNDRAINED
'LOW WATER

II.--CONTROL
ANCHORED WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.30

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.
ELEVATION AT ANCHOR = -4.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-16.05
10.00	-16.05
52.00	-27.90

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-3.70	0.00	DEF	DEF
112.00	102.00	0.00	250.00	0.00	0.00	-7.50	0.00	DEF	DEF
103.00	93.00	0.00	250.00	0.00	0.00	-20.30	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	0.00	250.00	0.00	0.00	-20.30	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

S3 568_85 TO PROP BENCHED10 UND REV NOAD OUT

VI.--WATER DATA
UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -7.40 (FT)
LEFTSIDE ELEVATION = -7.40 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 14:07:47

****
* SOIL PRESSURES FOR *
* ANCHORED WALL DESIGN *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH UNDRAINED
'LOW WATER

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

		<---LEFTSIDE--->		<------NET------> (SOIL + WATER)	<--RIGHTSIDE--->	
ELEV. (FT)	NET WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.0	0.0	0.0	0.0	0.0	0.0	0.0
-1.0	0.0	0.0	0.0	35.2	35.2	395.8
-2.0	0.0	0.0	0.0	70.3	70.3	791.7
-3.0	0.0	0.0	0.0	105.5	105.5	1187.5
-3.7+	0.0	0.0	0.0	130.1	130.1	1464.6
-3.7-	0.0	0.0	0.0	0.0	0.0	836.0
-4.0	0.0	0.0	0.0	0.0	0.0	866.6
-4.2	0.0	0.0	0.0	0.0	0.0	884.6
-5.0	0.0	0.0	0.0	84.0	84.0	968.6
-6.0	0.0	0.0	0.0	186.0	186.0	1070.6
-7.0	0.0	0.0	0.0	288.0	288.0	1172.6
-7.4	0.0	0.0	0.0	328.8	328.8	1213.4
-7.5	0.0	0.0	0.0	333.8	333.8	1218.4
-8.0	0.0	0.0	0.0	354.1	354.1	1238.7
-9.0	0.0	0.0	0.0	394.7	394.7	1279.3
-10.0	0.0	0.0	0.0	435.3	435.3	1319.9

-11.0	0.0	0.0	0.0	475.9	475.9	1360.5
-12.0	0.0	0.0	0.0	516.5	516.5	1401.1
-13.0	0.0	0.0	0.0	557.1	557.1	1441.7
-14.0	0.0	0.0	0.0	597.7	597.7	1482.3
-15.0	0.0	0.0	0.0	638.3	638.3	1522.9
-16.0	0.0	0.0	0.0	678.9	678.9	1563.5
-16.1+	0.0	0.0	0.0	680.9	680.9	1565.5
-16.1-	0.0	384.6	0.0	296.3	680.9	1565.5
-17.0	0.0	423.2	0.0	296.3	719.5	1604.1
-17.1	0.0	425.2	0.0	296.3	721.5	1606.1
-18.0	0.0	463.8	0.0	296.3	760.1	1644.7
-19.0	0.0	504.4	0.0	296.3	800.7	1685.3
-20.0	0.0	545.0	0.0	296.3	841.3	1725.9
-20.1	0.0	655.4	0.0	0.0	846.7	1731.3
-20.3+	0.0	791.3	0.0	-364.6	853.4	1738.1
-20.3-	0.0	791.3	0.0	-364.6	0.0	2507.3
-21.0	0.0	1377.2	0.0	-1377.2	0.0	2558.1
-22.0	0.0	1449.8	0.0	-1449.8	0.0	2630.7
-22.3	0.0	1473.0	0.0	-1473.0	0.0	2653.8
-23.0	0.0	1522.4	0.0	-1473.0	49.5	2703.3
-24.0	0.0	1595.0	0.0	-1473.0	122.1	2775.9
-25.0	0.0	1644.2	0.0	-1449.6	194.7	2848.5
-26.0	0.0	1666.2	0.0	-1398.9	267.3	2921.1
-27.0	0.0	1706.5	0.0	-1366.7	339.9	2993.7
-28.0	0.0	1769.2	0.0	-1356.7	412.5	3066.3
-29.0	0.0	1831.8	0.0	-1346.8	485.1	3138.9
-30.0	0.0	1894.5	0.0	-1336.8	557.7	3211.5
-31.0	0.0	1957.1	0.0	-1326.9	630.3	3284.1
-32.0	0.0	2019.8	0.0	-1316.9	702.9	3356.7
-33.0	0.0	2082.4	0.0	-1307.0	775.5	3429.3
-34.0	0.0	2145.1	0.0	-1297.0	848.1	3501.9
-35.0	0.0	2207.7	0.0	-1287.1	920.7	3574.5
-36.0	0.0	2270.4	0.0	-1277.1	993.3	3647.1
-37.0	0.0	2332.1	0.0	-1266.2	1065.9	3719.7
-38.0	0.0	2391.9	0.0	-1253.4	1138.5	3792.3
-39.0	0.0	2266.1	0.0	-1055.1	1211.1	3864.9
-40.0	0.0	2173.7	0.0	-890.1	1283.7	3937.5
-41.0	0.0	2251.8	0.0	-895.5	1356.3	4010.1
-42.0	0.0	2288.5	0.0	-859.6	1428.9	4082.7
-43.0	0.0	2333.0	0.0	-831.5	1501.5	4155.3
-44.0	0.0	2367.6	0.0	-793.5	1574.1	4227.9
-45.0	0.0	2402.5	0.0	-755.8	1646.7	4300.5
-46.0	0.0	2443.0	0.0	-723.7	1719.3	4373.1
-47.0	0.0	2474.3	0.0	-682.5	1791.9	4445.7
-48.0	0.0	2511.2	0.0	-646.8	1864.5	4518.3
-49.0	0.0	2550.9	0.0	-613.8	1937.1	4590.9
-50.0	0.0	2601.7	0.0	-592.0	2009.7	4663.5
-51.0	0.0	2652.5	0.0	-570.2	2082.3	4736.1
-52.0	0.0	2801.7	0.0	-646.9	2154.9	4808.7
-53.0	0.0	2866.8	0.0	-639.3	2227.5	4881.3
-54.0	0.0	2979.1	0.0	-679.0	2300.1	4953.9
-55.0	0.0	3078.7	0.0	-706.0	2372.7	5026.5
-56.0	0.0	3055.0	0.0	-609.7	2445.3	5099.1
-57.0	0.0	3297.6	499.5	-779.7	2517.9	5171.7
-58.0	0.0	3304.9	1184.0	-714.5	2590.5	5244.3
-59.0	0.0	3333.3	1404.0	-670.2	2663.1	5316.9
-60.0	0.0	3597.8	1473.0	-862.1	2735.7	5389.5
-61.0	0.0	3553.1	1535.1	-744.8	2808.3	5462.1
-62.0	0.0	3613.2	1591.7	-732.3	2880.9	5534.7
-63.0	0.0	3811.3	1648.3	-857.8	2953.5	5607.3
-64.0	0.0	3848.8	1705.0	-822.8	3026.1	5679.9
-65.0	0.0	3903.8	1761.6	-805.2	3098.7	5752.5

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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
                          BY CLASSICAL METHODS
DATE: 28-NOVEMBER-2006                                      TIME: 14:07:50

                    ****************************
                    *  SUMMARY OF RESULTS FOR  *
                    *   ANCHORED WALL DESIGN   *
                    ****************************

   I.--HEADING
    'KINNICKINNIC RIVER WALL SECTIONS
    'SECTION 3
    'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH UNDRAINED
    'LOW WATER

  II.--SUMMARY

      RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
      AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

      LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

  METHOD                            :     FREE EARTH         FIXED EARTH

  WALL BOTTOM ELEVATION (FT)        :         -22.67              -26.72
        PENETRATION (FT)            :           6.62               10.67

  MAXIMUM BENDING MOMENT (LB-FT)    :    -1.7179E+04         -1.2668E+04
        AT ELEVATION (FT)           :         -13.07              -12.09

  MAXIMUM SCALED DEFLECTION (LB-IN^3):    1.0123E+09          6.8327E+08
        AT ELEVATION (FT)           :         -13.00              -13.00

  ANCHOR FORCE (LB)                 :     3.2898E+03          2.7643E+03

             NOTE:  DIVIDE SCALED DEFLECTION MODULUS OF
                    ELASTICITY IN PSI TIMES PILE MOMENT
                    OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
                    IN INCHES.


PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
                          BY CLASSICAL METHODS
DATE: 28-NOVEMBER-2006                                      TIME: 14:07:51

                    ****************************
                    * COMPLETE OF RESULTS FOR  *
                    *   ANCHORED WALL DESIGN   *
                    *   BY FREE EARTH METHOD   *
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S3 568_85 TO PROP BENCHED10 UND REV NOAD OUT

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH UNDRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 3290. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-6.8809E+08	0.00
-1.00	5.8612E+00	18.	-5.1620E+08	35.17
-2.00	4.6890E+01	70.	-3.4429E+08	70.33
-3.00	1.5825E+02	158.	-1.7229E+08	105.50
-3.70	2.9689E+02	241.	-5.1736E+07	130.12
-3.70	2.9689E+02	241.	-5.1736E+07	0.00
-4.00	3.6910E+02	241.	0.0000E+00	0.00
-4.00	3.6910E+02	-3049.	0.0000E+00	0.00
-4.18	-1.6898E+02	-3049.	3.0454E+07	0.00
-5.00	-2.6705E+03	-3015.	1.7198E+08	84.00
-6.00	-5.6261E+03	-2880.	3.3936E+08	186.00
-7.00	-8.3957E+03	-2643.	4.9705E+08	288.00
-7.40	-9.4286E+03	-2519.	5.5632E+08	328.80
-7.50	-9.6788E+03	-2486.	5.7075E+08	333.76
-8.00	-1.0879E+04	-2314.	6.4027E+08	354.06
-9.00	-1.3010E+04	-1940.	7.6474E+08	394.66
-10.00	-1.4745E+04	-1525.	8.6678E+08	435.26
-11.00	-1.6046E+04	-1069.	9.4341E+08	475.86
-12.00	-1.6870E+04	-573.	9.9238E+08	516.46
-13.00	-1.7178E+04	-36.	1.0123E+09	557.06
-14.00	-1.6929E+04	541.	1.0026E+09	597.66
-15.00	-1.6083E+04	1159.	9.6369E+08	638.26
-16.00	-1.4598E+04	1818.	8.9711E+08	678.86
-16.05	-1.4506E+04	1852.	8.9309E+08	680.89
-16.05	-1.4506E+04	1852.	8.9309E+08	296.27
-17.00	-1.2613E+04	2133.	8.0538E+08	296.27
-17.05	-1.2506E+04	2148.	8.0019E+08	296.27
-18.00	-1.0332E+04	2429.	6.9190E+08	296.27
-19.00	-7.7548E+03	2726.	5.6061E+08	296.27
-20.00	-4.8811E+03	3022.	4.1596E+08	296.27
-20.13	-4.4729E+03	3042.	3.9575E+08	0.00
-20.30	-3.9711E+03	3012.	3.7069E+08	-364.57
-21.00	-2.0350E+03	2402.	2.6289E+08	-1377.22
-22.00	-3.3375E+02	988.	1.0612E+08	-1449.82
-22.32	-9.2731E+01	523.	5.5916E+07	-1472.96
-22.67	0.0000E+00	0.	0.0000E+00	-1472.96

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL	PRESSURES------------->		
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	396.
-2.00	0.	0.	0.	70.	792.
-3.00	0.	0.	0.	106.	1187.

-3.70+	0.	0.	0.	130.	1465.
-3.70+	0.	0.	0.	0.	836.
-4.00	0.	0.	0.	0.	867.
-4.18	0.	0.	0.	0.	885.
-5.00	0.	0.	0.	84.	969.
-6.00	0.	0.	0.	186.	1071.
-7.00	0.	0.	0.	288.	1173.
-7.40	0.	0.	0.	329.	1213.
-7.50	0.	0.	0.	334.	1218.
-8.00	0.	0.	0.	354.	1239.
-9.00	0.	0.	0.	395.	1279.
-10.00	0.	0.	0.	435.	1320.
-11.00	0.	0.	0.	476.	1360.
-12.00	0.	0.	0.	516.	1401.
-13.00	0.	0.	0.	557.	1442.
-14.00	0.	0.	0.	598.	1482.
-15.00	0.	0.	0.	638.	1523.
-16.00	0.	0.	0.	679.	1563.
-16.05+	0.	0.	0.	681.	1566.
-16.05+	0.	385.	0.	681.	1566.
-17.00	0.	423.	0.	719.	1604.
-17.05	0.	425.	0.	721.	1606.
-18.00	0.	464.	0.	760.	1645.
-19.00	0.	504.	0.	801.	1685.
-20.00	0.	545.	0.	841.	1726.
-20.13	0.	655.	0.	847.	1731.
-20.30+	0.	791.	0.	853.	1738.
-20.30+	0.	791.	0.	0.	2507.
-21.00	0.	1377.	0.	0.	2558.
-22.00	0.	1450.	0.	0.	2631.
-22.32	0.	1473.	0.	0.	2654.
-23.00	0.	1522.	0.	49.	2703.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 14:07:51

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* COMPLETE OF RESULTS FOR  *
*   ANCHORED WALL DESIGN   *
*   BY FIXED EARTH METHOD  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH UNDRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 2764. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-4.9283E+08	0.00
-1.00	5.8612E+00	18.	-3.6975E+08	35.17
-2.00	4.6890E+01	70.	-2.4666E+08	70.33
-3.00	1.5825E+02	158.	-1.2347E+08	105.50
-3.70	2.9689E+02	241.	-3.7091E+07	130.12

-3.70	2.9689E+02	241.	-3.7091E+07	0.00
-4.00	3.6910E+02	241.	0.0000E+00	0.00
-4.00	3.6910E+02	-2524.	0.0000E+00	0.00
-4.18	-7.6240E+01	-2524.	2.1840E+07	0.00
-5.00	-2.1450E+03	-2489.	1.2332E+08	84.00
-6.00	-4.5750E+03	-2354.	2.4294E+08	186.00
-7.00	-6.8191E+03	-2117.	3.5469E+08	288.00
-7.40	-7.6417E+03	-1994.	3.9630E+08	328.80
-7.50	-7.8395E+03	-1961.	4.0638E+08	333.76
-8.00	-8.7772E+03	-1789.	4.5469E+08	354.06
-9.00	-1.0382E+04	-1414.	5.3957E+08	394.66
-10.00	-1.1592E+04	-999.	6.0658E+08	435.26
-11.00	-1.2367E+04	-544.	6.5361E+08	475.86
-12.00	-1.2666E+04	-48.	6.7935E+08	516.46
-13.00	-1.2448E+04	489.	6.8327E+08	557.06
-14.00	-1.1674E+04	1067.	6.6576E+08	597.66
-15.00	-1.0302E+04	1685.	6.2816E+08	638.26
-16.00	-8.2914E+03	2343.	5.7285E+08	678.86
-16.05	-8.1734E+03	2377.	5.6968E+08	680.89
-16.05	-8.1734E+03	2377.	5.6968E+08	296.27
-17.00	-5.7814E+03	2659.	5.0329E+08	296.27
-17.05	-5.6481E+03	2673.	4.9952E+08	296.27
-18.00	-2.9748E+03	2955.	4.2379E+08	296.27
-19.00	1.2821E+02	3251.	3.3918E+08	296.27
-20.00	3.5275E+03	3547.	2.5484E+08	296.27
-20.13	4.0064E+03	3567.	2.4383E+08	0.00
-20.30	4.5951E+03	3537.	2.3046E+08	-364.57
-21.00	6.8991E+03	2928.	1.7661E+08	-1377.22
-22.00	9.1259E+03	1514.	1.1012E+08	-1449.82
-22.32	9.5344E+03	1048.	9.2087E+07	-1472.96
-23.00	9.9067E+03	45.	5.9196E+07	-1472.96
-24.00	9.2149E+03	-1428.	2.5175E+07	-1472.96
-25.00	7.0541E+03	-2889.	6.8648E+06	-1449.55
-26.00	3.4483E+03	-4314.	5.3625E+05	-1398.90
-27.00	0.0000E+00	-5308.	0.0000E+00	-1375.80

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<------------SOIL PRESSURES------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	396.
-2.00	0.	0.	0.	70.	792.
-3.00	0.	0.	0.	106.	1187.
-3.70+	0.	0.	0.	130.	1465.
-3.70+	0.	0.	0.	0.	836.
-4.00	0.	0.	0.	0.	867.
-4.18	0.	0.	0.	0.	885.
-5.00	0.	0.	0.	84.	969.
-6.00	0.	0.	0.	186.	1071.
-7.00	0.	0.	0.	288.	1173.
-7.40	0.	0.	0.	329.	1213.
-7.50	0.	0.	0.	334.	1218.
-8.00	0.	0.	0.	354.	1239.
-9.00	0.	0.	0.	395.	1279.
-10.00	0.	0.	0.	435.	1320.

S3 568_85 TO PROP BENCHED10 UND REV NOAD OUT

-11.00	0.	0.	0.	476.	1360.
-12.00	0.	0.	0.	516.	1401.
-13.00	0.	0.	0.	557.	1442.
-14.00	0.	0.	0.	598.	1482.
-15.00	0.	0.	0.	638.	1523.
-16.00	0.	0.	0.	679.	1563.
-16.05+	0.	0.	0.	681.	1566.
-16.05+	0.	385.	0.	681.	1566.
-17.00	0.	423.	0.	719.	1604.
-17.05	0.	425.	0.	721.	1606.
-18.00	0.	464.	0.	760.	1645.
-19.00	0.	504.	0.	801.	1685.
-20.00	0.	545.	0.	841.	1726.
-20.13	0.	655.	0.	847.	1731.
-20.30+	0.	791.	0.	853.	1738.
-20.30+	0.	791.	0.	0.	2507.
-21.00	0.	1377.	0.	0.	2558.
-22.00	0.	1450.	0.	0.	2631.
-22.32	0.	1473.	0.	0.	2654.
-23.00	0.	1522.	0.	49.	2703.
-24.00	0.	1595.	0.	122.	2776.
-25.00	0.	1644.	0.	195.	2849.
-26.00	0.	1666.	0.	267.	2921.
-27.00	0.	1707.	0.	340.	2994.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 14:08:06

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********************************
* PRELIMINARY DESIGN DATA FOR *
*  FREE EARTH DESIGN IN CLAY  *
********************************
```

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH UNDRAINED
'LOW WATER

II.--DESIGN PARAMETERS
WALL HEIGHT RATIO (ALPHA) = 0.71
ANCHOR HEIGHT RATIO (BETA) = 0.18
STABILITY NUMBER = 0.28

SHEET PILE DATA:

SHEET PILE NAME	<SECTION PROPERTIES> (PER FOOT OF WALL) SECTION MODULUS (IN^3)	MOMENT OF INERTIA (IN^4)	ALLOWABLE STRESS (PSI)	MODULUS OF ELASTICITY (PSI)
PZ40	60.70	490.80	24000.00	2.90E+07
PZ38	46.80	280.80	24000.00	2.90E+07

S3 568_85 TO PROP BENCHED10 UND REV NOAD OUT

PZ35	48.50	361.20	24000.00	2.90E+07
PZ32	38.30	220.40	24000.00	2.90E+07
PZ27	30.20	184.20	24000.00	2.90E+07
PZ22	18.10	84.40	24000.00	2.90E+07
PLZ25	32.80	223.25	24000.00	2.90E+07
PLZ23	30.20	203.75	24000.00	2.90E+07
M116	10.70	42.11	24000.00	2.90E+07

III.--PRELIMINARY DESIGN DATA

SHEET PILE NAME	LOG(H^4/EI)	ROWE'S MOMENT REDUCTION COEF.	RATIO OF ALLOWABLE MOMENT TO FREE EARTH MOMENT
PZ40	-4.73	1.0 (***)	7.07
PZ38	-4.49	1.0 (***)	5.45
PZ35	-4.60	1.0 (***)	5.65
PZ32	-4.38	1.0 (***)	4.46
PZ27	-4.31	1.0 (***)	3.52
PZ22	-3.97	1.0 (***)	2.11
PLZ25	-4.39	1.0 (***)	3.82
PLZ23	-4.35	1.0 (***)	3.52
M116	-3.66	1.0 (***)	1.25

*** REDUCTION NOT APPLICABLE DUE TO STABILITY NUMBER LESS THAN 0.5.

S6 571_0 PROPOSED BENCHED10 UND REV NOAD OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 15:50:24

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- UNDRAINED
'LOW WATER

II.--CONTROL
ANCHORED WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.30

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.
ELEVATION AT ANCHOR = -3.40 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-2.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-13.30
10.00	-13.30
70.00	-28.70

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-2.90	0.00	DEF	DEF
112.00	102.00	0.00	250.00	0.00	0.00	-9.30	0.00	DEF	DEF
103.00	93.00	0.00	250.00	0.00	0.00	-25.20	0.00	DEF	DEF
112.00	102.00	0.00	250.00	0.00	0.00	-32.00	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	0.00	250.00	0.00	0.00	-25.20	0.00	DEF	DEF
112.00	102.00	0.00	250.00	0.00	0.00	-32.00	0.00	DEF	DEF

S6 571_0 PROPOSED BENCHED10 UND REV NOAD OUT

135.00 129.00 0.00 750.00 0.00 0.00 DEF DEF

VI.--WATER DATA

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -6.80 (FT)
LEFTSIDE ELEVATION = -6.80 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS

NONE

VIII.--HORIZONTAL LOADS

NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 15:50:27

****
* SOIL PRESSURES FOR *
* ANCHORED WALL DESIGN *
****

I.--HEADING

'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- UNDRAINED
'LOW WATER

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)	<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.0	0.0	0.0	0.0	0.0	0.0	0.0
-1.0	0.0	0.0	0.0	0.0	0.0	0.0
-2.0	0.0	0.0	0.0	0.0	0.0	0.0
-2.9+	0.0	0.0	0.0	31.7	31.7	356.2
-2.9-	0.0	0.0	0.0	0.0	0.0	494.4
-3.0	0.0	0.0	0.0	0.0	0.0	504.6
-3.4	0.0	0.0	0.0	0.0	0.0	545.4
-4.0	0.0	0.0	0.0	0.0	0.0	606.6
-5.0	0.0	0.0	0.0	0.0	0.0	708.6
-6.0	0.0	0.0	0.0	0.0	0.0	810.6
-6.7	0.0	0.0	0.0	0.0	0.0	884.6
-6.8	0.0	0.0	0.0	7.6	7.6	892.2
-7.0	0.0	0.0	0.0	17.5	17.5	902.1
-8.0	0.0	0.0	0.0	67.1	67.1	951.7

-9.0	0.0	0.0	0.0	116.7	116.7	1001.3
-9.3	0.0	0.0	0.0	131.6	131.6	1016.2
-10.0	0.0	0.0	0.0	160.0	160.0	1044.6
-11.0	0.0	0.0	0.0	200.6	200.6	1085.2
-12.0	0.0	0.0	0.0	241.2	241.2	1125.8
-13.0	0.0	0.0	0.0	281.8	281.8	1166.4
-13.3+	0.0	0.0	0.0	294.0	294.0	1178.6
-13.3-	0.0	384.6	0.0	-90.6	294.0	1178.6
-14.0	0.0	413.0	0.0	-90.6	322.4	1207.0
-14.3	0.0	425.2	0.0	-90.6	334.6	1219.2
-15.0	0.0	453.6	0.0	-90.6	363.0	1247.6
-16.0	0.0	494.2	0.0	-90.6	403.6	1288.2
-17.0	0.0	534.8	0.0	-90.6	444.2	1328.8
-18.0	0.0	575.4	0.0	-90.6	484.8	1369.4
-19.0	0.0	616.0	0.0	-90.6	525.4	1410.0
-20.0	0.0	656.6	0.0	-90.6	566.0	1450.6
-21.0	0.0	697.2	0.0	-90.6	606.6	1491.2
-22.0	0.0	689.6	0.0	-42.4	647.2	1531.8
-23.0	0.0	670.3	0.0	17.6	687.8	1572.4
-24.0	0.0	691.8	0.0	36.6	728.4	1613.0
-25.0	0.0	717.3	0.0	51.7	769.0	1653.6
-25.2	0.0	723.4	0.0	53.7	777.1	1661.8
-26.0	0.0	751.3	0.0	65.6	816.8	1701.4
-27.0	0.0	785.4	0.0	81.0	866.4	1751.0
-28.0	0.0	819.1	0.0	96.9	916.0	1800.6
-29.0	0.0	852.4	0.0	113.2	965.6	1850.2
-30.0	0.0	884.8	0.0	130.4	1015.2	1899.8
-31.0	0.0	916.9	0.0	148.0	1064.8	1949.4
-32.0+	0.0	1423.7	0.0	-809.2	1114.4	1999.0
-32.0-	0.0	1423.7	0.0	-809.2	114.4	2768.3
-33.0	0.0	1926.8	0.0	-1739.8	187.0	2840.9
-34.0	0.0	1964.2	0.0	-1704.5	259.6	2913.5
-35.0	0.0	2013.0	0.0	-1680.8	332.2	2986.1
-36.0	0.0	2068.2	0.0	-1663.4	404.8	3058.7
-37.0	0.0	2128.7	0.0	-1651.3	477.4	3131.3
-38.0	0.0	2185.5	0.0	-1635.4	550.0	3203.9
-39.0	0.0	2243.1	0.0	-1620.5	622.6	3276.5
-40.0	0.0	2304.8	0.0	-1609.6	695.2	3349.1
-41.0	0.0	2366.5	0.0	-1598.7	767.8	3421.7
-42.0	0.0	2428.2	0.0	-1587.8	840.4	3494.3
-43.0	0.0	2489.9	0.0	-1576.9	913.0	3566.9
-44.0	0.0	2551.7	0.0	-1566.0	985.6	3639.5
-45.0	0.0	2613.4	0.0	-1555.1	1058.2	3712.1
-46.0	0.0	2675.1	0.0	-1544.3	1130.8	3784.7
-47.0	0.0	2736.8	0.0	-1533.4	1203.4	3857.3
-48.0	0.0	2798.5	0.0	-1522.5	1276.0	3929.9
-49.0	0.0	2860.2	0.0	-1511.6	1348.6	4002.5
-50.0	0.0	2921.9	0.0	-1500.7	1421.2	4075.1
-51.0	0.0	2983.6	0.0	-1489.8	1493.8	4147.7
-52.0	0.0	3045.3	0.0	-1478.9	1566.4	4220.3
-53.0	0.0	3107.0	0.0	-1468.0	1639.0	4292.9
-54.0	0.0	3168.7	329.4	-1457.1	1711.6	4365.5

S6 571_0 PROPOSED BENCHED10 UND REV NOAD OUT
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 15:50:30

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*****************************
*  SUMMARY OF RESULTS FOR   *
*   ANCHORED WALL DESIGN    *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- UNDRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

METHOD	:	FREE EARTH	FIXED EARTH
WALL BOTTOM ELEVATION (FT)	:	-19.84	-33.56
PENETRATION (FT)	:	6.54	20.26
MAXIMUM BENDING MOMENT (LB-FT)	:	-2.6067E+03	-2.3991E+03
AT ELEVATION (FT)	:	-10.88	-10.73
MAXIMUM SCALED DEFLECTION (LB-IN^3)	:	1.0436E+08	1.2609E+08
AT ELEVATION (FT)	:	-11.00	-12.00
ANCHOR FORCE (LB)	:	4.4713E+02	4.1911E+02

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 15:50:31

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*****************************
* COMPLETE OF RESULTS FOR   *
*   ANCHORED WALL DESIGN    *
*   BY FREE EARTH METHOD    *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- UNDRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 447. (LB))

ELEVATION	BENDING MOMENT	SHEAR	SCALED DEFLECTION	NET PRESSURE

S6 571_0 PROPOSED BENCHED10 UND REV NOAD OUT

(FT)	(LB-FT)	(LB)	(LB-IN^3)	(PSF)
0.00	0.0000E+00	0.	-7.0396E+07	0.00
-1.00	1.0914E-11	0.	-4.9692E+07	0.00
-2.00	-1.0914E-11	0.	-2.8988E+07	0.00
-2.90	4.2728E+00	14.	-1.0354E+07	31.65
-2.90	4.2728E+00	14.	-1.0354E+07	0.00
-3.00	5.6971E+00	14.	-8.2836E+06	0.00
-3.40	1.1394E+01	14.	0.0000E+00	0.00
-3.40	1.1394E+01	-433.	0.0000E+00	0.00
-4.00	-2.4834E+02	-433.	1.2404E+07	0.00
-5.00	-6.8124E+02	-433.	3.2654E+07	0.00
-6.00	-1.1141E+03	-433.	5.1727E+07	0.00
-6.73	-1.4282E+03	-433.	6.4402E+07	0.00
-6.80	-1.4604E+03	-433.	6.5635E+07	7.60
-7.00	-1.5467E+03	-430.	6.8875E+07	17.52
-8.00	-1.9598E+03	-388.	8.3353E+07	67.12
-9.00	-2.3058E+03	-296.	9.4453E+07	116.72
-9.30	-2.3891E+03	-259.	9.7032E+07	131.60
-10.00	-2.5355E+03	-157.	1.0159E+08	160.02
-11.00	-2.6053E+03	24.	1.0436E+08	200.62
-12.00	-2.4744E+03	245.	1.0266E+08	241.22
-13.00	-2.1024E+03	506.	9.6724E+07	281.82
-13.30	-1.9376E+03	593.	9.4200E+07	294.00
-13.30	-1.9376E+03	593.	9.4200E+07	-90.62
-14.00	-1.5450E+03	529.	8.7185E+07	-90.62
-14.30	-1.3904E+03	502.	8.3759E+07	-90.62
-15.00	-1.0612E+03	439.	7.4964E+07	-90.62
-16.00	-6.6795E+02	348.	6.0896E+07	-90.62
-17.00	-3.6533E+02	257.	4.5661E+07	-90.62
-18.00	-1.5333E+02	167.	2.9782E+07	-90.62
-19.00	-3.1938E+01	76.	1.3624E+07	-90.62
-19.84	0.0000E+00	0.	0.0000E+00	-90.62

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	0.	0.
-2.00	0.	0.	0.	0.	0.
-2.90+	0.	0.	0.	32.	356.
-2.90+	0.	0.	0.	0.	494.
-3.00	0.	0.	0.	0.	505.
-3.40	0.	0.	0.	0.	545.
-4.00	0.	0.	0.	0.	607.
-5.00	0.	0.	0.	0.	709.
-6.00	0.	0.	0.	0.	811.
-6.73	0.	0.	0.	0.	885.
-6.80	0.	0.	0.	8.	892.
-7.00	0.	0.	0.	18.	902.
-8.00	0.	0.	0.	67.	952.
-9.00	0.	0.	0.	117.	1001.
-9.30	0.	0.	0.	132.	1016.
-10.00	0.	0.	0.	160.	1045.
-11.00	0.	0.	0.	201.	1085.
-12.00	0.	0.	0.	241.	1126.

-13.00	0.	0.	0.	282.	1166.
-13.30+	0.	0.	0.	294.	1179.
-13.30+	0.	385.	0.	294.	1179.
-14.00	0.	413.	0.	322.	1207.
-14.30	0.	425.	0.	335.	1219.
-15.00	0.	454.	0.	363.	1248.
-16.00	0.	494.	0.	404.	1288.
-17.00	0.	535.	0.	444.	1329.
-18.00	0.	575.	0.	485.	1369.
-19.00	0.	616.	0.	525.	1410.
-20.00	0.	657.	0.	566.	1451.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 15:50:32

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* COMPLETE OF RESULTS FOR  *
*    ANCHORED WALL DESIGN  *
*   BY FIXED EARTH METHOD  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- UNDRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 419. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-7.7626E+07	0.00
-1.00	0.0000E+00	0.	-5.4796E+07	0.00
-2.00	0.0000E+00	0.	-3.1965E+07	0.00
-2.90	4.2728E+00	14.	-1.1418E+07	31.65
-2.90	4.2728E+00	14.	-1.1418E+07	0.00
-3.00	5.6971E+00	14.	-9.1343E+06	0.00
-3.40	1.1394E+01	14.	0.0000E+00	0.00
-3.40	1.1394E+01	-405.	0.0000E+00	0.00
-4.00	-2.3153E+02	-405.	1.3682E+07	0.00
-5.00	-6.3640E+02	-405.	3.6090E+07	0.00
-6.00	-1.0413E+03	-405.	5.7398E+07	0.00
-6.73	-1.3350E+03	-405.	7.1771E+07	0.00
-6.80	-1.3652E+03	-405.	7.3183E+07	7.60
-7.00	-1.4459E+03	-402.	7.6908E+07	17.52
-8.00	-1.8309E+03	-360.	9.3921E+07	67.12
-9.00	-2.1488E+03	-268.	1.0778E+08	116.72
-9.30	-2.2237E+03	-231.	1.1124E+08	131.60
-10.00	-2.3506E+03	-129.	1.1794E+08	160.02
-11.00	-2.3923E+03	52.	1.2407E+08	200.62
-12.00	-2.2334E+03	273.	1.2609E+08	241.22
-13.00	-1.8333E+03	534.	1.2428E+08	281.82
-13.30	-1.6602E+03	621.	1.2309E+08	294.00
-13.30	-1.6602E+03	621.	1.2309E+08	-90.62
-14.00	-1.2480E+03	557.	1.1934E+08	-90.62
-14.30	-1.0849E+03	530.	1.1739E+08	-90.62
-15.00	-7.3609E+02	467.	1.1223E+08	-90.62

-16.00	-3.1483E+02	376.	1.0384E+08	-90.62
-17.00	1.5815E+01	285.	9.4887E+07	-90.62
-18.00	2.5584E+02	195.	8.5950E+07	-90.62
-19.00	4.0526E+02	104.	7.7442E+07	-90.62
-20.00	4.6405E+02	13.	6.9622E+07	-90.62
-21.00	4.3224E+02	-77.	6.2590E+07	-90.62
-22.00	3.1784E+02	-144.	5.6293E+07	-42.41
-23.00	1.6298E+02	-156.	5.0539E+07	17.55
-24.00	1.8862E+01	-129.	4.5069E+07	36.61
-25.00	-8.9308E+01	-85.	3.9636E+07	51.71
-25.20	-1.0523E+02	-74.	3.8537E+07	53.70
-26.00	-1.4621E+02	-27.	3.4057E+07	65.57
-27.00	-1.3743E+02	47.	2.8235E+07	81.04
-28.00	-4.7548E+01	136.	2.2186E+07	96.90
-29.00	1.3931E+02	241.	1.6070E+07	113.21
-30.00	4.3953E+02	363.	1.0210E+07	130.39
-31.00	8.7020E+02	502.	5.1287E+06	147.96
-32.00	1.2864E+03	171.	1.5584E+06	-809.23
-33.00	8.9774E+02	-1103.	9.4793E+04	-1739.83
-34.00	0.0000E+00	-2079.	0.0000E+00	-1719.92

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	0.	0.
-2.00	0.	0.	0.	0.	0.
-2.90+	0.	0.	0.	32.	356.
-2.90+	0.	0.	0.	0.	494.
-3.00	0.	0.	0.	0.	505.
-3.40	0.	0.	0.	0.	545.
-4.00	0.	0.	0.	0.	607.
-5.00	0.	0.	0.	0.	709.
-6.00	0.	0.	0.	0.	811.
-6.73	0.	0.	0.	0.	885.
-6.80	0.	0.	0.	8.	892.
-7.00	0.	0.	0.	18.	902.
-8.00	0.	0.	0.	67.	952.
-9.00	0.	0.	0.	117.	1001.
-9.30	0.	0.	0.	132.	1016.
-10.00	0.	0.	0.	160.	1045.
-11.00	0.	0.	0.	201.	1085.
-12.00	0.	0.	0.	241.	1126.
-13.00	0.	0.	0.	282.	1166.
-13.30+	0.	0.	0.	294.	1179.
-13.30+	0.	385.	0.	294.	1179.
-14.00	0.	413.	0.	322.	1207.
-14.30	0.	425.	0.	335.	1219.
-15.00	0.	454.	0.	363.	1248.
-16.00	0.	494.	0.	404.	1288.
-17.00	0.	535.	0.	444.	1329.
-18.00	0.	575.	0.	485.	1369.
-19.00	0.	616.	0.	525.	1410.
-20.00	0.	657.	0.	566.	1451.
-21.00	0.	697.	0.	607.	1491.

S6 571_0 PROPOSED BENCHED10 UND REV NOAD OUT

-22.00	0.	690.	0.	647.	1532.
-23.00	0.	670.	0.	688.	1572.
-24.00	0.	692.	0.	728.	1613.
-25.00	0.	717.	0.	769.	1654.
-25.20	0.	723.	0.	777.	1662.
-26.00	0.	751.	0.	817.	1701.
-27.00	0.	785.	0.	866.	1751.
-28.00	0.	819.	0.	916.	1801.
-29.00	0.	852.	0.	966.	1850.
-30.00	0.	885.	0.	1015.	1900.
-31.00	0.	917.	0.	1065.	1949.
-32.00+	0.	1424.	0.	1114.	1999.
-32.00+	0.	1424.	0.	114.	2768.
-33.00	0.	1927.	0.	187.	2841.
-34.00	0.	1964.	0.	260.	2913.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 15:50:34

****
* PRELIMINARY DESIGN DATA FOR *
* FREE EARTH DESIGN IN CLAY *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- UNDRAINED
'LOW WATER

II.--DESIGN PARAMETERS
WALL HEIGHT RATIO (ALPHA) = 0.67
ANCHOR HEIGHT RATIO (BETA) = 0.17
STABILITY NUMBER = 0.24

SHEET PILE DATA:

SHEET PILE NAME	<SECTION PROPERTIES> (PER FOOT OF WALL) SECTION MODULUS (IN^3)	MOMENT OF INERTIA (IN^4)	ALLOWABLE STRESS (PSI)	MODULUS OF ELASTICITY (PSI)
PZ40	60.70	490.80	24000.00	2.90E+07
PZ38	46.80	280.80	24000.00	2.90E+07
PZ35	48.50	361.20	24000.00	2.90E+07
PZ32	38.30	220.40	24000.00	2.90E+07
PZ27	30.20	184.20	24000.00	2.90E+07
PZ22	18.10	84.40	24000.00	2.90E+07
PLZ25	32.80	223.25	24000.00	2.90E+07
PLZ23	30.20	203.75	24000.00	2.90E+07
M116	10.70	42.11	24000.00	2.90E+07

III.--PRELIMINARY DESIGN DATA

S6 571_0 PROPOSED BENCHED10 UND REV NOAD OUT

SHEET PILE NAME	LOG(H^4/EI)	ROWE'S MOMENT REDUCTION COEF.	RATIO OF ALLOWABLE MOMENT TO FREE EARTH MOMENT
PZ40	-4.96	1.0 (***)	46.57
PZ38	-4.72	1.0 (***)	35.91
PZ35	-4.83	1.0 (***)	37.21
PZ32	-4.62	1.0 (***)	29.39
PZ27	-4.54	1.0 (***)	23.17
PZ22	-4.20	1.0 (***)	13.89
PLZ25	-4.62	1.0 (***)	25.17
PLZ23	-4.58	1.0 (***)	23.17
M116	-3.90	1.0 (***)	8.21

*** REDUCTION NOT APPLICABLE DUE TO RIGHTSIDE SURFACE BELOW TOP OF WALL.

*** REDUCTION NOT APPLICABLE DUE TO STABILITY NUMBER LESS THAN 0.5.

S14 570_5 BENCH 10 TO 50 UNDRAINED REV NOAD OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 15:06:10

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 14
'ELEV. 570.50 TO PROPOSED CHANNEL BOTTOM - UNDRAINED
'LOW WATER

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.30

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-11.60
10.00	-11.60
50.00	-29.10

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
112.00	102.00	0.00	250.00	0.00	0.00	-8.00	0.00	DEF	DEF
80.00	50.00	26.60	0.00	14.30	0.00	-16.00	0.00	DEF	DEF
103.00	93.00	0.00	250.00	0.00	0.00	-34.00	0.00	DEF	DEF
128.00	117.00	28.00	0.00	15.10	0.00	-40.10	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	0.00	250.00	0.00	0.00	-34.00	0.00	DEF	DEF
128.00	117.00	28.00	0.00	15.10	0.00	-40.10	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

VI.--WATER DATA
UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -3.10 (FT)
LEFTSIDE ELEVATION = -4.60 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 28-NOVEMBER-2006 TIME: 15:06:34

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 14
'ELEV. 570.50 TO PROPOSED CHANNEL BOTTOM - UNDRAINED
'LOW WATER

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

				<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
	NET	<---LEFTSIDE--->					
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.0	0.0	0.0	0.0	0.0	500.0	0.0	500.0
-1.0	0.0	0.0	0.0	0.0	602.0	0.0	602.0
-2.0	0.0	0.0	0.0	0.0	704.0	0.0	704.0
-3.0	0.0	0.0	0.0	0.0	806.0	0.0	806.0
-3.1	0.0	0.0	0.0	0.0	816.2	0.0	816.2
-4.0	56.2	0.0	0.0	56.2	917.0	0.0	860.8
-4.6	93.6	0.0	0.0	93.6	984.2	0.0	890.6
-5.0	93.6	0.0	0.0	93.6	1004.0	0.0	910.4
-6.0	93.6	0.0	0.0	93.6	1053.6	0.0	960.0
-6.8	93.6	0.0	0.0	93.6	1093.6	0.0	1000.0
-7.0	93.6	0.0	0.0	103.2	1103.2	9.6	1009.6
-8.0+	93.6	0.0	0.0	152.8	1152.8	59.2	1059.2
-8.0-	93.6	0.0	0.0	279.7	2275.0	186.1	2181.4
-9.0	93.6	0.0	0.0	285.6	2343.6	192.0	2250.0
-10.0	93.6	0.0	0.0	291.4	2412.3	197.8	2318.7

S14 570_5 BENCH 10 TO 50 UNDRAINED REV NOAD OUT

-11.0	93.6	0.0	0.0	297.3	2480.9	203.7	2387.3
-11.6+	93.6	0.0	0.0	300.8	2522.1	207.2	2428.5
-11.6-	93.6	500.0	0.0	-199.2	2522.1	207.2	2428.5
-12.0	93.6	516.2	0.0	-213.1	2549.6	209.5	2456.0
-12.6	93.6	540.6	0.0	-234.0	2590.8	213.0	2497.2
-13.0	93.6	556.8	0.0	-247.9	2618.2	215.4	2524.6
-14.0	93.6	597.4	0.0	-282.6	2686.9	221.2	2593.3
-15.0	93.6	638.0	0.0	-317.3	2755.5	227.1	2661.9
-16.0+	93.6	678.6	0.0	-368.5	2058.9	233.0	2730.6
-16.0-	93.6	678.6	0.0	-368.5	2058.9	200.0	1200.0
-17.0	93.6	719.2	0.0	-385.0	1334.2	240.6	1240.6
-18.0	93.6	759.8	0.0	-385.0	1374.8	281.2	1281.2
-19.0	93.6	800.4	0.0	-385.0	1415.4	321.8	1321.8
-20.0	93.6	694.0	0.0	-237.9	1456.0	362.4	1362.4
-21.0	93.6	606.2	0.0	-109.5	1496.6	403.0	1403.0
-22.0	93.6	652.5	0.0	-115.2	1537.2	443.6	1443.6
-23.0	93.6	666.6	0.0	-88.8	1577.8	484.2	1484.2
-24.0	93.6	679.7	0.0	-61.3	1618.4	524.8	1524.8
-25.0	93.6	691.0	0.0	-32.0	1659.0	565.4	1565.4
-26.0	93.6	699.7	0.0	-0.1	1699.6	606.0	1606.0
-27.0	93.6	706.9	0.0	33.3	1740.2	646.6	1646.6
-28.0	93.6	712.7	0.0	68.2	1780.8	687.2	1687.2
-29.0	93.6	715.6	0.0	105.8	1821.4	727.8	1727.8
-30.0	93.6	747.0	0.0	115.0	1862.0	768.4	1768.4
-31.0	93.6	787.6	0.0	115.0	1902.6	809.0	1809.0
-32.0	93.6	828.2	0.0	115.0	1943.2	849.6	1849.6
-33.0	93.6	868.8	0.0	115.0	1983.8	890.2	1890.2
-34.0+	93.6	1637.8	101.4	-854.4	3986.0	930.8	1930.8
-34.0-	93.6	1637.8	101.4	-854.4	3986.0	448.9	6056.9
-35.0	93.6	2574.4	244.4	-2011.4	6183.8	469.5	6334.6
-36.0	93.6	2651.0	291.2	-2067.4	6414.7	490.0	6612.3
-37.0	93.6	2828.5	311.0	-2224.3	6672.6	510.6	6890.0
-38.0	93.6	2963.1	329.3	-2338.3	6931.9	531.2	7167.7
-39.0	93.6	3058.9	347.4	-2413.5	7191.6	551.8	7445.4
-40.0	93.6	3153.5	371.3	-2487.5	7445.3	572.3	7723.1
-40.1+	93.6	2942.2	305.6	-2395.9	5328.9	574.4	7750.8
-40.1-	93.6	2942.2	305.6	-2395.9	5328.9	331.0	3331.0
-40.6+	93.6	1645.1	0.0	-1461.4	3461.9	368.3	3368.3
-40.6-	93.6	2201.5	0.0	-1461.4	3461.9	368.3	3368.3
-41.0	93.6	1645.1	0.0	-1155.2	3489.9	396.3	3396.3
-42.0	93.6	2318.6	0.0	-1756.0	3562.5	468.9	3468.9
-43.0	93.6	2254.6	0.0	-1619.5	3635.1	541.5	3541.5
-44.0	93.6	2299.9	0.0	-1592.1	3707.7	614.1	3614.1
-44.2+	93.6	2353.8	0.0	-1608.5	3724.5	630.9	3630.9
-44.2-	93.6	2312.3	0.0	-1608.5	3724.5	630.9	3630.9
-45.0	93.6	2353.8	45.1	-1573.5	3735.2	686.7	3686.7
-46.0	93.6	2453.8	108.3	-1600.8	3744.6	759.3	3759.3
-47.0	93.6	2508.2	176.1	-1582.7	3749.5	831.9	3831.9

S14 570_5 BENCH 10 TO 50 UNDRAINED REV NOAD OUT

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*   SUMMARY OF RESULTS FOR   *
*   CANTILEVER WALL DESIGN   *
******************************
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 14
'ELEV. 570.50 TO PROPOSED CHANNEL BOTTOM - UNDRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

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WALL BOTTOM ELEV. (FT)      :      -24.85
      PENETRATION (FT)      :       13.25

MAX. BEND. MOMENT (LB-FT)   :  8.3327E+03
      AT ELEVATION (FT)     :      -16.66

MAX. SCALED DEFL. (LB-IN^3):   2.3357E+09
      AT ELEVATION (FT)     :        0.00
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NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 28-NOVEMBER-2006 TIME: 15:06:34

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******************************
*  COMPLETE OF RESULTS FOR   *
*   CANTILEVER WALL DESIGN   *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 14
'ELEV. 570.50 TO PROPOSED CHANNEL BOTTOM - UNDRAINED
'LOW WATER

II.--RESULTS219. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	2.3357E+09	0.00
-1.00	3.4925E-10	0.	2.1919E+09	0.00
-2.00	3.4925E-10	0.	2.0481E+09	0.00
-3.00	3.4925E-10	0.	1.9043E+09	0.00
-3.10	-6.8690E-08	0.	1.8900E+09	0.00
-4.00	7.5816E+00	25.	1.7605E+09	56.16
-4.60	3.5100E+01	70.	1.6743E+09	93.60
-5.00	7.0668E+01	108.	1.6168E+09	93.60

-6.00	2.2511E+02	201.	1.4731E+09	93.60
-6.81	4.1761E+02	277.	1.3577E+09	93.60
-7.00	4.7321E+02	296.	1.3299E+09	103.24
-8.00	8.2887E+02	424.	1.1875E+09	152.84
-8.00	8.2887E+02	424.	1.1875E+09	279.70
-9.00	1.3935E+03	706.	1.0466E+09	285.55
-10.00	2.2437E+03	995.	9.0808E+08	291.41
-11.00	3.3853E+03	1289.	7.7351E+08	297.27
-11.60	4.2126E+03	1469.	6.9545E+08	300.78
-11.60	4.2126E+03	1469.	6.9545E+08	-199.22
-12.00	4.7838E+03	1386.	6.4483E+08	-213.12
-12.60	5.5759E+03	1252.	5.7143E+08	-233.96
-13.00	6.0576E+03	1156.	5.2439E+08	-247.86
-14.00	7.0836E+03	890.	4.1439E+08	-282.60
-15.00	7.8270E+03	591.	3.1658E+08	-317.35
-16.00	8.2503E+03	248.	2.3226E+08	-368.54
-17.00	8.3109E+03	-129.	1.6213E+08	-385.00
-18.00	7.9892E+03	-514.	1.0632E+08	-385.00
-19.00	7.2825E+03	-899.	6.4251E+07	-385.00
-20.00	6.2153E+03	-1211.	3.4715E+07	-237.92
-21.00	4.9071E+03	-1384.	1.5885E+07	-109.53
-22.00	3.4670E+03	-1497.	5.5164E+06	-115.23
-22.82	2.2056E+03	-1582.	1.5944E+06	-93.59
-23.00	1.9178E+03	-1585.	1.1228E+06	62.56
-24.00	5.0747E+02	-1092.	5.6507E+04	923.12
-24.85	0.0000E+00	0.	0.0000E+00	1652.87

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION	PRESSURE	PASSIVE	ACTIVE	ACTIVE	PASSIVE
(FT)	(PSF)	(PSF)	(PSF)	(PSF)	(PSF)
0.00	0.	0.	0.	0.	500.
-1.00	0.	0.	0.	0.	602.
-2.00	0.	0.	0.	0.	704.
-3.00	0.	0.	0.	0.	806.
-3.10	0.	0.	0.	0.	816.
-4.00	56.	0.	0.	0.	861.
-4.60	94.	0.	0.	0.	891.
-5.00	94.	0.	0.	0.	910.
-6.00	94.	0.	0.	0.	960.
-6.81	94.	0.	0.	0.	1000.
-7.00	94.	0.	0.	10.	1010.
-8.00+	94.	0.	0.	59.	1059.
-8.00+	94.	0.	0.	186.	2181.
-9.00	94.	0.	0.	192.	2250.
-10.00	94.	0.	0.	198.	2319.
-11.00	94.	0.	0.	204.	2387.
-11.60+	94.	0.	0.	207.	2429.
-11.60+	94.	500.	0.	207.	2429.
-12.00	94.	516.	0.	210.	2456.
-12.60	94.	541.	0.	213.	2497.
-13.00	94.	557.	0.	215.	2525.
-14.00	94.	597.	0.	221.	2593.
-15.00	94.	638.	0.	227.	2662.
-16.00+	94.	679.	0.	233.	2731.
-16.00+	94.	679.	0.	200.	1200.

S14 570_5 BENCH 10 TO 50 UNDRAINED REV NOAD OUT

-17.00	94.	719.	0.	241.	1241.
-18.00	94.	760.	0.	281.	1281.
-19.00	94.	800.	0.	322.	1322.
-20.00	94.	694.	0.	362.	1362.
-21.00	94.	606.	0.	403.	1403.
-22.00	94.	652.	0.	444.	1444.
-22.82	94.	664.	0.	477.	1477.
-23.00	94.	667.	0.	484.	1484.
-24.00	94.	680.	0.	525.	1525.
-24.85	94.	691.	0.	565.	1565.
-26.00	94.	700.	0.	606.	1606.

CWALSHT

DESIGN MODE

FOR SSP LENGTH

DRAINED CONDITION

S1 574_95 TO PROP BENCHED DND REV NOAD OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:19:15

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****************
*  INPUT DATA  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - DRAINED REV
'LOW WATER

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 2.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.20 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-9.65
10.00	-9.65
75.00	-27.40

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-3.20	0.00	DEF	DEF
112.00	102.00	30.00	0.00	16.20	0.00	-7.00	0.00	DEF	DEF
103.00	93.00	30.00	0.00	16.20	0.00	-19.80	0.00	DEF	DEF
135.00	129.00	33.00	0.00	17.80	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	30.00	0.00	16.20	0.00	-19.80	0.00	DEF	DEF
135.00	129.00	33.00	0.00	17.80	0.00			DEF	DEF

VI.--WATER DATA

S1 574_95 TO PROP BENCHED DND REV NOAD OUT

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -6.90 (FT)
LEFTSIDE ELEVATION = -6.90 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:19:36

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - DRAINED REV
'LOW WATER

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

				<------NET------> (SOIL + WATER)			
	NET	<---LEFTSIDE--->				<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-0.8	0.0	0.0	0.0	28.1	205.1	28.1	205.1
-1.8	0.0	0.0	0.0	63.3	461.5	63.3	461.5
-2.8	0.0	0.0	0.0	98.5	717.9	98.5	717.9
-3.2	0.0	0.0	0.0	112.5	820.4	112.5	820.4
-3.8	0.0	0.0	0.0	130.2	949.0	130.2	949.0
-4.8	0.0	0.0	0.0	159.6	1163.4	159.6	1163.4
-5.8	0.0	0.0	0.0	189.0	1377.8	189.0	1377.8
-6.8	0.0	0.0	0.0	218.4	1592.1	218.4	1592.1
-6.9	0.0	0.0	0.0	221.3	1613.5	221.3	1613.5
-7.0	0.0	0.0	0.0	222.8	1624.0	222.8	1624.0
-7.8	0.0	0.0	0.0	232.1	1692.2	232.1	1692.2
-8.8	0.0	0.0	0.0	243.8	1777.5	243.8	1777.5
-9.7	0.0	0.0	0.0	253.8	1850.1	253.8	1850.1
-9.8	0.0	12.9	1.8	242.6	1861.1	255.5	1862.9
-10.7	0.0	86.1	11.7	179.4	1923.7	265.5	1935.4

S1 574_95 TO PROP BENCHED DND REV NOAD OUT

-10.8	0.0	99.0	13.5	168.3	1934.7	267.2	1948.2
-11.8	0.0	185.0	25.2	93.9	2008.4	278.9	2033.5
-12.8	0.0	271.1	36.9	19.6	2082.0	290.6	2118.8
-13.1	0.0	293.7	39.9	0.0	2101.4	293.7	2141.3
-13.8	0.0	357.1	48.6	-54.8	2155.6	302.3	2204.2
-14.8	0.0	422.8	60.3	-108.8	2229.2	314.0	2289.5
-15.8	0.0	438.6	72.0	-112.8	2302.8	325.7	2374.8
-16.8	0.0	449.2	83.7	-111.7	2376.5	337.4	2460.1
-17.8	0.0	487.2	95.4	-138.1	2450.1	349.1	2545.4
-18.8	0.0	535.1	107.1	-174.2	2523.7	360.9	2630.8
-19.8+	0.0	746.0	118.5	-395.9	2741.9	372.6	2716.1
-19.8-	0.0	746.0	118.5	-395.9	2741.9	327.6	3004.7
-20.8	0.0	954.6	128.2	-608.6	3045.3	346.0	3173.5
-21.8	0.0	1045.4	141.7	-680.9	3200.6	364.4	3342.3
-22.8	0.0	1173.5	160.1	-790.7	3351.0	382.8	3511.1
-23.8	0.0	1305.3	178.5	-904.1	3501.3	401.2	3679.9
-24.8	0.0	1437.5	196.7	-1017.9	3652.0	419.6	3848.6
-25.8	0.0	1567.4	215.1	-1129.4	3802.3	438.0	4017.4
-26.8	0.0	1702.9	233.1	-1246.5	3953.1	456.4	4186.2
-27.8	0.0	1839.1	250.1	-1364.2	4104.9	474.8	4355.0
-28.8	0.0	1968.2	266.9	-1475.0	4256.9	493.2	4523.8
-29.8	0.0	2096.9	283.6	-1585.3	4409.0	511.6	4692.6
-30.8	0.0	2231.6	300.4	-1701.6	4561.0	530.0	4861.3
-31.8	0.0	2366.4	317.1	-1817.9	4713.0	548.4	5030.1
-32.8	0.0	2501.1	333.9	-1934.3	4865.0	566.8	5198.9
-33.8	0.0	2632.9	350.6	-2047.7	5017.1	585.2	5367.7
-34.8	0.0	2735.8	367.4	-2132.2	5169.1	603.6	5536.5
-35.8	0.0	2795.5	384.1	-2173.5	5321.1	622.0	5705.3
-36.8	0.0	2845.2	401.0	-2204.7	5473.1	640.4	5874.0
-37.8	0.0	2911.0	417.9	-2252.2	5624.9	658.8	6042.8
-38.8	0.0	2993.8	434.9	-2316.5	5776.7	677.3	6211.6
-39.8	0.0	3105.7	451.9	-2410.0	5928.5	695.7	6380.4

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:19:37

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****************************
*  SUMMARY OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - DRAINED REV
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

S1 574_95 TO PROP BENCHED DND REV NOAD OUT

```
WALL BOTTOM ELEV. (FT)      :      -29.68
     PENETRATION (FT)       :       20.03

MAX. BEND. MOMENT (LB-FT)   :  2.2406E+04
     AT ELEVATION (FT)      :      -21.57

MAX. SCALED DEFL. (LB-IN^3):  1.0080E+10
     AT ELEVATION (FT)      :        0.20
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NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:19:37

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****************************
* COMPLETE OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - DRAINED REV
'LOW WATER

II.--RESULTS0. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.20	0.0000E+00	0.	1.0080E+10	0.00
0.00	-1.1602E-08	0.	9.9759E+09	0.00
-0.80	3.0009E+00	11.	9.5609E+09	28.13
-1.80	3.4183E+01	57.	9.0421E+09	63.30
-2.80	1.2867E+02	138.	8.5234E+09	98.47
-3.20	1.9206E+02	180.	8.3160E+09	112.54
-3.80	3.2141E+02	253.	8.0050E+09	130.18
-4.80	6.4427E+02	398.	7.4871E+09	159.58
-5.80	1.1267E+03	572.	6.9704E+09	188.98
-6.80	1.7981E+03	776.	6.4557E+09	218.38
-6.90	1.8768E+03	798.	6.4043E+09	221.32
-7.00	1.9577E+03	820.	6.3530E+09	222.75
-7.80	2.6859E+03	1002.	5.9440E+09	232.12
-8.80	3.8057E+03	1240.	5.4371E+09	243.82
-9.65	4.9488E+03	1451.	5.0113E+09	253.77
-9.80	5.1693E+03	1489.	4.9368E+09	242.61
-10.65	6.5146E+03	1668.	4.5184E+09	179.42
-10.80	6.7668E+03	1694.	4.4454E+09	168.27
-11.80	8.5325E+03	1825.	3.9658E+09	93.92
-12.80	1.0392E+04	1882.	3.5009E+09	19.57
-13.06	1.0888E+04	1884.	3.3813E+09	0.00
-13.80	1.2271E+04	1864.	3.0539E+09	-54.78
-14.80	1.4099E+04	1782.	2.6282E+09	-108.79
-15.80	1.5826E+04	1672.	2.2268E+09	-112.85

-16.80	1.7442E+04	1559.	1.8528E+09	-111.74
-17.80	1.8941E+04	1434.	1.5089E+09	-138.06
-18.80	2.0300E+04	1278.	1.1976E+09	-174.23
-19.80	2.1454E+04	993.	9.2148E+08	-395.88
-20.80	2.2214E+04	491.	6.8232E+08	-608.57
-21.80	2.2389E+04	-154.	4.8147E+08	-680.94
-22.80	2.1876E+04	-890.	3.1921E+08	-790.65
-23.80	2.0572E+04	-1737.	1.9464E+08	-904.13
-24.80	1.8364E+04	-2698.	1.0549E+08	-1017.93
-25.80	1.5139E+04	-3772.	4.7920E+07	-1129.42
-26.65	1.1500E+04	-4777.	1.9636E+07	-1229.26
-26.80	1.0784E+04	-4938.	1.6350E+07	-955.53
-27.80	5.6778E+03	-4964.	3.2906E+06	903.39
-28.80	1.4750E+03	-3131.	1.7204E+05	2762.30
-29.68	0.0000E+00	0.	0.0000E+00	4390.04

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.20	0.	0.	0.	0.	0.
0.00	0.	0.	0.	0.	0.
-0.80	0.	0.	0.	28.	205.
-1.80	0.	0.	0.	63.	461.
-2.80	0.	0.	0.	98.	718.
-3.20	0.	0.	0.	113.	820.
-3.80	0.	0.	0.	130.	949.
-4.80	0.	0.	0.	160.	1163.
-5.80	0.	0.	0.	189.	1378.
-6.80	0.	0.	0.	218.	1592.
-6.90	0.	0.	0.	221.	1614.
-7.00	0.	0.	0.	223.	1624.
-7.80	0.	0.	0.	232.	1692.
-8.80	0.	0.	0.	244.	1778.
-9.65	0.	0.	0.	254.	1850.
-9.80	0.	13.	2.	256.	1863.
-10.65	0.	86.	12.	265.	1935.
-10.80	0.	99.	13.	267.	1948.
-11.80	0.	185.	25.	279.	2034.
-12.80	0.	271.	37.	291.	2119.
-13.06	0.	294.	40.	294.	2141.
-13.80	0.	357.	49.	302.	2204.
-14.80	0.	423.	60.	314.	2289.
-15.80	0.	439.	72.	326.	2375.
-16.80	0.	449.	84.	337.	2460.
-17.80	0.	487.	95.	349.	2545.
-18.80	0.	535.	107.	361.	2631.
-19.80+	0.	746.	118.	373.	2716.
-19.80+	0.	746.	118.	328.	3005.
-20.80	0.	955.	128.	346.	3174.
-21.80	0.	1045.	142.	364.	3342.
-22.80	0.	1173.	160.	383.	3511.
-23.80	0.	1305.	179.	401.	3680.
-24.80	0.	1438.	197.	420.	3849.
-25.80	0.	1567.	215.	438.	4017.
-26.65	0.	1683.	230.	454.	4161.

S1 574_95 TO PROP BENCHED DND REV NOAD OUT

-26.80	0.	1703.	233.	456.	4186.
-27.80	0.	1839.	250.	475.	4355.
-28.80	0.	1968.	267.	493.	4524.
-29.68	0.	2097.	284.	512.	4693.
-30.80	0.	2232.	300.	530.	4861.

S2 573_63 TO PROP BENCHED10 DND REV NOAD OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:01:42

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - DRAINED
'LOW WATER

II.--CONTROL
ANCHORED WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 2.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.
ELEVATION AT ANCHOR = -4.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-8.87
10.00	-8.87
48.00	-25.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-6.60	0.00	DEF	DEF
103.00	93.00	30.00	0.00	16.20	0.00	-39.90	0.00	DEF	DEF
128.00	117.00	28.00	0.00	15.10	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	30.00	0.00	16.20	0.00	-39.90	0.00	DEF	DEF
128.00	117.00	28.00	0.00	15.10	0.00			DEF	DEF

VI.--WATER DATA

S2 573_63 TO PROP BENCHED10 DND REV NOAD OUT

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -4.70 (FT)
LEFTSIDE ELEVATION = -5.00 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:01:58

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*    SOIL PRESSURES FOR  *
*  ANCHORED WALL DESIGN  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - DRAINED
'LOW WATER

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

		<---LEFTSIDE--->		<------NET------> (SOIL + WATER)	<--RIGHTSIDE--->	
ELEV. (FT)	NET WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.0	0.0	0.0	0.0	0.0	0.0	0.0
-1.0	0.0	0.0	0.0	35.2	35.2	256.4
-2.0	0.0	0.0	0.0	70.3	70.3	512.8
-3.0	0.0	0.0	0.0	105.5	105.5	769.2
-4.0	0.0	0.0	0.0	140.7	140.7	1025.5
-4.7	0.0	0.0	0.0	165.3	165.3	1205.0
-5.0	18.7	0.0	0.0	189.9	171.1	1247.6
-6.0	18.7	0.0	0.0	209.3	190.6	1389.7
-6.6	18.7	0.0	0.0	221.0	202.3	1474.9
-7.0	18.7	0.0	0.0	225.7	207.0	1509.1
-8.0	18.7	0.0	0.0	237.4	218.7	1594.4
-8.9	18.7	0.0	0.0	247.6	228.9	1668.6
-9.0	18.7	11.2	1.5	237.9	230.4	1679.7
-9.9	18.7	86.1	11.7	173.2	240.6	1753.9
-10.0	18.7	97.2	13.2	163.6	242.1	1765.0
-11.0	18.7	183.3	24.9	89.2	253.8	1850.3
-12.0	18.7	269.3	36.6	14.9	265.5	1935.7

S2 573_63 TO PROP BENCHED10 DND REV NOAD OUT

-12.2	18.7	286.6	39.0	0.0	267.9	1952.8
-13.0	18.7	355.4	48.3	-59.5	277.2	2021.0
-14.0	18.7	208.3*	60.0	99.4	288.9	2106.3
-15.0	18.7	248.9*	71.7	70.5	300.6	2191.6
-16.0	18.7	306.1*	83.4	24.9	312.3	2277.0
-17.0	18.7	351.3*	95.1	-8.6	324.0	2362.3
-18.0	18.7	397.8*	106.8	-43.3	335.7	2447.6
-19.0	18.7	445.5*	118.5	-79.4	347.4	2532.9
-20.0	18.7	494.7*	130.2	-116.8	359.1	2618.2
-21.0	18.7	545.3*	141.9	-155.7	370.8	2703.6
-22.0	18.7	597.3*	153.6	-196.0	382.5	2788.9
-23.0	18.7	650.8*	165.3	-237.9	394.2	2874.2
-24.0	18.7	706.0*	176.7	-281.3	405.9	2959.5
-25.0	18.7	717.9*	186.8	-281.5	417.6	3044.8
-26.0	18.7	695.5*	196.0	-247.4	429.4	3130.2
-27.0	18.7	736.1*	205.3	-276.3	441.1	3215.5
-28.0	18.7	853.9	215.7	-382.4	452.8	3300.8
-29.0	18.7	979.7	226.0	-496.5	464.5	3386.1
-30.0	18.7	1001.9	235.2	-507.0	476.2	3471.5
-31.0	18.7	1043.5	244.4	-536.9	487.9	3556.8
-32.0	18.7	1129.5	253.7	-611.2	499.6	3642.1
-33.0	18.7	1161.8	262.9	-631.8	511.3	3727.4
-34.0	18.7	1262.0	272.1	-720.3	523.0	3812.7
-35.0	18.7	1304.8	281.3	-751.4	534.7	3898.1
-36.0	18.7	1353.0	290.5	-787.9	546.4	3983.4
-37.0	18.7	1450.5	299.8	-873.7	558.1	4068.7
-38.0	18.7	1492.4	309.0	-903.9	569.8	4154.0
-39.0	18.7	1559.0	318.2	-958.7	581.5	4239.4

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE FOR THIS ELEVATION.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:02:04

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****************************
*  SUMMARY OF RESULTS FOR  *
*   ANCHORED WALL DESIGN   *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - DRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

*****WARNING: STANDARD WEDGE SOLUTION DOES NOT EXIST

S2 573_63 TO PROP BENCHED10 DND REV NOAD OUT
AT ALL ELEVATIONS. SEE COMPLETE OUTPUT.

METHOD		FREE EARTH	FIXED EARTH
WALL BOTTOM ELEVATION (FT)	:	-21.45	-25.35
PENETRATION (FT)	:	12.58	16.48
MAXIMUM BENDING MOMENT (LB-FT)	:	-3.1031E+03	-2.6726E+03
AT ELEVATION (FT)	:	-9.56	-9.18
MAXIMUM SCALED DEFLECTION (LB-IN^3)	:	1.4472E+08	1.0595E+08
AT ELEVATION (FT)	:	-12.00	-11.00
ANCHOR FORCE (LB)	:	1.4557E+03	1.3754E+03

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF
ELASTICITY IN PSI TIMES PILE MOMENT
OF INERTIA IN IN^4 TO OBTAIN DEFLECTION
IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:02:05

****
* COMPLETE OF RESULTS FOR *
* ANCHORED WALL DESIGN *
* BY FREE EARTH METHOD *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - DRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 1456. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-1.1848E+08	0.00
-1.00	5.8612E+00	18.	-8.8987E+07	35.17
-2.00	4.6890E+01	70.	-5.9482E+07	70.33
-3.00	1.5825E+02	158.	-2.9885E+07	105.50
-4.00	3.7512E+02	281.	0.0000E+00	140.67
-4.00	3.7512E+02	-1174.	0.0000E+00	140.67
-4.70	-4.1044E+02	-1067.	2.1142E+07	165.29
-5.00	-7.2281E+02	-1014.	3.0134E+07	189.85
-6.00	-1.6386E+03	-814.	5.9046E+07	209.34
-6.60	-2.0889E+03	-685.	7.5135E+07	221.03
-7.00	-2.3452E+03	-596.	8.5157E+07	225.71
-8.00	-2.8263E+03	-364.	1.0725E+08	237.41
-8.87	-3.0521E+03	-153.	1.2254E+08	247.60
-9.00	-3.0700E+03	-122.	1.2449E+08	237.93
-9.87	-3.0941E+03	57.	1.3521E+08	173.25
-10.00	-3.0853E+03	79.	1.3646E+08	163.58
-11.00	-2.9369E+03	205.	1.4312E+08	89.24
-12.00	-2.6994E+03	257.	1.4472E+08	14.89

-12.20	-2.6476E+03	259.	1.4447E+08	0.00
-13.00	-2.4469E+03	235.	1.4166E+08	-59.46
-14.00	-2.2151E+03	255.	1.3436E+08	99.36
-15.00	-1.9151E+03	340.	1.2325E+08	70.46
-16.00	-1.5475E+03	388.	1.0884E+08	24.89
-17.00	-1.1530E+03	396.	9.1755E+07	-8.56
-18.00	-7.6726E+02	370.	7.2680E+07	-43.31
-19.00	-4.2505E+02	309.	5.2272E+07	-79.40
-20.00	-1.6247E+02	210.	3.1118E+07	-116.85
-21.00	-1.6974E+01	74.	9.6672E+06	-155.72
-21.45	0.0000E+00	0.	0.0000E+00	-173.85

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES------------->			
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	256.
-2.00	0.	0.	0.	70.	513.
-3.00	0.	0.	0.	106.	769.
-4.00	0.	0.	0.	141.	1026.
-4.70	0.	0.	0.	165.	1205.
-5.00	19.	0.	0.	171.	1248.
-6.00	19.	0.	0.	191.	1390.
-6.60	19.	0.	0.	202.	1475.
-7.00	19.	0.	0.	207.	1509.
-8.00	19.	0.	0.	219.	1594.
-8.87	19.	0.	0.	229.	1669.
-9.00	19.	11.	2.	230.	1680.
-9.87	19.	86.	12.	241.	1754.
-10.00	19.	97.	13.	242.	1765.
-11.00	19.	183.	25.	254.	1850.
-12.00	19.	269.	37.	266.	1936.
-12.20	19.	287.	39.	268.	1953.
-13.00	19.	355.	48.	277.	2021.
-14.00	19.*	208.	60.	289.	2106.
-15.00	19.*	249.	72.	301.	2192.
-16.00	19.*	306.	83.	312.	2277.
-17.00	19.*	351.	95.	324.	2362.
-18.00	19.*	398.	107.	336.	2448.
-19.00	19.*	446.	119.	347.	2533.
-20.00	19.*	495.	130.	359.	2618.
-21.00	19.*	545.	142.	371.	2704.
-22.00	19.*	597.	154.	383.	2789.

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE AT THIS ELEVATION.

****
* COMPLETE OF RESULTS FOR *
* ANCHORED WALL DESIGN *
* BY FIXED EARTH METHOD *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - DRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 1375. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-9.2707E+07	0.00
-1.00	5.8612E+00	18.	-6.9659E+07	35.17
-2.00	4.6890E+01	70.	-4.6597E+07	70.33
-3.00	1.5825E+02	158.	-2.3443E+07	105.50
-4.00	3.7512E+02	281.	0.0000E+00	140.67
-4.00	3.7512E+02	-1094.	0.0000E+00	140.67
-4.70	-3.5429E+02	-987.	1.6640E+07	165.29
-5.00	-6.4259E+02	-934.	2.3715E+07	189.85
-6.00	-1.4782E+03	-734.	4.6346E+07	209.34
-6.60	-1.8803E+03	-605.	5.8791E+07	221.03
-7.00	-2.1045E+03	-516.	6.6453E+07	225.71
-8.00	-2.5054E+03	-284.	8.2956E+07	237.41
-8.87	-2.6615E+03	-73.	9.3834E+07	247.60
-9.00	-2.6689E+03	-42.	9.5164E+07	237.93
-9.87	-2.6232E+03	137.	1.0206E+08	173.25
-10.00	-2.6039E+03	159.	1.0279E+08	163.58
-11.00	-2.3754E+03	286.	1.0595E+08	89.24
-12.00	-2.0576E+03	338.	1.0501E+08	14.89
-12.20	-1.9898E+03	339.	1.0437E+08	0.00
-13.00	-1.7249E+03	315.	1.0052E+08	-59.46
-14.00	-1.4128E+03	335.	9.3039E+07	99.36
-15.00	-1.0327E+03	420.	8.3132E+07	70.46
-16.00	-5.8484E+02	468.	7.1450E+07	24.89
-17.00	-1.1010E+02	476.	5.8761E+07	-8.56
-18.00	3.5586E+02	450.	4.5881E+07	-43.31
-19.00	7.7829E+02	389.	3.3610E+07	-79.40
-20.00	1.1211E+03	291.	2.2672E+07	-116.85
-21.00	1.3468E+03	154.	1.3654E+07	-155.72
-22.00	1.4166E+03	-22.	6.9410E+06	-196.04
-23.00	1.2900E+03	-239.	2.6477E+06	-237.89
-24.00	9.2536E+02	-498.	5.4940E+05	-281.30
-25.00	2.8657E+02	-780.	1.0181E+04	-281.52
-26.00	0.0000E+00	-875.	0.0000E+00	-269.69

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL	PRESSURES------------->		
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.

S2 573_63 TO PROP BENCHED10 DND REV NOAD OUT

-1.00	0.	0.	0.	35.	256.
-2.00	0.	0.	0.	70.	513.
-3.00	0.	0.	0.	106.	769.
-4.00	0.	0.	0.	141.	1026.
-4.70	0.	0.	0.	165.	1205.
-5.00	19.	0.	0.	171.	1248.
-6.00	19.	0.	0.	191.	1390.
-6.60	19.	0.	0.	202.	1475.
-7.00	19.	0.	0.	207.	1509.
-8.00	19.	0.	0.	219.	1594.
-8.87	19.	0.	0.	229.	1669.
-9.00	19.	11.	2.	230.	1680.
-9.87	19.	86.	12.	241.	1754.
-10.00	19.	97.	13.	242.	1765.
-11.00	19.	183.	25.	254.	1850.
-12.00	19.	269.	37.	266.	1936.
-12.20	19.	287.	39.	268.	1953.
-13.00	19.	355.	48.	277.	2021.
-14.00	19.*	208.	60.	289.	2106.
-15.00	19.*	249.	72.	301.	2192.
-16.00	19.*	306.	83.	312.	2277.
-17.00	19.*	351.	95.	324.	2362.
-18.00	19.*	398.	107.	336.	2448.
-19.00	19.*	446.	119.	347.	2533.
-20.00	19.*	495.	130.	359.	2618.
-21.00	19.*	545.	142.	371.	2704.
-22.00	19.*	597.	154.	383.	2789.
-23.00	19.*	651.	165.	394.	2874.
-24.00	19.*	706.	177.	406.	2960.
-25.00	19.*	718.	187.	418.	3045.
-26.00	19.*	695.	196.	429.	3130.

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE AT THIS ELEVATION.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:02:18

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* PRELIMINARY DESIGN DATA FOR  *
*   FREE EARTH DESIGN IN SAND  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - DRAINED
'LOW WATER

II.--DESIGN PARAMETERS

WALL HEIGHT RATIO (ALPHA) = 0.41
ANCHOR HEIGHT RATIO (BETA) = 0.19

S2 573_63 TO PROP BENCHED10 DND REV NOAD OUT

SHEET PILE DATA:

SHEET PILE NAME	<SECTION PROPERTIES> (PER FOOT OF WALL) SECTION MODULUS (IN^3)	MOMENT OF INERTIA (IN^4)	ALLOWABLE STRESS (PSI)	MODULUS OF ELASTICITY (PSI)
PZ40	60.70	490.80	2.40E+04	2.90E+07
PZ38	46.80	280.80	2.40E+04	2.90E+07
PZ35	48.50	361.20	2.40E+04	2.90E+07
PZ32	38.30	220.40	2.40E+04	2.90E+07
PZ27	30.20	184.20	2.40E+04	2.90E+07
PZ22	18.10	84.40	2.40E+04	2.90E+07
PLZ25	32.80	223.25	2.40E+04	2.90E+07
PLZ23	30.20	203.75	2.40E+04	2.90E+07
M116	10.70	42.11	2.40E+04	2.90E+07

III.--PRELIMINARY DESIGN DATA

SHEET PILE NAME	LOG(H^4/EI)	ROWE'S MOMENT REDUCTION COEF.	RATIO OF ALLOWABLE MOMENT TO FREE EARTH MOMENT
PZ40	-4.83	1.0 (***)	39.12
PZ38	-4.59	1.0 (***)	30.16
PZ35	-4.69	1.0 (***)	31.26
PZ32	-4.48	1.0 (***)	24.68
PZ27	-4.40	1.0 (***)	19.46
PZ22	-4.06	1.0 (***)	11.67
PLZ25	-4.49	1.0 (***)	21.14
PLZ23	-4.45	1.0 (***)	19.46
M116	-3.76	1.0 (***)	6.90

*** REDUCTION NOT APPLICABLE DUE TO ALPHA LESS THAN 0.6.

S3 568_85 TO PROP BENCHED10 DND REV NOAD OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:24:06

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH DRAINED
'LOW WATER

II.--CONTROL
ANCHORED WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 2.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.
ELEVATION AT ANCHOR = -4.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-16.05
10.00	-16.05
52.00	-27.90

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-3.70	0.00	DEF	DEF
112.00	102.00	30.00	0.00	16.20	0.00	-7.50	0.00	DEF	DEF
103.00	93.00	30.00	0.00	16.20	0.00	-20.30	0.00	DEF	DEF
135.00	129.00	33.00	0.00	17.80	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	30.00	0.00	16.20	0.00	-20.30	0.00	DEF	DEF
135.00	129.00	33.00	0.00	17.80	0.00			DEF	DEF

S3 568_85 TO PROP BENCHED10 DND REV NOAD OUT

VI.--WATER DATA
UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -7.40 (FT)
LEFTSIDE ELEVATION = -7.40 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:24:09

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* SOIL PRESSURES FOR *
* ANCHORED WALL DESIGN *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH DRAINED
'LOW WATER

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

		<---LEFTSIDE--->		<------NET------> (SOIL + WATER)	<--RIGHTSIDE--->	
ELEV. (FT)	NET WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.0	0.0	0.0	0.0	0.0	0.0	0.0
-1.0	0.0	0.0	0.0	35.2	35.2	256.4
-2.0	0.0	0.0	0.0	70.3	70.3	512.8
-3.0	0.0	0.0	0.0	105.5	105.5	769.2
-3.7	0.0	0.0	0.0	130.1	130.1	948.6
-4.0	0.0	0.0	0.0	138.9	138.9	1012.9
-5.0	0.0	0.0	0.0	168.3	168.3	1227.3
-6.0	0.0	0.0	0.0	197.7	197.7	1441.6
-7.0	0.0	0.0	0.0	227.1	227.1	1656.0
-7.4	0.0	0.0	0.0	238.9	238.9	1741.7
-7.5	0.0	0.0	0.0	240.3	240.3	1752.2
-8.0	0.0	0.0	0.0	246.2	246.2	1794.8
-9.0	0.0	0.0	0.0	257.9	257.9	1880.1
-10.0	0.0	0.0	0.0	269.6	269.6	1965.5
-11.0	0.0	0.0	0.0	281.3	281.3	2050.8
-12.0	0.0	0.0	0.0	293.0	293.0	2136.1

S3 568_85 TO PROP BENCHED10 DND REV NOAD OUT

-13.0	0.0	0.0	0.0	304.7	304.7	2221.4
-14.0	0.0	0.0	0.0	316.4	316.4	2306.8
-15.0	0.0	0.0	0.0	328.1	328.1	2392.1
-16.0	0.0	0.0	0.0	339.8	339.8	2477.4
-16.1	0.0	0.0	0.0	340.4	340.4	2481.7
-17.0	0.0	81.7	11.1	269.8	351.5	2562.7
-17.1	0.0	86.1	11.7	266.1	352.1	2567.0
-18.0	0.0	167.8	22.8	195.4	363.2	2648.0
-19.0	0.0	253.8	34.5	121.1	374.9	2733.4
-20.0	0.0	339.9	46.2	46.7	386.6	2818.7
-20.2	0.0	372.9	48.4	0.0	389.0	2836.2
-20.3+	0.0	388.2	49.4	-21.6	390.1	2844.3
-20.3-	0.0	388.2	49.4	-21.6	343.1	3146.5
-21.0	0.0	517.8	58.3	-161.8	355.9	3264.7
-22.0	0.0	641.2	75.2	-266.8	374.4	3433.5
-23.0	0.0	765.7	93.7	-372.9	392.8	3602.3
-24.0	0.0	900.8	112.2	-489.7	411.2	3771.0
-25.0	0.0	1034.2	130.6	-604.7	429.6	3939.8
-26.0	0.0	1166.9	149.0	-718.9	448.0	4108.6
-27.0	0.0	1299.5	167.4	-833.1	466.4	4277.4
-28.0	0.0	1430.8	185.8	-946.0	484.8	4446.2
-29.0	0.0	1518.3	204.2	-1015.1	503.2	4615.0
-30.0	0.0	1563.5	222.6	-1041.9	521.6	4783.7
-31.0	0.0	1619.9	241.0	-1079.9	540.0	4952.5
-32.0	0.0	1696.3	259.4	-1137.9	558.4	5121.3
-33.0	0.0	1784.1	277.1	-1207.3	576.8	5290.1
-34.0	0.0	1901.0	294.0	-1305.8	595.2	5458.9
-35.0	0.0	2016.7	310.7	-1403.1	613.6	5627.7
-36.0	0.0	2123.3	327.4	-1491.3	632.0	5796.4
-37.0	0.0	2269.3	344.2	-1618.9	650.4	5965.2
-38.0	0.0	2379.1	361.1	-1710.3	668.8	6134.0
-39.0	0.0	2519.1	378.0	-1831.9	687.2	6302.8
-40.0	0.0	2652.8	394.9	-1947.2	705.6	6471.6
-41.0	0.0	2756.6	411.9	-2032.6	724.0	6640.4
-42.0	0.0	2944.6	428.8	-2202.2	742.4	6809.1
-43.0	0.0	3057.1	445.7	-2296.3	760.8	6977.9
-44.0	0.0	3160.8	462.7	-2381.6	779.2	7146.7
-45.0	0.0	3354.5	479.6	-2556.9	797.6	7315.5
-46.0	0.0	3493.3	496.6	-2677.3	816.0	7484.3
-47.0	0.0	3600.4	513.5	-2765.9	834.4	7653.1
-48.0	0.0	3760.4	530.4	-2907.6	852.8	7821.8
-49.0	0.0	3947.6	547.4	-3076.3	871.2	7990.6
-50.0	0.0	4082.8	564.3	-3193.2	889.6	8159.4
-51.0	0.0	4192.3	581.3	-3284.3	908.0	8328.2
-52.0	0.0	4350.4	598.2	-3424.0	926.4	8497.0
-53.0	0.0	4531.0	615.1	-3586.2	944.8	8665.8
-54.0	0.0	4711.6	632.1	-3748.4	963.2	8834.6
-55.0	0.0	4849.9	649.0	-3868.3	981.6	9003.3
-56.0	0.0	4963.1	665.9	-3963.1	1000.0	9172.1
-57.0	0.0	5116.3	682.9	-4097.9	1018.4	9340.9
-58.0	0.0	5292.2	699.8	-4255.4	1036.8	9509.7
-59.0	0.0	5468.1	716.8	-4412.9	1055.2	9678.5
-60.0	0.0	5644.0	733.7	-4570.4	1073.6	9847.3
-61.0	0.0	5819.9	750.6	-4727.9	1092.0	10016.0
-62.0	0.0	5953.7	767.3	-4843.3	1110.4	10184.8
-63.0	0.0	6071.8	783.3	-4942.9	1128.9	10353.6
-64.0	0.0	6230.3	799.0	-5083.0	1147.3	10522.4
-65.0	0.0	6402.9	814.8	-5237.3	1165.7	10691.2

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 29-NOVEMBER-2006 TIME: 9:24:13

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*  SUMMARY OF RESULTS FOR  *
*   ANCHORED WALL DESIGN   *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH DRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

METHOD	:	FREE EARTH	FIXED EARTH
WALL BOTTOM ELEVATION (FT)	:	-25.06	-29.46
PENETRATION (FT)	:	9.01	13.41
MAXIMUM BENDING MOMENT (LB-FT)	:	-1.1691E+04	-9.0473E+03
AT ELEVATION (FT)	:	-13.45	-12.48
MAXIMUM SCALED DEFLECTION (LB-IN^3)	:	8.5826E+08	5.9449E+08
AT ELEVATION (FT)	:	-14.00	-13.00
ANCHOR FORCE (LB)	:	2.5833E+03	2.2885E+03

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 29-NOVEMBER-2006 TIME: 9:24:14

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* COMPLETE OF RESULTS FOR  *
*   ANCHORED WALL DESIGN   *
*   BY FREE EARTH METHOD   *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH DRAINED

S3 568_85 TO PROP BENCHED10 DND REV NOAD OUT

'LOW WATER

II.--RESULTS (ANCHOR FORCE= 2583. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-5.3780E+08	0.00
-1.00	5.8612E+00	18.	-4.0348E+08	35.17
-2.00	4.6890E+01	70.	-2.6914E+08	70.33
-3.00	1.5825E+02	158.	-1.3472E+08	105.50
-3.70	2.9689E+02	241.	-4.0463E+07	130.12
-4.00	3.7509E+02	281.	0.0000E+00	138.94
-4.00	3.7509E+02	-2302.	0.0000E+00	138.94
-5.00	-1.8528E+03	-2149.	1.3464E+08	168.34
-6.00	-3.9123E+03	-1966.	2.6610E+08	197.74
-7.00	-5.7741E+03	-1753.	3.9083E+08	227.15
-7.40	-6.4569E+03	-1660.	4.3811E+08	238.91
-7.50	-6.6217E+03	-1636.	4.4965E+08	240.34
-8.00	-7.4094E+03	-1514.	5.0562E+08	246.19
-9.00	-8.7987E+03	-1262.	6.0763E+08	257.89
-10.00	-9.9301E+03	-999.	6.9448E+08	269.59
-11.00	-1.0792E+04	-723.	7.6421E+08	281.30
-12.00	-1.1372E+04	-436.	8.1534E+08	293.00
-13.00	-1.1660E+04	-137.	8.4685E+08	304.70
-14.00	-1.1643E+04	173.	8.5826E+08	316.41
-15.00	-1.1309E+04	496.	8.4959E+08	328.11
-16.00	-1.0647E+04	830.	8.2143E+08	339.81
-16.05	-1.0605E+04	847.	8.1953E+08	340.40
-17.00	-9.6581E+03	1137.	7.7492E+08	269.77
-17.05	-9.6009E+03	1150.	7.7214E+08	266.05
-18.00	-8.3991E+03	1369.	7.1176E+08	195.42
-19.00	-6.9447E+03	1527.	6.3412E+08	121.07
-20.00	-5.3692E+03	1611.	5.4449E+08	46.73
-20.21	-5.0380E+03	1616.	5.2486E+08	0.00
-20.30	-4.8847E+03	1615.	5.1566E+08	-21.61
-21.00	-3.7709E+03	1551.	4.4558E+08	-161.83
-22.00	-2.3185E+03	1336.	3.4014E+08	-266.85
-23.00	-1.1332E+03	1017.	2.3066E+08	-372.90
-24.00	-3.2249E+02	585.	1.1916E+08	-489.69
-25.00	-1.1968E+00	38.	7.0356E+06	-604.67
-25.06	0.0000E+00	0.	0.0000E+00	-611.84

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES------------->			
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	256.
-2.00	0.	0.	0.	70.	513.
-3.00	0.	0.	0.	106.	769.
-3.70	0.	0.	0.	130.	949.
-4.00	0.	0.	0.	139.	1013.
-5.00	0.	0.	0.	168.	1227.
-6.00	0.	0.	0.	198.	1442.
-7.00	0.	0.	0.	227.	1656.

-7.40	0.	0.	0.	239.	1742.
-7.50	0.	0.	0.	240.	1752.
-8.00	0.	0.	0.	246.	1795.
-9.00	0.	0.	0.	258.	1880.
-10.00	0.	0.	0.	270.	1965.
-11.00	0.	0.	0.	281.	2051.
-12.00	0.	0.	0.	293.	2136.
-13.00	0.	0.	0.	305.	2221.
-14.00	0.	0.	0.	316.	2307.
-15.00	0.	0.	0.	328.	2392.
-16.00	0.	0.	0.	340.	2477.
-16.05	0.	0.	0.	340.	2482.
-17.00	0.	82.	11.	352.	2563.
-17.05	0.	86.	12.	352.	2567.
-18.00	0.	168.	23.	363.	2648.
-19.00	0.	254.	35.	375.	2733.
-20.00	0.	340.	46.	387.	2819.
-20.21	0.	373.	48.	389.	2836.
-20.30+	0.	388.	49.	390.	2844.
-20.30+	0.	388.	49.	343.	3147.
-21.00	0.	518.	58.	356.	3265.
-22.00	0.	641.	75.	374.	3433.
-23.00	0.	766.	94.	393.	3602.
-24.00	0.	901.	112.	411.	3771.
-25.00	0.	1034.	131.	430.	3940.
-26.00	0.	1167.	149.	448.	4109.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:24:15

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* COMPLETE OF RESULTS FOR  *
*   ANCHORED WALL DESIGN   *
*   BY FIXED EARTH METHOD  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH DRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 2288. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-3.9813E+08	0.00
-1.00	5.8612E+00	18.	-2.9872E+08	35.17
-2.00	4.6890E+01	70.	-1.9931E+08	70.33
-3.00	1.5825E+02	158.	-9.9798E+07	105.50
-3.70	2.9689E+02	241.	-2.9988E+07	130.12
-4.00	3.7509E+02	281.	0.0000E+00	138.94
-4.00	3.7509E+02	-2007.	0.0000E+00	138.94
-5.00	-1.5579E+03	-1854.	9.9807E+07	168.34
-6.00	-3.3226E+03	-1671.	1.9695E+08	197.74
-7.00	-4.8896E+03	-1458.	2.8837E+08	227.15
-7.40	-5.4544E+03	-1365.	3.2272E+08	238.91

-7.50	-5.5897E+03	-1341.	3.3108E+08	240.34
-8.00	-6.2300E+03	-1219.	3.7138E+08	246.19
-9.00	-7.3244E+03	-967.	4.4366E+08	257.89
-10.00	-8.1609E+03	-704.	5.0332E+08	269.59
-11.00	-8.7279E+03	-428.	5.4892E+08	281.30
-12.00	-9.0135E+03	-141.	5.7947E+08	293.00
-13.00	-9.0062E+03	158.	5.9449E+08	304.70
-14.00	-8.6941E+03	468.	5.9400E+08	316.41
-15.00	-8.0656E+03	791.	5.7852E+08	328.11
-16.00	-7.1090E+03	1125.	5.4916E+08	339.81
-16.05	-7.0524E+03	1142.	5.4735E+08	340.40
-17.00	-5.8249E+03	1431.	5.0756E+08	269.77
-17.05	-5.7530E+03	1445.	5.0519E+08	266.05
-18.00	-4.2711E+03	1664.	4.5593E+08	195.42
-19.00	-2.5218E+03	1822.	3.9695E+08	121.07
-20.00	-6.5144E+02	1906.	3.3363E+08	46.73
-20.21	-2.5977E+02	1911.	3.2039E+08	0.00
-20.30	-7.8527E+01	1910.	3.1427E+08	-21.61
-21.00	1.2416E+03	1846.	2.6919E+08	-161.83
-22.00	2.9889E+03	1631.	2.0687E+08	-266.85
-23.00	4.4691E+03	1311.	1.4968E+08	-372.90
-24.00	5.5747E+03	880.	1.0016E+08	-489.69
-25.00	6.1908E+03	333.	6.0197E+07	-604.67
-26.00	6.2024E+03	-329.	3.0848E+07	-718.90
-27.00	5.4951E+03	-1105.	1.2113E+07	-833.15
-28.00	3.9549E+03	-1994.	2.7540E+06	-945.99
-29.00	1.4760E+03	-2975.	9.3203E+04	-1015.12
-30.00	0.0000E+00	-3445.	0.0000E+00	-1027.45

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<------------SOIL PRESSURES------------>			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	256.
-2.00	0.	0.	0.	70.	513.
-3.00	0.	0.	0.	106.	769.
-3.70	0.	0.	0.	130.	949.
-4.00	0.	0.	0.	139.	1013.
-5.00	0.	0.	0.	168.	1227.
-6.00	0.	0.	0.	198.	1442.
-7.00	0.	0.	0.	227.	1656.
-7.40	0.	0.	0.	239.	1742.
-7.50	0.	0.	0.	240.	1752.
-8.00	0.	0.	0.	246.	1795.
-9.00	0.	0.	0.	258.	1880.
-10.00	0.	0.	0.	270.	1965.
-11.00	0.	0.	0.	281.	2051.
-12.00	0.	0.	0.	293.	2136.
-13.00	0.	0.	0.	305.	2221.
-14.00	0.	0.	0.	316.	2307.
-15.00	0.	0.	0.	328.	2392.
-16.00	0.	0.	0.	340.	2477.
-16.05	0.	0.	0.	340.	2482.
-17.00	0.	82.	11.	352.	2563.
-17.05	0.	86.	12.	352.	2567.

S3 568_85 TO PROP BENCHED10 DND REV NOAD OUT

-18.00	0.	168.	23.	363.	2648.
-19.00	0.	254.	35.	375.	2733.
-20.00	0.	340.	46.	387.	2819.
-20.21	0.	373.	48.	389.	2836.
-20.30+	0.	388.	49.	390.	2844.
-20.30+	0.	388.	49.	343.	3147.
-21.00	0.	518.	58.	356.	3265.
-22.00	0.	641.	75.	374.	3433.
-23.00	0.	766.	94.	393.	3602.
-24.00	0.	901.	112.	411.	3771.
-25.00	0.	1034.	131.	430.	3940.
-26.00	0.	1167.	149.	448.	4109.
-27.00	0.	1300.	167.	466.	4277.
-28.00	0.	1431.	186.	485.	4446.
-29.00	0.	1518.	204.	503.	4615.
-30.00	0.	1564.	223.	522.	4784.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:24:28

****
* PRELIMINARY DESIGN DATA FOR *
* FREE EARTH DESIGN IN SAND *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH DRAINED
'LOW WATER

II.--DESIGN PARAMETERS

WALL HEIGHT RATIO (ALPHA) = 0.64
ANCHOR HEIGHT RATIO (BETA) = 0.16

SHEET PILE DATA:

SHEET PILE NAME	<SECTION PROPERTIES> (PER FOOT OF WALL) SECTION MODULUS (IN^3)	MOMENT OF INERTIA (IN^4)	ALLOWABLE STRESS (PSI)	MODULUS OF ELASTICITY (PSI)
PZ40	60.70	490.80	2.40E+04	2.90E+07
PZ38	46.80	280.80	2.40E+04	2.90E+07
PZ35	48.50	361.20	2.40E+04	2.90E+07
PZ32	38.30	220.40	2.40E+04	2.90E+07
PZ27	30.20	184.20	2.40E+04	2.90E+07
PZ22	18.10	84.40	2.40E+04	2.90E+07
PLZ25	32.80	223.25	2.40E+04	2.90E+07
PLZ23	30.20	203.75	2.40E+04	2.90E+07
M116	10.70	42.11	2.40E+04	2.90E+07

III.--PRELIMINARY DESIGN DATA

S3 568_85 TO PROP BENCHED10 DND REV NOAD OUT

SHEET PILE NAME	LOG(H^4/EI)	ROWE'S MOMENT REDUCTION COEF. LOOSE	DENSE	RATIO OF ALLOWABLE MOMENT TO REDUCED FREE EARTH MOMENT LOOSE	DENSE
PZ40	-4.56	1.00*	1.00*	10.38	10.38
PZ38	-4.31	1.00*	1.00*	8.01	8.01
PZ35	-4.42	1.00*	1.00*	8.30	8.30
PZ32	-4.21	1.00*	1.00*	6.55	6.55
PZ27	-4.13	1.00*	1.00*	5.17	5.17
PZ22	-3.79	1.00*	1.00*	3.10	3.10
PLZ25	-4.22	1.00*	1.00*	5.61	5.61
PLZ23	-4.18	1.00*	1.00*	5.17	5.17
M116	-3.49	0.93	0.52	1.97	3.51

* REDUCTION NOT APPLICABLE DUE TO
LOG(H^4/EI) LESS THAN -3.5 OR GREATER THEN -1.5.

S6 571_0 PROPOSED BENCHED10 DND REV NOAD OUT

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:26:13

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- DRAINED
'LOW WATER

II.--CONTROL
ANCHORED WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 2.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.
ELEVATION AT ANCHOR = -3.40 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-2.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-13.30
10.00	-13.30
70.00	-28.70

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-2.90	0.00	DEF	DEF
112.00	102.00	30.00	0.00	16.20	0.00	-9.30	0.00	DEF	DEF
103.00	93.00	30.00	0.00	16.20	0.00	-25.20	0.00	DEF	DEF
112.00	102.00	30.00	0.00	16.20	0.00	-32.00	0.00	DEF	DEF
135.00	129.00	33.00	0.00	17.80	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	30.00	0.00	16.20	0.00	-25.20	0.00	DEF	DEF
112.00	102.00	30.00	0.00	16.20	0.00	-32.00	0.00	DEF	DEF

S6 571_0 PROPOSED BENCHED10 DND REV NOAD OUT

135.00	129.00	33.00	0.00	17.80	0.00	DEF	DEF

VI.--WATER DATA
UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -6.80 (FT)
LEFTSIDE ELEVATION = -6.80 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:26:28

****
* SOIL PRESSURES FOR *
* ANCHORED WALL DESIGN *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- DRAINED
'LOW WATER

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

		<---LEFTSIDE--->		<------NET------> (SOIL + WATER)	<--RIGHTSIDE--->	
ELEV. (FT)	NET WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.0	0.0	0.0	0.0	0.0	0.0	0.0
-1.0	0.0	0.0	0.0	0.0	0.0	0.0
-2.0	0.0	0.0	0.0	0.0	0.0	0.0
-2.9	0.0	0.0	0.0	31.7	31.7	230.7
-3.0	0.0	0.0	0.0	34.6	34.6	252.2
-3.4	0.0	0.0	0.0	46.4	46.4	337.9
-4.0	0.0	0.0	0.0	64.0	64.0	466.5
-5.0	0.0	0.0	0.0	93.4	93.4	680.9
-6.0	0.0	0.0	0.0	122.8	122.8	895.2
-6.8	0.0	0.0	0.0	146.3	146.3	1066.7
-7.0	0.0	0.0	0.0	149.2	149.2	1087.6
-8.0	0.0	0.0	0.0	163.5	163.5	1191.8
-9.0	0.0	0.0	0.0	177.8	177.8	1296.0
-9.3	0.0	0.0	0.0	182.1	182.1	1327.3

-10.0	0.0	0.0	0.0	190.3	190.3	1387.0
-11.0	0.0	0.0	0.0	202.0	202.0	1472.4
-12.0	0.0	0.0	0.0	213.7	213.7	1557.7
-13.0	0.0	0.0	0.0	225.4	225.4	1643.0
-13.3	0.0	0.0	0.0	228.9	228.9	1668.6
-14.0	0.0	60.2	8.2	176.8	237.1	1728.3
-14.3	0.0	86.1	11.7	154.5	240.6	1753.9
-15.0	0.0	146.3	19.9	102.5	248.8	1813.7
-16.0	0.0	232.3	31.6	28.1	260.5	1899.0
-16.4	0.0	264.9	36.0	0.0	264.9	1931.3
-17.0	0.0	318.4	43.3	-46.2	272.2	1984.3
-18.0	0.0	403.7	55.0	-119.8	283.9	2069.6
-19.0	0.0	449.1	66.7	-153.5	295.6	2154.9
-20.0	0.0	465.5	78.4	-158.2	307.3	2240.3
-21.0	0.0	499.7	90.1	-180.7	319.0	2325.6
-22.0	0.0	543.3	101.8	-212.6	330.7	2410.9
-23.0	0.0	588.7	113.5	-246.3	342.4	2496.2
-24.0	0.0	635.5	125.2	-281.4	354.1	2581.5
-25.0	0.0	683.4	136.9	-317.6	365.8	2666.9
-25.2	0.0	698.0	139.5	-329.9	368.1	2683.9
-26.0	0.0	775.6	150.7	-396.0	379.6	2767.3
-27.0	0.0	864.5	165.0	-470.6	393.9	2871.6
-28.0	0.0	942.8	179.2	-534.6	408.2	2975.8
-29.0	0.0	1018.3	192.9	-595.9	422.5	3080.0
-30.0	0.0	1097.5	205.7	-660.7	436.8	3184.3
-31.0	0.0	1170.1	218.3	-719.0	451.1	3288.5
-32.0+	0.0	1419.3	235.4	-982.0	465.4	3392.7
-32.0-	0.0	1419.3	235.4	-982.0	409.2	3753.3
-33.0	0.0	1658.5	238.5	-1230.9	427.6	3922.1
-34.0	0.0	1748.8	239.4	-1302.8	446.0	4090.8
-35.0	0.0	1877.8	256.6	-1413.3	464.4	4259.6
-36.0	0.0	2009.1	273.5	-1526.2	482.8	4428.4
-37.0	0.0	2141.9	290.3	-1640.7	501.2	4597.2
-38.0	0.0	2267.3	307.2	-1747.7	519.6	4766.0
-39.0	0.0	2400.3	324.1	-1862.3	538.0	4934.8
-40.0	0.0	2537.7	341.0	-1981.3	556.4	5103.5
-41.0	0.0	2669.9	357.8	-2095.1	574.8	5272.3
-42.0	0.0	2798.0	374.7	-2204.8	593.2	5441.1
-43.0	0.0	2925.8	391.5	-2314.2	611.6	5609.9
-44.0	0.0	3053.7	408.4	-2423.6	630.0	5778.7
-45.0	0.0	3181.5	425.2	-2533.1	648.5	5947.5
-46.0	0.0	3308.7	442.1	-2641.9	666.9	6116.2
-47.0	0.0	3432.8	458.9	-2747.6	685.3	6285.0
-48.0	0.0	3557.1	475.8	-2853.4	703.7	6453.8
-49.0	0.0	3683.6	492.7	-2961.6	722.1	6622.6
-50.0	0.0	3820.5	509.9	-3080.0	740.5	6791.4
-51.0	0.0	3983.8	527.4	-3224.9	758.9	6960.2
-52.0	0.0	4161.9	544.7	-3384.7	777.3	7129.0
-53.0	0.0	4271.5	561.8	-3475.9	795.7	7297.7
-54.0	0.0	4379.8	578.8	-3565.7	814.1	7466.5

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*****************************
*  SUMMARY OF RESULTS FOR   *
*   ANCHORED WALL DESIGN    *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- DRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

METHOD	:	FREE EARTH	FIXED EARTH
WALL BOTTOM ELEVATION (FT)	:	-22.14	-26.78
PENETRATION (FT)	:	8.84	13.48
MAXIMUM BENDING MOMENT (LB-FT)	:	-5.2503E+03	-4.2920E+03
AT ELEVATION (FT)	:	-11.30	-10.68
MAXIMUM SCALED DEFLECTION (LB-IN^3)	:	2.9245E+08	2.1730E+08
AT ELEVATION (FT)	:	-12.00	-12.00
ANCHOR FORCE (LB)	:	1.1598E+03	1.0336E+03

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 29-NOVEMBER-2006 TIME: 9:26:32

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* COMPLETE OF RESULTS FOR   *
*   ANCHORED WALL DESIGN    *
*   BY FREE EARTH METHOD    *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- DRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 1160. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-1.8197E+08	0.00

-1.00	0.0000E+00	0.	-1.2845E+08	0.00
-2.00	4.3656E-11	0.	-7.4932E+07	0.00
-2.90	4.2728E+00	14.	-2.6763E+07	31.65
-3.00	5.8602E+00	18.	-2.1411E+07	34.59
-3.40	1.5963E+01	34.	0.0000E+00	46.35
-3.40	1.5963E+01	-1126.	0.0000E+00	46.35
-4.00	-6.5027E+02	-1093.	3.2054E+07	63.99
-5.00	-1.7063E+03	-1014.	8.4383E+07	93.39
-6.00	-2.6690E+03	-906.	1.3378E+08	122.80
-6.80	-3.3521E+03	-799.	1.7006E+08	146.32
-7.00	-3.5089E+03	-769.	1.7858E+08	149.18
-8.00	-4.2009E+03	-613.	2.1733E+08	163.48
-9.00	-4.7294E+03	-442.	2.4886E+08	177.77
-9.30	-4.8540E+03	-388.	2.5676E+08	182.06
-10.00	-5.0803E+03	-258.	2.7223E+08	190.25
-11.00	-5.2410E+03	-62.	2.8685E+08	201.96
-12.00	-5.1997E+03	146.	2.9245E+08	213.66
-13.00	-4.9447E+03	366.	2.8909E+08	225.36
-13.30	-4.8248E+03	434.	2.8639E+08	228.88
-14.00	-4.4693E+03	576.	2.7722E+08	176.83
-14.30	-4.2889E+03	626.	2.7211E+08	154.53
-15.00	-3.8174E+03	715.	2.5765E+08	102.48
-16.00	-3.0631E+03	781.	2.3151E+08	28.14
-16.38	-2.7663E+03	786.	2.2016E+08	0.00
-17.00	-2.2806E+03	772.	2.0007E+08	-46.21
-18.00	-1.5442E+03	689.	1.6468E+08	-119.83
-19.00	-9.2103E+02	552.	1.2661E+08	-153.53
-20.00	-4.4651E+02	396.	8.6925E+07	-158.21
-21.00	-1.3317E+02	227.	4.6446E+07	-180.71
-22.00	-2.1124E+00	30.	5.7112E+06	-212.59
-22.14	0.0000E+00	0.	0.0000E+00	-217.32

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	0.	0.
-2.00	0.	0.	0.	0.	0.
-2.90	0.	0.	0.	32.	231.
-3.00	0.	0.	0.	35.	252.
-3.40	0.	0.	0.	46.	338.
-4.00	0.	0.	0.	64.	467.
-5.00	0.	0.	0.	93.	681.
-6.00	0.	0.	0.	123.	895.
-6.80	0.	0.	0.	146.	1067.
-7.00	0.	0.	0.	149.	1088.
-8.00	0.	0.	0.	163.	1192.
-9.00	0.	0.	0.	178.	1296.
-9.30	0.	0.	0.	182.	1327.
-10.00	0.	0.	0.	190.	1387.
-11.00	0.	0.	0.	202.	1472.
-12.00	0.	0.	0.	214.	1558.
-13.00	0.	0.	0.	225.	1643.
-13.30	0.	0.	0.	229.	1669.
-14.00	0.	60.	8.	237.	1728.

-14.30	0.	86.	12.	241.	1754.
-15.00	0.	146.	20.	249.	1814.
-16.00	0.	232.	32.	260.	1899.
-16.38	0.	265.	36.	265.	1931.
-17.00	0.	318.	43.	272.	1984.
-18.00	0.	404.	55.	284.	2070.
-19.00	0.	449.	67.	296.	2155.
-20.00	0.	465.	78.	307.	2240.
-21.00	0.	500.	90.	319.	2326.
-22.00	0.	543.	102.	331.	2411.
-23.00	0.	589.	114.	342.	2496.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:26:33

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* COMPLETE OF RESULTS FOR    *
*   ANCHORED WALL DESIGN     *
*   BY FIXED EARTH METHOD    *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- DRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 1034. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-1.4312E+08	0.00
-1.00	-2.1828E-11	0.	-1.0103E+08	0.00
-2.00	2.1828E-11	0.	-5.8933E+07	0.00
-2.90	4.2728E+00	14.	-2.1049E+07	31.65
-3.00	5.8602E+00	18.	-1.6840E+07	34.59
-3.40	1.5963E+01	34.	0.0000E+00	46.35
-3.40	1.5963E+01	-1000.	0.0000E+00	46.35
-4.00	-5.7453E+02	-967.	2.5205E+07	63.99
-5.00	-1.5044E+03	-888.	6.6247E+07	93.39
-6.00	-2.3408E+03	-780.	1.0470E+08	122.80
-6.80	-2.9229E+03	-672.	1.3263E+08	146.32
-7.00	-3.0544E+03	-643.	1.3913E+08	149.18
-8.00	-3.6202E+03	-486.	1.6830E+08	163.48
-9.00	-4.0225E+03	-316.	1.9124E+08	177.77
-9.30	-4.1092E+03	-262.	1.9680E+08	182.06
-10.00	-4.2472E+03	-131.	2.0726E+08	190.25
-11.00	-4.2816E+03	65.	2.1596E+08	201.96
-12.00	-4.1140E+03	272.	2.1730E+08	213.66
-13.00	-3.7328E+03	492.	2.1155E+08	225.36
-13.30	-3.5751E+03	560.	2.0854E+08	228.88
-14.00	-3.1312E+03	702.	1.9939E+08	176.83
-14.30	-2.9129E+03	752.	1.9463E+08	154.53
-15.00	-2.3531E+03	842.	1.8184E+08	102.48
-16.00	-1.4725E+03	907.	1.6024E+08	28.14
-16.38	-1.1279E+03	912.	1.5132E+08	0.00
-17.00	-5.6382E+02	898.	1.3610E+08	-46.21

-18.00	2.9880E+02	815.	1.1098E+08	-119.83
-19.00	1.0483E+03	678.	8.6358E+07	-153.53
-20.00	1.6490E+03	522.	6.3527E+07	-158.21
-21.00	2.0886E+03	353.	4.3522E+07	-180.71
-22.00	2.3459E+03	156.	2.7099E+07	-212.59
-23.00	2.3903E+03	-73.	1.4700E+07	-246.35
-24.00	2.1881E+03	-337.	6.3961E+06	-281.41
-25.00	1.7043E+03	-637.	1.8324E+06	-317.61
-25.20	1.5706E+03	-701.	1.3037E+06	-329.86
-26.00	8.9695E+02	-992.	1.6754E+05	-396.01
-27.00	0.0000E+00	-1322.	0.0000E+00	-454.02

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	0.	0.
-2.00	0.	0.	0.	0.	0.
-2.90	0.	0.	0.	32.	231.
-3.00	0.	0.	0.	35.	252.
-3.40	0.	0.	0.	46.	338.
-4.00	0.	0.	0.	64.	467.
-5.00	0.	0.	0.	93.	681.
-6.00	0.	0.	0.	123.	895.
-6.80	0.	0.	0.	146.	1067.
-7.00	0.	0.	0.	149.	1088.
-8.00	0.	0.	0.	163.	1192.
-9.00	0.	0.	0.	178.	1296.
-9.30	0.	0.	0.	182.	1327.
-10.00	0.	0.	0.	190.	1387.
-11.00	0.	0.	0.	202.	1472.
-12.00	0.	0.	0.	214.	1558.
-13.00	0.	0.	0.	225.	1643.
-13.30	0.	0.	0.	229.	1669.
-14.00	0.	60.	8.	237.	1728.
-14.30	0.	86.	12.	241.	1754.
-15.00	0.	146.	20.	249.	1814.
-16.00	0.	232.	32.	260.	1899.
-16.38	0.	265.	36.	265.	1931.
-17.00	0.	318.	43.	272.	1984.
-18.00	0.	404.	55.	284.	2070.
-19.00	0.	449.	67.	296.	2155.
-20.00	0.	465.	78.	307.	2240.
-21.00	0.	500.	90.	319.	2326.
-22.00	0.	543.	102.	331.	2411.
-23.00	0.	589.	114.	342.	2496.
-24.00	0.	636.	125.	354.	2582.
-25.00	0.	683.	137.	366.	2667.
-25.20	0.	698.	139.	368.	2684.
-26.00	0.	776.	151.	380.	2767.
-27.00	0.	864.	165.	394.	2872.

S6 571_0 PROPOSED BENCHED10 DND REV NOAD OUT

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:26:45

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********************************
* PRELIMINARY DESIGN DATA FOR *
*  FREE EARTH DESIGN IN SAND   *
********************************
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- DRAINED
'LOW WATER

II.--DESIGN PARAMETERS

WALL HEIGHT RATIO (ALPHA) = 0.60
ANCHOR HEIGHT RATIO (BETA) = 0.15

SHEET PILE DATA:

SHEET PILE NAME	<SECTION PROPERTIES> (PER FOOT OF WALL) SECTION MODULUS (IN^3)	MOMENT OF INERTIA (IN^4)	ALLOWABLE STRESS (PSI)	MODULUS OF ELASTICITY (PSI)
PZ40	60.70	490.80	2.40E+04	2.90E+07
PZ38	46.80	280.80	2.40E+04	2.90E+07
PZ35	48.50	361.20	2.40E+04	2.90E+07
PZ32	38.30	220.40	2.40E+04	2.90E+07
PZ27	30.20	184.20	2.40E+04	2.90E+07
PZ22	18.10	84.40	2.40E+04	2.90E+07
PLZ25	32.80	223.25	2.40E+04	2.90E+07
PLZ23	30.20	203.75	2.40E+04	2.90E+07
M116	10.70	42.11	2.40E+04	2.90E+07

III.--PRELIMINARY DESIGN DATA

SHEET PILE NAME	LOG(H^4/EI)	ROWE'S MOMENT REDUCTION COEF.	RATIO OF ALLOWABLE MOMENT TO FREE EARTH MOMENT
PZ40	-4.77	1.0 (***)	23.12
PZ38	-4.53	1.0 (***)	17.83
PZ35	-4.64	1.0 (***)	18.48
PZ32	-4.42	1.0 (***)	14.59
PZ27	-4.35	1.0 (***)	11.50
PZ22	-4.01	1.0 (***)	6.89
PLZ25	-4.43	1.0 (***)	12.49
PLZ23	-4.39	1.0 (***)	11.50
M116	-3.71	1.0 (***)	4.08

*** REDUCTION NOT APPLICABLE DUE TO RIGHTSIDE SURFACE BELOW TOP OF WALL.

S14 570_5 BENCH 10 TO 50 DRAINED REV NOAD OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:28:59

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 14
'ELEV. 570.50 TO PROPOSED CHANNEL BOTTOM - DRAINED
'LOW WATER

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 2.00

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-11.60
10.00	-11.60
50.00	-29.10

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
112.00	102.00	30.00	0.00	16.20	0.00	-8.00	0.00	DEF	DEF
80.00	50.00	26.60	0.00	16.20	0.00	-16.00	0.00	DEF	DEF
103.00	93.00	30.00	0.00	16.20	0.00	-34.00	0.00	DEF	DEF
128.00	117.00	28.00	0.00	15.10	0.00	-40.10	0.00	DEF	DEF
135.00	129.00	33.00	0.00	17.80	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	30.00	0.00	16.20	0.00	-34.00	0.00	DEF	DEF
128.00	117.00	28.00	0.00	15.10	0.00	-40.10	0.00	DEF	DEF
135.00	129.00	33.00	0.00	17.80	0.00			DEF	DEF

VI.--WATER DATA
UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -3.10 (FT)
LEFTSIDE ELEVATION = -4.60 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:29:14

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 14
'ELEV. 570.50 TO PROPOSED CHANNEL BOTTOM - DRAINED
'LOW WATER

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

				<------NET------>			
	NET	<---LEFTSIDE--->		(SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-1.0	0.0	0.0	0.0	29.4	490.0	29.4	490.0
-2.0	0.0	0.0	0.0	58.8	980.0	58.8	980.0
-3.0	0.0	0.0	0.0	88.2	1470.0	88.2	1470.0
-3.1	0.0	0.0	0.0	91.1	1519.0	91.1	1519.0
-4.0	56.2	0.0	0.0	160.2	1789.6	104.0	1733.4
-4.6	93.6	0.0	0.0	206.2	1970.0	112.6	1876.4
-5.0	93.6	0.0	0.0	211.9	2065.3	118.3	1971.7
-6.0	93.6	0.0	0.0	226.2	2303.6	132.6	2210.0
-7.0	93.6	0.0	0.0	240.5	2541.9	146.9	2448.3
-8.0+	93.6	0.0	0.0	254.8	2780.1	161.2	2686.5
-8.0-	93.6	0.0	0.0	276.7	2362.6	183.1	2269.0
-9.0	93.6	0.0	0.0	282.4	2434.1	188.8	2340.5
-10.0	93.6	0.0	0.0	288.2	2505.5	194.6	2411.9
-11.0	93.6	0.0	0.0	293.9	2576.9	200.3	2483.3

-11.6	93.6	0.0	0.0	297.4	2619.7	203.8	2526.1
-12.0	93.6	81.5	4.7	218.2	2643.6	206.1	2554.7
-12.6	93.6	203.7	11.7	99.5	2679.4	209.6	2597.5
-13.0	93.6	285.2	16.4	20.3	2703.3	211.9	2626.1
-13.1	93.6	306.1	17.6	0.0	2709.4	212.5	2633.4
-14.0	93.6	488.9	28.1	-177.6	2763.0	217.6	2697.5
-15.0	93.6	624.1	39.8	-307.1	2822.7	223.4	2768.9
-16.0+	93.6	639.8	51.5	-330.8	3143.7	229.1	2840.3
-16.0-	93.6	639.8	51.5	-330.8	3143.7	201.8	3362.9
-17.0	93.6	642.8	63.2	-335.7	3588.4	213.5	3558.0
-18.0	93.6	691.5	74.9	-372.7	3771.7	225.2	3753.0
-19.0	93.6	746.8	86.6	-416.3	3955.1	236.9	3948.1
-20.0	93.6	805.5	98.3	-463.3	4138.4	248.6	4143.1
-21.0	93.6	868.1	110.0	-514.1	4321.7	260.3	4338.1
-22.0	93.6	927.3*	121.7	-561.6	4505.1	272.0	4533.2
-23.0	93.6	989.0*	133.4	-611.7	4688.4	283.7	4728.2
-24.0	93.6	1066.2*	145.1	-677.2	4871.8	295.4	4923.3
-25.0	93.6	1156.0*	156.8	-755.3	5055.1	307.1	5118.3
-26.0	93.6	1251.4*	168.5	-839.0	5238.4	318.8	5313.3
-27.0	93.6	1352.8*	179.6	-928.7	5422.4	330.5	5508.4
-28.0	93.6	1460.8*	189.3	-1025.0	5607.7	342.2	5703.4
-29.0	93.6	1496.5*	198.4	-1048.9	5793.6	353.9	5898.5
-30.0	93.6	1506.7*	208.1	-1047.4	5979.0	365.6	6093.5
-31.0	93.6	1664.9	218.6	-1193.9	6163.6	377.3	6288.5
-32.0	93.6	1950.6	228.5	-1467.9	6348.7	389.0	6483.6
-33.0	93.6	1982.5	237.7	-1488.2	6534.5	400.7	6678.6
-34.0+	93.6	1511.0	242.6	-986.8	6316.3	412.4	6873.7
-34.0-	93.6	1511.0	242.6	-986.8	6316.3	448.9	6056.9
-35.0	93.6	1640.7	268.4	-1077.7	6159.8	469.5	6334.6
-36.0	93.6	2202.3	302.9	-1618.7	6403.0	490.0	6612.3
-37.0	93.6	2561.2	320.8	-1957.0	6662.8	510.6	6890.0
-38.0	93.6	2847.2	338.7	-2222.4	6922.5	531.2	7167.7
-39.0	93.6	3056.3	356.7	-2411.0	7182.3	551.8	7445.4
-40.0	93.6	3475.5	374.6	-2809.6	7442.1	572.3	7723.1
-40.1+	93.6	3947.1	384.3	-3334.2	9036.2	574.4	7750.8
-40.1-	93.6	3947.1	384.3	-3334.2	9036.2	464.1	10903.2
-41.0	93.6	6855.6	399.3	-6281.4	10986.5	480.7	11292.2
-42.0	93.6	5847.4	335.4	-5254.8	11482.7	499.1	11724.6
-43.0	93.6	6217.7	351.5	-5606.6	11899.0	517.5	12156.9
-44.0	93.6	6428.0	369.2	-5798.5	12313.6	535.9	12589.2
-45.0	93.6	6733.1	387.1	-6085.2	12728.0	554.3	13021.5
-46.0	93.6	7148.2	403.3	-6481.9	13144.1	572.7	13453.8
-47.0	93.6	7550.2	419.4	-6865.5	13560.4	591.1	13886.1

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE FOR THIS ELEVATION.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:29:15

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

S14 570_5 BENCH 10 TO 50 DRAINED REV NOAD OUT

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 14
'ELEV. 570.50 TO PROPOSED CHANNEL BOTTOM - DRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

*****WARNING: STANDARD WEDGE SOLUTION DOES NOT EXIST AT ALL ELEVATIONS. SEE COMPLETE OUTPUT.

WALL BOTTOM ELEV. (FT) : -29.63
PENETRATION (FT) : 18.03

MAX. BEND. MOMENT (LB-FT) : 2.3037E+04
AT ELEVATION (FT) : -20.51

MAX. SCALED DEFL. (LB-IN^3): 1.0530E+10
AT ELEVATION (FT) : 0.00

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 9:29:15

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 14
'ELEV. 570.50 TO PROPOSED CHANNEL BOTTOM - DRAINED
'LOW WATER

II.--RESULTS1160. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	1.0530E+10	0.00
-1.00	4.9003E+00	15.	9.9767E+09	29.40
-2.00	3.9203E+01	59.	9.4238E+09	58.80
-3.00	1.3231E+02	132.	8.8710E+09	88.21
-3.10	1.4599E+02	141.	8.8157E+09	91.15
-4.00	3.1937E+02	254.	8.3184E+09	160.17
-4.60	5.0358E+02	364.	7.9871E+09	206.19
-5.00	6.6594E+02	448.	7.7664E+09	211.91

-6.00	1.2222E+03	667.	7.2156E+09	226.21
-7.00	2.0046E+03	900.	6.6669E+09	240.51
-8.00	3.0276E+03	1148.	6.1217E+09	254.80
-8.00	3.0276E+03	1148.	6.1217E+09	276.66
-9.00	4.3149E+03	1428.	5.5818E+09	282.42
-10.00	5.8845E+03	1713.	5.0494E+09	288.18
-11.00	7.7424E+03	2004.	4.5272E+09	293.94
-11.60	8.9978E+03	2181.	4.2201E+09	297.40
-12.00	9.8920E+03	2284.	4.0184E+09	218.23
-12.60	1.1295E+04	2380.	3.7211E+09	99.47
-13.00	1.2253E+04	2404.	3.5268E+09	20.30
-13.10	1.2499E+04	2405.	3.4775E+09	0.00
-14.00	1.4633E+04	2325.	3.0563E+09	-177.63
-15.00	1.6848E+04	2083.	2.6111E+09	-307.07
-16.00	1.8773E+04	1764.	2.1950E+09	-330.78
-17.00	2.0371E+04	1430.	1.8112E+09	-335.75
-18.00	2.1627E+04	1076.	1.4626E+09	-372.70
-19.00	2.2510E+04	682.	1.1513E+09	-416.28
-20.00	2.2975E+04	242.	8.7888E+08	-463.29
-21.00	2.2977E+04	-247.	6.4607E+08	-514.14
-22.00	2.2466E+04	-785.	4.5289E+08	-561.65
-23.00	2.1392E+04	-1371.	2.9845E+08	-611.73
-24.00	1.9704E+04	-2016.	1.8089E+08	-677.20
-25.00	1.7336E+04	-2732.	9.7276E+07	-755.29
-26.00	1.4213E+04	-3529.	4.3511E+07	-838.95
-27.00	1.0249E+04	-4413.	1.4186E+07	-928.66
-27.60	7.4184E+03	-4990.	5.5065E+06	-986.68
-28.00	5.3922E+03	-5113.	2.4365E+06	366.15
-29.00	1.0291E+03	-3046.	6.1923E+04	3768.80
-29.63	0.0000E+00	0.	0.0000E+00	5910.28

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<----SOIL PRESSURES----			
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	29.	490.
-2.00	0.	0.	0.	59.	980.
-3.00	0.	0.	0.	88.	1470.
-3.10	0.	0.	0.	91.	1519.
-4.00	56.	0.	0.	104.	1733.
-4.60	94.	0.	0.	113.	1876.
-5.00	94.	0.	0.	118.	1972.
-6.00	94.	0.	0.	133.	2210.
-7.00	94.	0.	0.	147.	2448.
-8.00+	94.	0.	0.	161.	2687.
-8.00+	94.	0.	0.	183.	2269.
-9.00	94.	0.	0.	189.	2340.
-10.00	94.	0.	0.	195.	2412.
-11.00	94.	0.	0.	200.	2483.
-11.60	94.	0.	0.	204.	2526.
-12.00	94.	81.	5.	206.	2555.
-12.60	94.	204.	12.	210.	2598.
-13.00	94.	285.	16.	212.	2626.
-13.10	94.	306.	18.	212.	2633.
-14.00	94.	489.	28.	218.	2698.

S14 570_5 BENCH 10 TO 50 DRAINED REV NOAD OUT

-15.00	94.	624.	40.	223.	2769.
-16.00+	94.	640.	51.	229.	2840.
-16.00+	94.	640.	51.	202.	3363.
-17.00	94.	643.	63.	213.	3558.
-18.00	94.	691.	75.	225.	3753.
-19.00	94.	747.	87.	237.	3948.
-20.00	94.	805.	98.	249.	4143.
-21.00	94.	868.	110.	260.	4338.
-22.00	94.*	927.	122.	272.	4533.
-23.00	94.*	989.	133.	284.	4728.
-24.00	94.*	1066.	145.	295.	4923.
-25.00	94.*	1156.	157.	307.	5118.
-26.00	94.*	1251.	169.	319.	5313.
-27.00	94.*	1353.	180.	331.	5508.
-27.60	94.*	1418.	185.	338.	5626.
-28.00	94.*	1461.	189.	342.	5703.
-29.00	94.*	1496.	198.	354.	5898.
-29.63	94.	1507.	208.	366.	6093.
-31.00	94.	1665.	219.	377.	6289.

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE AT THIS ELEVATION.

EXAMPLE SECTION

WITH ADHESION INCLUDED

EXAMPLE SECTION W/ ADHESION INCLUDED

S1 574_95 TO PROP BENCHED UND REV OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 13:32:08

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - UNDRAINED REV
'LOW WATER

II.--CONTROL
CANTILEVER WALL DESIGN
FACTOR OF SAFETY FOR ACTIVE PRESSURES = 1.00
FACTOR OF SAFETY FOR PASSIVE PRESSURES = 1.30

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.20 FT.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-9.65
10.00	-9.65
75.00	-27.40

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-3.20	0.00	DEF	DEF
112.00	102.00	0.00	250.00	0.00	250.00	-7.00	0.00	DEF	DEF
103.00	93.00	0.00	250.00	0.00	250.00	-19.80	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	600.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	0.00	250.00	0.00	250.00	-19.80	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	600.00			DEF	DEF

VI.--WATER DATA

S1 574_95 TO PROP BENCHED UND REV OUT

UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -6.90 (FT)
LEFTSIDE ELEVATION = -6.90 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 13:32:22

****
* SOIL PRESSURES FOR *
* CANTILEVER WALL DESIGN *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - UNDRAINED REV
'LOW WATER

II.--SOIL PRESSURES

RIGHTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

	NET	<---LEFTSIDE--->		<------NET------> (SOIL + WATER)		<--RIGHTSIDE--->	
ELEV. (FT)	WATER (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-0.8	0.0	0.0	0.0	28.1	323.3	28.1	323.3
-1.8	0.0	0.0	0.0	63.3	727.4	63.3	727.4
-2.8	0.0	0.0	0.0	98.5	1131.5	98.5	1131.5
-3.1+	0.0	0.0	0.0	0.0	896.3	0.0	896.3
-3.1-	0.0	0.0	0.0	0.0	982.2	0.0	982.2
-3.2	0.0	0.0	0.0	0.0	896.3	0.0	896.3
-3.8	0.0	0.0	0.0	0.0	676.4	0.0	676.4
-4.8	0.0	0.0	0.0	0.0	1145.0	0.0	1145.0
-5.8	0.0	0.0	0.0	0.0	1239.0	0.0	1239.0
-6.8	0.0	0.0	0.0	0.0	1337.7	0.0	1337.7
-6.9	0.0	0.0	0.0	0.0	1346.3	0.0	1346.3
-7.0	0.0	0.0	0.0	0.0	1351.7	0.0	1351.7
-7.8	0.0	0.0	0.0	0.0	1380.8	0.0	1380.8
-8.8	0.0	0.0	0.0	0.0	1416.2	0.0	1416.2
-9.7+	0.0	0.0	0.0	0.0	1446.3	0.0	1446.3
-9.7-	0.0	384.6	0.0	-384.6	1446.3	0.0	1446.3

S1 574_95 TO PROP BENCHED UND REV OUT

-9.8	0.0	550.0	0.0	-527.8	1451.9	22.2	1451.9
-10.7	0.0	584.6	0.0	-389.5	1484.8	195.0	1484.8
-10.8	0.0	590.6	0.0	-384.3	1490.6	206.4	1490.6
-11.8	0.0	631.2	0.0	-384.5	1529.8	246.7	1529.8
-12.8	0.0	671.8	0.0	-384.7	1569.3	287.1	1569.3
-13.8	0.0	712.4	0.0	-384.9	1609.1	327.5	1609.1
-14.8	0.0	753.0	0.0	-385.0	1649.0	368.0	1649.0
-15.8	0.0	710.8	0.0	-301.6	1689.0	409.2	1689.0
-16.8	0.0	659.8	0.0	-209.0	1729.2	450.8	1729.2
-17.8	0.0	679.8	0.0	-188.0	1769.4	491.8	1769.4
-18.8	0.0	699.3	0.0	-167.0	1809.7	532.3	1809.7
-19.7+	0.0	713.7	0.0	-713.7	2351.6	0.0	2378.1
-19.7-	0.0	713.7	0.0	-713.7	2351.6	0.0	2325.2
-19.8	0.0	816.7	0.0	-816.7	2378.1	0.0	2378.1
-20.8	0.0	1925.0	0.0	-1925.0	2961.7	0.0	2961.7
-21.8	0.0	1956.7	0.0	-1956.7	3028.6	0.0	3028.6
-22.8	0.0	2003.1	0.0	-2003.1	3095.0	0.0	3095.0
-23.8	0.0	2053.9	0.0	-2053.9	3165.8	0.0	3165.8
-24.8	0.0	2113.1	0.0	-2113.1	3237.3	0.0	3237.3
-25.8	0.0	2172.3	0.0	-2172.3	3308.9	0.0	3308.9
-26.8	0.0	2231.5	0.0	-2231.5	3380.6	0.0	3380.6
-27.8	0.0	2290.7	0.0	-2290.7	3452.4	0.0	3452.4
-28.8	0.0	2349.9	0.0	-2349.9	3524.3	0.0	3524.3
-29.7+	0.0	2404.2	0.0	-2404.2	3593.2	0.0	3596.2
-29.7-	0.0	2404.2	0.0	-2404.2	3593.2	0.0	3590.2
-29.8	0.0	2409.1	0.0	-2403.2	3596.2	5.9	3596.2
-30.8	0.0	2468.3	0.0	-2391.3	3668.3	77.0	3668.3
-31.8	0.0	2527.5	0.0	-2379.4	3740.3	148.1	3740.3
-32.8	0.0	2586.7	0.0	-2367.2	3812.5	219.5	3812.5
-33.8	0.0	2645.9	0.0	-2355.0	3884.6	290.9	3884.6
-34.8	0.0	2705.1	0.0	-2342.7	3956.8	362.4	3956.8
-35.8	0.0	2764.3	0.0	-2330.3	4029.1	434.0	4029.1
-36.8	0.0	2823.5	0.0	-2317.8	4101.4	505.7	4101.4
-37.8	0.0	2882.7	0.0	-2305.2	4173.7	577.5	4173.7
-38.8	0.0	2941.9	0.0	-2292.6	4246.0	649.3	4246.0
-39.8	0.0	3001.1	0.0	-2279.9	4318.3	721.2	4318.3

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 13:32:24

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*****************************
*  SUMMARY OF RESULTS FOR   *
*  CANTILEVER WALL DESIGN   *
*****************************
```

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - UNDRAINED REV
'LOW WATER

II.--SUMMARY

S1 574_95 TO PROP BENCHED UND REV OUT

RIGHTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

```
WALL BOTTOM ELEV. (FT)      :      -12.75
     PENETRATION (FT)       :        3.10

MAX. BEND. MOMENT (LB-FT)   :  1.1815E+03
     AT ELEVATION (FT)      :       -9.96

MAX. SCALED DEFL. (LB-IN^3):  9.8577E+07
     AT ELEVATION (FT)      :        0.20
```

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 28-NOVEMBER-2006 TIME: 13:32:24

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****************************
* COMPLETE OF RESULTS FOR  *
*  CANTILEVER WALL DESIGN  *
****************************
```

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - UNDRAINED REV
'LOW WATER

II.--RESULTS690. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	SCALED DEFLECTION (LB-IN^3)	NET PRESSURE (PSF)
0.20	0.0000E+00	0.	9.8577E+07	0.00
0.00	-5.8401E-10	0.	9.6247E+07	0.00
-0.80	3.0006E+00	11.	8.6929E+07	28.13
-1.80	3.4179E+01	57.	7.5291E+07	63.29
-2.80	1.2865E+02	138.	6.3721E+07	98.46
-3.05	1.6574E+02	150.	6.0812E+07	0.00
-3.20	1.8773E+02	150.	5.9144E+07	0.00
-3.80	2.7793E+02	150.	5.2382E+07	0.00
-4.80	4.2826E+02	150.	4.1524E+07	0.00
-5.80	5.7859E+02	150.	3.1406E+07	0.00
-6.80	7.2893E+02	150.	2.2288E+07	0.00
-6.90	7.4396E+02	150.	2.1441E+07	0.00
-7.00	7.5899E+02	150.	2.0607E+07	0.00
-7.80	8.7926E+02	150.	1.4429E+07	0.00
-8.80	1.0296E+03	150.	8.0898E+06	0.00
-9.65	1.1574E+03	150.	4.0900E+06	0.00
-9.65	1.1574E+03	150.	4.0900E+06	-384.62
-9.80	1.1751E+03	82.	3.5296E+06	-527.84
-10.65	1.0707E+03	-308.	1.2120E+06	-389.51
-10.80	1.0201E+03	-366.	9.4831E+05	-384.28
-11.61	5.9934E+02	-676.	1.4485E+05	-384.48

S1 574_95 TO PROP BENCHED UND REV OUT

-11.80	4.6393E+02	-719.	7.3105E+04	-55.62
-12.75	0.0000E+00	0.	0.0000E+00	1567.40

NOTE: DIVIDE SCALED DEFLECTION MODULUS OF ELASTICITY IN PSI TIMES PILE MOMENT OF INERTIA IN IN^4 TO OBTAIN DEFLECTION IN INCHES.

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES------------->			
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.20	0.	0.	0.	0.	0.
0.00	0.	0.	0.	0.	0.
-0.80	0.	0.	0.	28.	323.
-1.80	0.	0.	0.	63.	727.
-2.80	0.	0.	0.	98.	1131.
-3.05+	0.	0.	0.	0.	896.
-3.05+	0.	0.	0.	0.	982.
-3.20	0.	0.	0.	0.	896.
-3.80	0.	0.	0.	0.	676.
-4.80	0.	0.	0.	0.	1145.
-5.80	0.	0.	0.	0.	1239.
-6.80	0.	0.	0.	0.	1338.
-6.90	0.	0.	0.	0.	1346.
-7.00	0.	0.	0.	0.	1352.
-7.80	0.	0.	0.	0.	1381.
-8.80	0.	0.	0.	0.	1416.
-9.65+	0.	0.	0.	0.	1446.
-9.65+	0.	385.	0.	0.	1446.
-9.80	0.	550.	0.	22.	1452.
-10.65	0.	585.	0.	195.	1485.
-10.80	0.	591.	0.	206.	1491.
-11.61	0.	623.	0.	239.	1522.
-11.80	0.	631.	0.	247.	1530.
-12.75	0.	672.	0.	287.	1569.
-13.80	0.	712.	0.	328.	1609.

CWALSHT

ANALYSIS MODE RESULTS

FOR MEMBER STRESSES

Summary Table of CWALSHT Member Forces

		SSP Wall Moments				Anchor Forces			
Parcel Number	**Section No.**	**Undrained Analysis Mode SSP Moment (ft-lbs/ft)**	**Drained Analysis Mode SSP Moment (ft-lbs/ft)**	**Undrained Design Mode SSP Moment (ft-lbs/ft)**	**Drained Design Mode SSP Moment (ft-lbs/ft)**	**Undrained Analysis Mode Anchor Force (lbs/ft)**	**Drained Analysis Mode Anchor Force (lbs/ft)**	**Undrained Design Mode Anchor Force (lbs/ft)**	**Drained Design Mode Anchor Force (lbs/ft)**
432	1	**33085**	28304	18645	22406	NA	NA	NA	NA
429	2	701	1924	972	**2673**	906	1221	987	**1375**
433	3	**15905****	9357	12668	9047	**3147***	2325	2764	2289
433	6	1458	3075	2399	**4292**	284	855	419	**1034**
440	14	8333	**23461**	8333	23037	NA	NA	NA	NA

* Section 3 revised elevation of bench in order to reduce anchor force due to overstressing. Bench raised 1.50 feet and anchor force reduced to 3kips.

** Moment also reduced to 14950.

Analysis of SSP bending stress, wale bending stress, and tie rod tensile stress normally analyzed using CWALSHT analysis mode and passive FS = 1.0. However, for the soil conditions encountered at KK River CWALSHT would not run for certain conditions using the field determined pile lengths. Therefore, the above table was created of all CWALSHT results in order to get a range of forces and moments. The maximum forces and moments were then used for analysis. This was done to ensure conservatism in the analysis. The range of values generally finds the members meet the required stress values except for Section 3 which was revised as mentioned above. Because the results are not precise and under this scope of work a more detailed analysis software will not be used, engineering judgement must be used to evaluate results. All but one of the results indicates the SSP, wale, and tie rod stresses are significantly below allowable stresses. For Section 3 the tie rod tensile stress is about equal to the allowable stress. Based on the numerous runs of various conditions, it is our judgement that the wall members will not be overstressed for the revised geometries presented.

S1 574_95 TO PROP BENCHED UND REV NOAD ALYS OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:38:13

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - UNDRAINED REV
'LOW WATER

II.--CONTROL
CANTILEVER WALL ANALYSIS
SAME FACTOR OF SAFETY APPLIED TO BOTH ACTIVE AND PASSIVE PRESSURES.

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.20 FT.
ELEVATION AT BOTTOM OF WALL = -32.80 FT. ← AS DETERMINED FROM GEOPHYSICAL INVESTIGATION
WALL MODULUS OF ELASTACITY = 2.900E+07 PSI.
WALL MOMENT OF INERTIA = 184.00 IN^4.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-9.65
10.00	-9.65
75.00	-27.40

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-3.20	0.00	DEF	DEF
112.00	102.00	0.00	250.00	0.00	0.00	-7.00	0.00	DEF	DEF
103.00	93.00	0.00	250.00	0.00	0.00	-19.80	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	0.00	250.00	0.00	0.00	-19.80	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

```
 VI.--WATER DATA
      UNIT WEIGHT          = 62.40 (PCF)
      RIGHTSIDE ELEVATION = -6.90 (FT)
      LEFTSIDE ELEVATION  = -6.90 (FT)
      NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
      NONE

VIII.--HORIZONTAL LOADS
      NONE
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                    ****************************
                    *  SUMMARY OF RESULTS FOR  *
                    * CANTILEVER WALL ANALYSIS *
                    ****************************

  I.--HEADING
   'KINNICKINNIC RIVER WALL SECTIONS
   'SECTION 1
   'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - UNDRAINED REV
   'LOW WATER

 II.--SUMMARY

      RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
      AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

      LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

      *****WARNING:  STANDARD WEDGE SOLUTION DOES NOT EXIST
                     AT ALL ELEVATIONS.  SEE COMPLETE OUTPUT.

 FACTOR OF SAFETY            :        2.51

 MAX. BEND. MOMENT (LB-FT)   :  3.3085E+04
      AT ELEVATION (FT)      :      -23.02

 MAXIMUM DEFLECTION (IN.)    :  3.0069E+00
      AT ELEVATION (FT)      :        0.20
```

S1 574_95 TO PROP BENCHED UND REV NOAD ALYS OUT

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL ANALYSIS *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - UNDRAINED REV
'LOW WATER

II.--RESULTS1456. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.20	0.0000E+00	0.	3.0069E+00	0.00
0.00	6.7400E-08	0.	2.9790E+00	0.00
-0.80	3.0009E+00	11.	2.8673E+00	28.13
-1.80	3.4183E+01	57.	2.7278E+00	63.30
-2.80	1.2867E+02	138.	2.5883E+00	98.47
-3.20	1.9206E+02	180.	2.5325E+00	112.54
-3.20	1.9206E+02	180.	2.5325E+00	0.00
-3.80	3.0009E+02	180.	2.4489E+00	0.00
-4.27	3.8553E+02	180.	2.3827E+00	0.00
-4.80	4.8262E+02	194.	2.3095E+00	53.60
-5.80	7.2056E+02	299.	2.1703E+00	155.60
-6.80	1.1141E+03	505.	2.0313E+00	257.60
-6.90	1.1659E+03	532.	2.0174E+00	267.80
-7.00	1.2204E+03	559.	2.0036E+00	272.76
-7.80	1.7581E+03	790.	1.8927E+00	305.24
-8.80	2.7073E+03	1115.	1.7547E+00	345.84
-9.65	3.7845E+03	1424.	1.6381E+00	380.35
-9.65	3.7845E+03	1424.	1.6381E+00	181.53
-9.80	4.0001E+03	1451.	1.6176E+00	181.53
-10.65	5.2993E+03	1606.	1.5020E+00	181.53
-10.80	5.5421E+03	1633.	1.4817E+00	181.53
-11.80	7.2657E+03	1814.	1.3477E+00	181.53
-12.80	9.1707E+03	1996.	1.2160E+00	181.53
-13.80	1.1257E+04	2177.	1.0873E+00	181.53
-14.80	1.3525E+04	2359.	9.6226E-01	181.53
-15.80	1.5975E+04	2540.	8.4159E-01	181.53
-16.80	1.8606E+04	2722.	7.2610E-01	181.53
-17.80	2.1419E+04	2903.	6.1664E-01	181.53
-18.80	2.4425E+04	3120.	5.1412E-01	250.55
-19.23	2.5786E+04	3174.	4.7227E-01	0.00
-19.80	2.7573E+04	3080.	4.1952E-01	-330.10
-20.80	3.0372E+04	2403.	3.3384E-01	-1023.81
-21.80	3.2254E+04	1352.	2.5796E-01	-1077.35
-22.66	3.3012E+04	405.	2.0109E-01	-1126.98
-22.80	3.3058E+04	247.	1.9251E-01	-1125.00
-23.80	3.2744E+04	-873.	1.3772E-01	-1113.61
-24.80	3.1316E+04	-1981.	9.3515E-02	-1102.21
-25.80	2.8786E+04	-3077.	5.9418E-02	-1090.82
-26.80	2.5166E+04	-4162.	3.4614E-02	-1079.43
-27.38	2.2593E+04	-4781.	2.4111E-02	-1072.88
-27.80	2.0475E+04	-5172.	1.7930E-02	-767.58
-28.80	1.5039E+04	-5580.	7.8559E-03	-48.51
-29.80	9.5542E+03	-5269.	2.6508E-03	670.55
-30.80	4.7402E+03	-4239.	5.5780E-04	1389.62
-31.80	1.3158E+03	-2490.	3.7396E-05	2108.68
-32.80	5.9642E-02	-22.	-9.2807E-14	2827.75
-32.81	0.0000E+00	0.	0.0000E+00	2833.26

S1 574_95 TO PROP BENCHED UND REV NOAD ALYS OUT

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES------------->			
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.20	0.	0.	0.	0.	0.
0.00	0.	0.	0.	0.	0.
-0.80	0.	0.	0.	28.	176.
-1.80	0.	0.	0.	63.	396.
-2.80	0.	0.	0.	98.	616.
-3.20+	0.	0.	0.	113.	704.
-3.20+	0.	0.	0.	0.	589.
-3.80	0.	0.	0.	0.	650.
-4.27	0.	0.	0.	0.	699.
-4.80	0.	0.	0.	54.	752.
-5.80	0.	0.	0.	156.	854.
-6.80	0.	0.	0.	258.	956.
-6.90	0.	0.	0.	268.	967.
-7.00	0.	0.	0.	273.	972.
-7.80	0.	0.	0.	305.	1004.
-8.80	0.	0.	0.	346.	1045.
-9.65+	0.	0.	0.	380.	1079.
-9.65+	0.	199.	0.	380.	1079.
-9.80	0.	205.	0.	386.	1085.
-10.65	0.	239.	0.	421.	1120.
-10.80	0.	246.	0.	427.	1126.
-11.80	0.	286.	0.	468.	1166.
-12.80	0.	327.	0.	508.	1207.
-13.80	0.	367.	0.	549.	1248.
-14.80	0.	408.	0.	589.	1288.
-15.80	0.	449.	0.	630.	1329.
-16.80	0.	489.	0.	671.	1369.
-17.80	0.	530.	0.	711.	1410.
-18.80	0.	501.	0.	752.	1451.
-19.23	0.	598.	0.	769.	1468.
-19.80+	0.	726.	0.	792.	1491.
-19.80+	0.	726.	0.	0.	1889.
-20.80	0.	1024.	0.	0.	1962.
-21.80	0.	1077.	0.	0.	2034.
-22.66	0.	1127.	0.	0.	2096.
-22.80	0.	1135.	0.	10.	2107.
-23.80	0.	1196.	0.	83.	2179.
-24.80	0.	1258.	0.	155.	2252.
-25.80	0.	1319.	0.	228.	2325.
-26.80	0.	1380.	0.	301.	2397.
-27.38	0.	1415.	0.	342.	2439.
-27.80	0.	1441.	0.	373.	2470.
-28.80	0.	1502.	0.	446.	2542.
-29.80	0.	1564.	0.	518.	2615.
-30.80	0.	1625.	0.	591.	2688.
-31.80	0.	1686.	0.	664.	2760.
-32.80	0.	1746.	0.	736.	2833.
-32.81	0.	1805.	0.	809.	2905.
-34.80	0.	1865.	0.	881.	2978.

S1 574_95 TO PROP BENCHED DND REV NOAD ALYS OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:38:57

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - DRAINED REV
'LOW WATER

II.--CONTROL
CANTILEVER WALL ANALYSIS
SAME FACTOR OF SAFETY APPLIED TO BOTH ACTIVE AND PASSIVE PRESSURES.

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.20 FT.
ELEVATION AT BOTTOM OF WALL = -32.80 FT.
WALL MODULUS OF ELASTACITY = 2.900E+07 PSI.
WALL MOMENT OF INERTIA = 184.00 IN^4.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-9.65
10.00	-9.65
75.00	-27.40

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-3.20	0.00	DEF	DEF
112.00	102.00	30.00	0.00	16.20	0.00	-7.00	0.00	DEF	DEF
103.00	93.00	30.00	0.00	16.20	0.00	-19.80	0.00	DEF	DEF
135.00	129.00	33.00	0.00	17.80	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	30.00	0.00	16.20	0.00	-19.80	0.00	DEF	DEF
135.00	129.00	33.00	0.00	17.80	0.00			DEF	DEF

```
VI.--WATER DATA
    UNIT WEIGHT          = 62.40 (PCF)
    RIGHTSIDE ELEVATION = -6.90 (FT)
    LEFTSIDE ELEVATION  = -6.90 (FT)
    NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
    NONE

VIII.--HORIZONTAL LOADS
    NONE
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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:39:00

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*  SUMMARY OF RESULTS FOR  *
* CANTILEVER WALL ANALYSIS *
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I.--HEADING
  'KINNICKINNIC RIVER WALL SECTIONS
  'SECTION 1
  'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - DRAINED REV
  'LOW WATER

II.--SUMMARY

    RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
    AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

    LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

    *****WARNING:  STANDARD WEDGE SOLUTION DOES NOT EXIST
                   AT ALL ELEVATIONS.  SEE COMPLETE OUTPUT.

FACTOR OF SAFETY             :        2.61

MAX. BEND. MOMENT (LB-FT)    :  2.8304E+04
      AT ELEVATION (FT)      :      -23.33

MAXIMUM DEFLECTION (IN.)     :  2.8576E+00
      AT ELEVATION (FT)      :        0.20
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S1 574_95 TO PROP BENCHED DND REV NOAD ALYS OUT

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*****************************
* COMPLETE OF RESULTS FOR   *
* CANTILEVER WALL ANALYSIS  *
*****************************
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 1
'ELEVATION 574.95 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH - DRAINED REV
'LOW WATER

II.--RESULTS1456. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.20	0.0000E+00	0.	2.8576E+00	0.00
0.00	1.2861E-07	0.	2.8307E+00	0.00
-0.80	3.0009E+00	11.	2.7232E+00	28.13
-1.80	3.4183E+01	57.	2.5888E+00	63.30
-2.80	1.2867E+02	138.	2.4544E+00	98.47
-3.20	1.9206E+02	180.	2.4006E+00	112.54
-3.80	3.2141E+02	253.	2.3200E+00	130.18
-4.80	6.4427E+02	398.	2.1858E+00	159.58
-5.80	1.1267E+03	572.	2.0517E+00	188.98
-6.80	1.7981E+03	776.	1.9181E+00	218.38
-6.90	1.8768E+03	798.	1.9047E+00	221.32
-7.00	1.9577E+03	820.	1.8914E+00	222.75
-7.80	2.6859E+03	1002.	1.7850E+00	232.12
-8.80	3.8057E+03	1240.	1.6528E+00	243.82
-9.65	4.9488E+03	1451.	1.5414E+00	253.77
-9.80	5.1693E+03	1489.	1.5218E+00	244.79
-10.65	6.5170E+03	1675.	1.4118E+00	193.90
-10.80	6.7704E+03	1704.	1.3925E+00	184.92
-11.80	8.5564E+03	1859.	1.2655E+00	125.06
-12.80	1.0468E+04	1954.	1.1411E+00	65.19
-13.80	1.2444E+04	1989.	1.0202E+00	5.33
-14.80	1.4449E+04	2034.	9.0333E-01	85.39
-15.80	1.6524E+04	2115.	7.9112E-01	76.05
-16.60	1.8232E+04	2145.	7.0518E-01	0.00
-16.80	1.8661E+04	2143.	6.8426E-01	-19.02
-17.80	2.0792E+04	2114.	5.8345E-01	-40.45
-18.80	2.2875E+04	2042.	4.8937E-01	-102.82
-19.80	2.4827E+04	1823.	4.0269E-01	-335.61
-20.80	2.6453E+04	1402.	3.2404E-01	-506.79
-21.80	2.7599E+04	889.	2.5395E-01	-519.58
-22.80	2.8215E+04	330.	1.9278E-01	-598.39
-23.80	2.8231E+04	-311.	1.4073E-01	-682.64
-24.80	2.7565E+04	-1037.	9.7811E-02	-769.77
-25.80	2.6128E+04	-1852.	6.3792E-02	-858.87
-26.80	2.3831E+04	-2756.	3.8211E-02	-950.84
-27.80	2.0585E+04	-3752.	2.0323E-02	-1039.88
-28.80	1.6299E+04	-4835.	9.0721E-03	-1127.10
-29.02	1.5196E+04	-5088.	7.3400E-03	-1147.89
-29.80	1.0998E+04	-5569.	3.0702E-03	-89.70
-30.80	5.6109E+03	-4979.	6.2763E-04	1270.94
-31.80	1.4944E+03	-3027.	3.6329E-05	2631.58
-32.73	0.0000E+00	0.	0.0000E+00	3894.06

III.--WATER AND SOIL PRESSURES

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                  &lt;-------------SOIL PRESSURES------------->
       WATER      &lt;----LEFTSIDE----->      &lt;---RIGHTSIDE---->
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S1 574_95 TO PROP BENCHED DND REV NOAD ALYS OUT

ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.20	0.	0.	0.	0.	0.
0.00	0.	0.	0.	0.	0.
-0.80	0.	0.	0.	28.	172.
-1.80	0.	0.	0.	63.	386.
-2.80	0.	0.	0.	98.	601.
-3.20	0.	0.	0.	113.	687.
-3.80	0.	0.	0.	130.	794.
-4.80	0.	0.	0.	160.	974.
-5.80	0.	0.	0.	189.	1153.
-6.80	0.	0.	0.	218.	1332.
-6.90	0.	0.	0.	221.	1350.
-7.00	0.	0.	0.	223.	1359.
-7.80	0.	0.	0.	232.	1416.
-8.80	0.	0.	0.	244.	1487.
-9.65	0.	0.	0.	254.	1548.
-9.80	0.	11.	2.	256.	1559.
-10.65	0.	72.	12.	265.	1620.
-10.80	0.	82.	13.	267.	1630.
-11.80	0.	154.	25.	279.	1702.
-12.80	0.	225.	37.	291.	1773.
-13.80	0.	297.	49.	302.	1844.
-14.80	0.	229.	60.	314.	1916.
-15.80	0.	250.	72.	326.	1987.
-16.60	0.	335.	81.	335.	2044.
-16.80	0.	356.	84.	337.	2059.
-17.80	0.	390.	95.	349.	2130.
-18.80	0.	464.	107.	361.	2201.
-19.80+	0.	686.	118.	373.	2273.
-19.80+	0.	686.	118.	328.	2449.
-20.80	0.	853.	128.	346.	2586.
-21.80	0.	884.	142.	364.	2724.
-22.80	0.	981.	160.	383.	2861.
-23.80	0.	1084.	179.	401.	2999.
-24.80	0.	1189.	197.	420.	3136.
-25.80	0.	1297.	215.	438.	3274.
-26.80	0.	1407.	233.	456.	3411.
-27.80	0.	1515.	250.	475.	3549.
-28.80	0.	1620.	267.	493.	3686.
-29.02	0.	1645.	271.	497.	3717.
-29.80	0.	1732.	284.	512.	3824.
-30.80	0.	1845.	300.	530.	3962.
-31.80	0.	1953.	317.	548.	4099.
-32.73	0.	1928.	334.	567.	4237.
-33.80	0.	1954.	351.	585.	4374.

S2 573_63 TO PROP BENCHED10 UND REV NOAD ALYS OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:50:58

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*  INPUT DATA  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - UNDRAINED
'LOW WATER

II.--CONTROL
ANCHORED WALL ANALYSIS
SAME FACTOR OF SAFETY APPLIED TO BOTH ACTIVE AND PASSIVE PRESSURES.

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.
ELEVATION AT ANCHOR = -4.00 FT.
ELEVATION AT BOTTOM OF WALL = -13.81 FT. ← FROM "DESIGN" MODE COMPUTATIONS. PROGRAM FAILED TO RUN WHEN ACTUAL FIELD LENGTH (30') INPUT
WALL MODULUS OF ELASTACITY = 2.900E+07 PSI.
WALL MOMENT OF INERTIA = 39.75 IN^4.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-8.87
10.00	-8.87
48.00	-25.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-6.60	0.00	DEF	DEF
103.00	93.00	0.00	250.00	0.00	0.00	-39.90	0.00	DEF	DEF
128.00	117.00	28.00	0.00	15.10	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	0.00	250.00	0.00	0.00	-39.90	0.00	DEF	DEF
128.00	117.00	28.00	0.00	15.10	0.00			DEF	DEF

```
VI.--WATER DATA
    UNIT WEIGHT          = 62.40 (PCF)
    RIGHTSIDE ELEVATION = -4.70 (FT)
    LEFTSIDE ELEVATION  = -5.00 (FT)
    NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
    NONE

VIII.--HORIZONTAL LOADS
    NONE
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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:51:02

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*  SUMMARY OF RESULTS FOR  *
*  ANCHORED WALL ANALYSIS  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - UNDRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

*****WARNING: STANDARD WEDGE SOLUTION DOES NOT EXIST AT ALL ELEVATIONS. SEE COMPLETE OUTPUT.

METHOD	:	FREE EARTH	FIXED EARTH
FACTOR OF SAFETY	:	1.30	1.04
MAXIMUM BENDING MOMENT (LB-FT)	:	-1.0925E+03	-7.0089E+02
AT ELEVATION (FT)	:	-7.64	-7.18
MAXIMUM DEFLECTION (IN.)	:	-1.5190E-02	-5.5700E-03
AT ELEVATION (FT)	:	0.00	0.00
ANCHOR FORCE (LB)	:	1.0210E+03	9.0630E+02

S2 573_63 TO PROP BENCHED10 UND REV NOAD ALYS OUT

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:51:03

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*  COMPLETE OF RESULTS FOR   *
*   ANCHORED WALL ANALYSIS   *
*    BY FREE EARTH METHOD    *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - UNDRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 1021. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-1.5190E-02	0.00
-1.00	5.8612E+00	18.	-1.1505E-02	35.17
-2.00	4.6890E+01	70.	-7.8061E-03	70.33
-3.00	1.5825E+02	158.	-4.0283E-03	105.50
-4.00	3.7512E+02	281.	0.0000E+00	140.67
-4.00	3.7512E+02	-740.	0.0000E+00	140.67
-4.70	-1.0618E+02	-633.	3.0498E-03	165.29
-5.00	-2.8815E+02	-579.	4.3531E-03	189.85
-6.00	-7.6929E+02	-380.	8.2972E-03	209.34
-6.60	-9.5874E+02	-251.	1.0156E-02	221.03
-6.60	-9.5874E+02	-251.	1.0156E-02	220.56
-7.00	-1.0409E+03	-159.	1.1114E-02	236.80
-8.00	-1.0749E+03	98.	1.2401E-02	277.40
-8.87	-8.8022E+02	355.	1.2229E-02	312.72
-8.87	-8.8022E+02	355.	1.2229E-02	-71.45
-9.00	-8.3472E+02	345.	1.2110E-02	-71.45
-9.87	-5.6128E+02	283.	1.0827E-02	-71.45
-10.00	-5.2507E+02	274.	1.0573E-02	-71.45
-11.00	-2.8687E+02	202.	8.2405E-03	-71.45
-12.00	-1.2013E+02	131.	5.4685E-03	-71.45
-13.00	-2.4831E+01	60.	2.5076E-03	-71.45
-13.83	0.0000E+00	0.	0.0000E+00	-71.45

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES------------->			
		<----LEFTSIDE---->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	395.
-2.00	0.	0.	0.	70.	791.
-3.00	0.	0.	0.	106.	1186.
-4.00	0.	0.	0.	141.	1581.
-4.70	0.	0.	0.	165.	1858.
-5.00	19.	0.	0.	171.	1923.
-6.00	19.	0.	0.	191.	2142.
-6.60+	19.	0.	0.	202.	2274.
-6.60+	19.	0.	0.	202.	1086.
-7.00	19.	0.	0.	218.	1102.
-8.00	19.	0.	0.	259.	1143.

-8.87+	19.	0.	0.	294.	1178.
-8.87+	19.	384.	0.	294.	1178.
-9.00	19.	389.	0.	299.	1183.
-9.87	19.	425.	0.	335.	1219.
-10.00	19.	430.	0.	340.	1224.
-11.00	19.	471.	0.	380.	1265.
-12.00	19.	511.	0.	421.	1305.
-13.00	19.	552.	0.	462.	1346.
-14.00	19.	592.	0.	502.	1386.

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE AT THIS ELEVATION.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:51:04

****
* COMPLETE OF RESULTS FOR *
* ANCHORED WALL ANALYSIS *
* BY FIXED EARTH METHOD *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - UNDRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 906. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-5.5700E-03	0.00
-1.00	5.8612E+00	18.	-4.2895E-03	35.17
-2.00	4.6890E+01	70.	-2.9959E-03	70.33
-3.00	1.5825E+02	158.	-1.6231E-03	105.50
-4.00	3.7512E+02	281.	0.0000E+00	140.67
-4.00	3.7512E+02	-625.	0.0000E+00	140.67
-4.70	-2.5879E+01	-518.	1.3760E-03	165.29
-5.00	-1.7343E+02	-465.	1.9766E-03	189.85
-6.00	-5.3986E+02	-265.	3.7162E-03	209.34
-6.60	-6.6049E+02	-136.	4.4064E-03	221.03
-6.60	-6.6049E+02	-136.	4.4064E-03	220.56
-7.00	-6.9677E+02	-44.	4.6728E-03	236.80
-8.00	-6.1603E+02	213.	4.6144E-03	277.40
-8.87	-3.2156E+02	469.	3.8261E-03	312.72
-8.87	-3.2156E+02	469.	3.8261E-03	-166.49
-9.00	-2.6195E+02	448.	3.6673E-03	-166.49
-9.87	6.4568E+01	303.	2.4999E-03	-166.49
-10.00	1.0254E+02	281.	2.3236E-03	-166.49
-11.00	3.0053E+02	115.	1.1128E-03	-166.49
-12.00	3.3203E+02	-52.	3.3167E-04	-166.49
-13.00	1.9704E+02	-218.	2.7490E-05	-166.49
-14.00	0.0000E+00	-337.	0.0000E+00	-166.49

III.--WATER AND SOIL PRESSURES

S2 573_63 TO PROP BENCHED10 UND REV NOAD ALYS OUT

ELEVATION (FT)	WATER PRESSURE (PSF)	SOIL PRESSURES LEFTSIDE PASSIVE (PSF)	SOIL PRESSURES LEFTSIDE ACTIVE (PSF)	SOIL PRESSURES RIGHTSIDE ACTIVE (PSF)	SOIL PRESSURES RIGHTSIDE PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	550.
-2.00	0.	0.	0.	70.	1099.
-3.00	0.	0.	0.	106.	1649.
-4.00	0.	0.	0.	141.	2199.
-4.70	0.	0.	0.	165.	2584.
-5.00	19.	0.	0.	171.	2675.
-6.00	19.	0.	0.	191.	2980.
-6.60+	19.	0.	0.	202.	3162.
-6.60+	19.	0.	0.	202.	1181.
-7.00	19.	0.	0.	218.	1197.
-8.00	19.	0.	0.	259.	1238.
-8.87+	19.	0.	0.	294.	1273.
-8.87+	19.	479.	0.	294.	1273.
-9.00	19.	484.	0.	299.	1278.
-9.87	19.	520.	0.	335.	1314.
-10.00	19.	525.	0.	340.	1319.
-11.00	19.	566.	0.	380.	1360.
-12.00	19.	606.	0.	421.	1400.
-13.00	19.	647.	0.	462.	1441.
-14.00	19.	687.	0.	502.	1481.

S2 573_63 TO PROP BENCHED10 DND REV NOAD ALYS OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:51:37

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - DRAINED
'LOW WATER

II.--CONTROL
ANCHORED WALL ANALYSIS
SAME FACTOR OF SAFETY APPLIED TO BOTH ACTIVE AND PASSIVE PRESSURES.

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.
ELEVATION AT ANCHOR = -4.00 FT.
ELEVATION AT BOTTOM OF WALL = -21.45 FT. ← FROM "DESIGN" MODE RESULTS
WALL MODULUS OF ELASTACITY = 2.900E+07 PSI. PROGRAM FAILED W/ 30' SHEET
WALL MOMENT OF INERTIA = 39.75 IN^4.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-8.87
10.00	-8.87
48.00	-25.50

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH- ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH- ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-6.60	0.00	DEF	DEF
103.00	93.00	30.00	0.00	16.20	0.00	-39.90	0.00	DEF	DEF
128.00	117.00	28.00	0.00	15.10	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH- ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH- ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	30.00	0.00	16.20	0.00	-39.90	0.00	DEF	DEF
128.00	117.00	28.00	0.00	15.10	0.00			DEF	DEF

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VI.--WATER DATA
    UNIT WEIGHT          = 62.40 (PCF)
    RIGHTSIDE ELEVATION = -4.70 (FT)
    LEFTSIDE ELEVATION  = -5.00 (FT)
    NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
    NONE

VIII.--HORIZONTAL LOADS
    NONE
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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:51:41

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*  SUMMARY OF RESULTS FOR  *
*  ANCHORED WALL ANALYSIS  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - DRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

*****WARNING: STANDARD WEDGE SOLUTION DOES NOT EXIST AT ALL ELEVATIONS. SEE COMPLETE OUTPUT.

METHOD	:	FREE EARTH	FIXED EARTH
FACTOR OF SAFETY	:	2.00	1.54
MAXIMUM BENDING MOMENT (LB-FT)	:	-3.1031E+03	-1.9235E+03
AT ELEVATION (FT)	:	-9.56	-8.54
MAXIMUM DEFLECTION (IN.)	:	1.2554E-01	-4.3797E-02
AT ELEVATION (FT)	:	-12.00	0.00
ANCHOR FORCE (LB)	:	1.4557E+03	1.2212E+03

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:51:42

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* COMPLETE OF RESULTS FOR    *
*  ANCHORED WALL ANALYSIS    *
*   BY FREE EARTH METHOD     *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - DRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 1456. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-1.0278E-01	0.00
-1.00	5.8612E+00	18.	-7.7196E-02	35.17
-2.00	4.6890E+01	70.	-5.1600E-02	70.33
-3.00	1.5825E+02	158.	-2.5925E-02	105.50
-4.00	3.7512E+02	281.	0.0000E+00	140.67
-4.00	3.7512E+02	-1174.	0.0000E+00	140.67
-4.70	-4.1044E+02	-1067.	1.8340E-02	165.29
-5.00	-7.2281E+02	-1014.	2.6141E-02	189.85
-6.00	-1.6386E+03	-814.	5.1222E-02	209.34
-6.60	-2.0889E+03	-685.	6.5179E-02	221.03
-7.00	-2.3452E+03	-596.	7.3873E-02	225.71
-8.00	-2.8263E+03	-364.	9.3036E-02	237.41
-8.87	-3.0521E+03	-153.	1.0630E-01	247.60
-9.00	-3.0700E+03	-122.	1.0799E-01	237.93
-9.87	-3.0941E+03	57.	1.1729E-01	173.25
-10.00	-3.0853E+03	79.	1.1838E-01	163.58
-11.00	-2.9369E+03	205.	1.2416E-01	89.24
-12.00	-2.6994E+03	257.	1.2554E-01	14.89
-12.20	-2.6476E+03	259.	1.2532E-01	0.00
-13.00	-2.4469E+03	235.	1.2289E-01	-59.46
-14.00	-2.2151E+03	255.	1.1656E-01	99.36
-15.00	-1.9151E+03	340.	1.0692E-01	70.46
-16.00	-1.5475E+03	388.	9.4415E-02	24.89
-17.00	-1.1530E+03	396.	7.9597E-02	-8.56
-18.00	-7.6726E+02	370.	6.3049E-02	-43.31
-19.00	-4.2505E+02	309.	4.5346E-02	-79.40
-20.00	-1.6247E+02	210.	2.6995E-02	-116.85
-21.00	-1.6974E+01	74.	8.3862E-03	-155.72
-21.45	0.0000E+00	0.	0.0000E+00	-173.85

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES------------->			
		<----LEFTSIDE---->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	256.
-2.00	0.	0.	0.	70.	513.
-3.00	0.	0.	0.	106.	769.
-4.00	0.	0.	0.	141.	1026.

-4.70	0.	0.	0.	165.	1205.
-5.00	19.	0.	0.	171.	1248.
-6.00	19.	0.	0.	191.	1390.
-6.60	19.	0.	0.	202.	1475.
-7.00	19.	0.	0.	207.	1509.
-8.00	19.	0.	0.	219.	1594.
-8.87	19.	0.	0.	229.	1669.
-9.00	19.	11.	2.	230.	1680.
-9.87	19.	86.	12.	241.	1754.
-10.00	19.	97.	13.	242.	1765.
-11.00	19.	183.	25.	254.	1850.
-12.00	19.	269.	37.	266.	1936.
-12.20	19.	287.	39.	268.	1953.
-13.00	19.*	355.	48.	277.	2021.
-14.00	19.*	208.	60.	289.	2106.
-15.00	19.*	249.	72.	301.	2192.
-16.00	19.*	306.	83.	312.	2277.
-17.00	19.*	351.	95.	324.	2362.
-18.00	19.*	398.	107.	336.	2448.
-19.00	19.*	446.	119.	347.	2533.
-20.00	19.*	495.	130.	359.	2618.
-21.00	19.*	545.	142.	371.	2704.
-22.00	19.*	597.	154.	383.	2789.

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE AT THIS ELEVATION.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:51:43

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* COMPLETE OF RESULTS FOR  *
*  ANCHORED WALL ANALYSIS  *
*   BY FIXED EARTH METHOD  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 2
'ELEV. 573.63 SLOPED TO PROPOSED CHANNEL ELEVATION W/ 10' BENCH - DRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 1221. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-4.3797E-02	0.00
-1.00	5.8612E+00	18.	-3.2960E-02	35.17
-2.00	4.6890E+01	70.	-2.2110E-02	70.33
-3.00	1.5825E+02	158.	-1.1180E-02	105.50
-4.00	3.7512E+02	281.	0.0000E+00	140.67
-4.00	3.7512E+02	-940.	0.0000E+00	140.67
-4.70	-2.4629E+02	-833.	8.0388E-03	165.29
-5.00	-4.8831E+02	-779.	1.1455E-02	189.85
-6.00	-1.1696E+03	-580.	2.2201E-02	209.34
-6.60	-1.4792E+03	-451.	2.7872E-02	221.03
-7.00	-1.6417E+03	-361.	3.1219E-02	225.71

-8.00	-1.8883E+03	-130.	3.7805E-02	237.41
-8.87	-1.9101E+03	81.	4.1261E-02	247.60
-9.00	-1.8975E+03	112.	4.1590E-02	234.85
-9.87	-1.7216E+03	280.	4.2584E-02	149.58
-10.00	-1.6840E+03	298.	4.2559E-02	136.84
-11.00	-1.3336E+03	386.	4.1021E-02	38.83
-11.40	-1.1785E+03	394.	3.9828E-02	0.00
-12.00	-9.4432E+02	376.	3.7489E-02	-59.18
-13.00	-5.8902E+02	344.	3.2536E-02	-5.76
-14.00	-2.4074E+02	361.	2.6699E-02	40.03
-15.00	1.2753E+02	364.	2.0505E-02	-34.31
-16.00	4.6785E+02	311.	1.4498E-02	-70.55
-17.00	7.3732E+02	222.	9.1831E-03	-108.53
-18.00	8.9797E+02	93.	4.9602E-03	-148.30
-19.00	9.1000E+02	-76.	2.0649E-03	-189.97
-20.00	7.3173E+02	-288.	5.0991E-04	-233.60
-21.00	3.1951E+02	-544.	2.2602E-05	-279.32
-22.00	0.0000E+00	-695.	0.0000E+00	-304.05

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES	-------------->		
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	326.
-2.00	0.	0.	0.	70.	652.
-3.00	0.	0.	0.	106.	979.
-4.00	0.	0.	0.	141.	1305.
-4.70	0.	0.	0.	165.	1533.
-5.00	19.	0.	0.	171.	1588.
-6.00	19.	0.	0.	191.	1768.
-6.60	19.	0.	0.	202.	1877.
-7.00	19.	0.	0.	207.	1920.
-8.00	19.	0.	0.	219.	2029.
-8.87	19.	0.	0.	229.	2123.
-9.00	19.	14.	2.	230.	2137.
-9.87	19.	110.	12.	241.	2232.
-10.00	19.	124.	13.	242.	2246.
-11.00	19.	234.	25.	254.	2354.
-11.40	19.	277.	30.	258.	2398.
-12.00	19.	343.	37.	266.	2463.
-13.00	19.*	302.	48.	277.	2572.
-14.00	19.*	268.	60.	289.	2680.
-15.00	19.*	354.	72.	301.	2789.
-16.00	19.*	402.	83.	312.	2897.
-17.00	19.*	451.	95.	324.	3006.
-18.00	19.*	503.	107.	336.	3114.
-19.00	19.*	556.	119.	347.	3223.
-20.00	19.*	611.	130.	359.	3332.
-21.00	19.*	669.	142.	371.	3440.
-22.00	19.*	728.	154.	383.	3549.

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE AT THIS ELEVATION.

S3 568_85 TO PROP BENCHED10 UND REV NOAD ALYS OUT

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:42:18

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*  INPUT DATA  *
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I.--HEADING

'KINNICKINNIC RIVER WALL SECTIONS

'SECTION 3

'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH UNDRAINED

'LOW WATER

II.--CONTROL

ANCHORED WALL ANALYSIS

SAME FACTOR OF SAFETY APPLIED TO BOTH ACTIVE AND PASSIVE PRESSURES.

III.--WALL DATA

ELEVATION AT TOP OF WALL = 0.00 FT.

ELEVATION AT ANCHOR = -4.00 FT.

ELEVATION AT BOTTOM OF WALL = -30.00 FT. ← FROM GEOPHYSICAL REPORT

WALL MODULUS OF ELASTACITY = 2.900E+07 PSI.

WALL MOMENT OF INERTIA = 184.00 IN^4.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-16.05
10.00	-16.05
52.00	-27.90

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-3.70	0.00	DEF	DEF
112.00	102.00	0.00	250.00	0.00	0.00	-7.50	0.00	DEF	DEF
103.00	93.00	0.00	250.00	0.00	0.00	-20.30	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

V.B.--LEFTSIDE

LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT

LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	0.00	250.00	0.00	0.00	-20.30	0.00	DEF	DEF

```
            S3 568_85 TO PROP BENCHED10 UND REV NOAD ALYS OUT
135.00  129.00     0.00  750.00     0.00    0.00                  DEF  DEF

     VI.--WATER DATA
        UNIT WEIGHT          = 62.40 (PCF)
        RIGHTSIDE ELEVATION = -7.40 (FT)
        LEFTSIDE ELEVATION  = -7.40 (FT)
        NO SEEPAGE

    VII.--VERTICAL SURCHARGE LOADS
        NONE

   VIII.--HORIZONTAL LOADS
        NONE
```

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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
                         BY CLASSICAL METHODS
DATE: 29-NOVEMBER-2006                                    TIME: 14:42:24

                    ****************************
                    *  SUMMARY OF RESULTS FOR  *
                    *  ANCHORED WALL ANALYSIS  *
                    ****************************

     I.--HEADING
      'KINNICKINNIC RIVER WALL SECTIONS
      'SECTION 3
      'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH UNDRAINED
      'LOW WATER

    II.--SUMMARY

        RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
        AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

        LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

        *****WARNING:  STANDARD WEDGE SOLUTION DOES NOT EXIST
                       AT ALL ELEVATIONS.  SEE COMPLETE OUTPUT.

    METHOD                          :   FREE EARTH       FIXED EARTH

    FACTOR OF SAFETY                :        11.80              2.53


    MAXIMUM BENDING MOMENT (LB-FT)  :  -2.6975E+04      -1.5905E+04
          AT ELEVATION (FT)         :       -14.73           -12.81

    MAXIMUM DEFLECTION (IN.)        :   5.1754E-01       1.9593E-01
          AT ELEVATION (FT)         :       -16.00           -14.00

    ANCHOR FORCE (LB)               :   4.2780E+03       3.1473E+03
```

S3 568_85 TO PROP BENCHED10 UND REV NOAD ALYS OUT

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:42:25

****
* COMPLETE OF RESULTS FOR *
* ANCHORED WALL ANALYSIS *
* BY FREE EARTH METHOD *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH UNDRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 4278. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-2.7614E-01	0.00
-1.00	5.8612E+00	18.	-2.0713E-01	35.17
-2.00	4.6890E+01	70.	-1.3812E-01	70.33
-3.00	1.5825E+02	158.	-6.9086E-02	105.50
-3.70	2.9689E+02	241.	-2.0735E-02	130.12
-3.70	2.9689E+02	241.	-2.0735E-02	0.00
-4.00	3.6910E+02	241.	0.0000E+00	0.00
-4.00	3.6910E+02	-4037.	0.0000E+00	0.00
-4.18	-3.4335E+02	-4037.	1.2201E-02	0.00
-5.00	-3.6587E+03	-4003.	6.8975E-02	84.00
-6.00	-7.6023E+03	-3868.	1.3677E-01	186.00
-7.00	-1.1360E+04	-3631.	2.0210E-01	288.00
-7.40	-1.2788E+04	-3507.	2.2727E-01	328.80
-7.50	-1.3137E+04	-3474.	2.3347E-01	333.76
-8.00	-1.4832E+04	-3302.	2.6377E-01	354.06
-9.00	-1.7950E+04	-2928.	3.2064E-01	394.66
-10.00	-2.0674E+04	-2513.	3.7171E-01	435.26
-11.00	-2.2962E+04	-2057.	4.1609E-01	475.86
-12.00	-2.4775E+04	-1561.	4.5306E-01	516.46
-13.00	-2.6071E+04	-1024.	4.8201E-01	557.06
-14.00	-2.6810E+04	-447.	5.0253E-01	597.66
-15.00	-2.6952E+04	171.	5.1439E-01	638.26
-16.00	-2.6455E+04	829.	5.1754E-01	678.86
-16.05	-2.6413E+04	863.	5.1747E-01	680.89
-16.05	-2.6413E+04	863.	5.1747E-01	638.52
-17.00	-2.5304E+04	1470.	5.1214E-01	638.52
-17.05	-2.5230E+04	1502.	5.1165E-01	638.52
-18.00	-2.3515E+04	2109.	4.9856E-01	638.52
-19.00	-2.1087E+04	2747.	4.7739E-01	638.52
-20.00	-1.8021E+04	3386.	4.4940E-01	638.52
-20.30	-1.6983E+04	3509.	4.3982E-01	183.01
-20.54	-1.6137E+04	3531.	4.3179E-01	0.00
-21.00	-1.4526E+04	3450.	4.1559E-01	-350.49
-22.00	-1.1263E+04	3063.	3.7707E-01	-423.09
-22.32	-1.0308E+04	2925.	3.6397E-01	-446.23
-23.00	-8.4193E+03	2621.	3.3489E-01	-446.23
-24.00	-6.0215E+03	2175.	2.8997E-01	-446.23
-25.00	-4.0660E+03	1740.	2.4309E-01	-422.30
-26.00	-2.5308E+03	1336.	1.9488E-01	-386.44
-27.00	-1.3844E+03	960.	1.4584E-01	-364.97

-28.00	-5.9894E+02	618.	9.6343E-02	-319.11
-29.00	-1.4023E+02	299.	4.6644E-02	-319.11
-29.94	0.0000E+00	0.	0.0000E+00	-319.11

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	139.
-2.00	0.	0.	0.	70.	277.
-3.00	0.	0.	0.	106.	416.
-3.70+	0.	0.	0.	130.	513.
-3.70+	0.	0.	0.	0.	494.
-4.00	0.	0.	0.	0.	524.
-4.18	0.	0.	0.	0.	542.
-5.00	0.	0.	0.	84.	626.
-6.00	0.	0.	0.	186.	728.
-7.00	0.	0.	0.	288.	830.
-7.40	0.	0.	0.	329.	871.
-7.50	0.	0.	0.	334.	876.
-8.00	0.	0.	0.	354.	896.
-9.00	0.	0.	0.	395.	937.
-10.00	0.	0.	0.	435.	978.
-11.00	0.	0.	0.	476.	1018.
-12.00	0.	0.	0.	516.	1059.
-13.00	0.	0.	0.	557.	1099.
-14.00	0.	0.	0.	598.	1140.
-15.00	0.	0.	0.	638.	1181.
-16.00	0.	0.	0.	679.	1221.
-16.05+	0.	0.	0.	681.	1223.
-16.05+	0.	42.	0.	681.	1223.
-17.00	0.	81.	0.	719.	1262.
-17.05	0.	83.	0.	721.	1264.
-18.00	0.	122.	0.	760.	1302.
-19.00	0.	162.	0.	801.	1343.
-20.00	0.	203.	0.	841.	1384.
-20.30+	0.	244.	0.	853.	1396.
-20.30+	0.	244.	0.	0.	1481.
-20.54	0.	280.	0.	0.	1498.
-21.00	0.	350.	0.	0.	1531.
-22.00	0.	423.	0.	0.	1604.
-22.32	0.	446.	0.	0.	1627.
-23.00	0.	496.	0.	49.	1677.
-24.00	0.	568.	0.	122.	1749.
-25.00	0.	617.	0.	195.	1822.
-26.00	0.	654.	0.	267.	1894.
-27.00	0.	705.	0.	340.	1967.
-28.00	0.	732.	0.	412.	2040.
-29.00	0.	804.	0.	485.	2112.
-30.00	0.	877.	0.	558.	2185.

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE AT THIS ELEVATION.

****
* COMPLETE OF RESULTS FOR *
* ANCHORED WALL ANALYSIS *
* BY FIXED EARTH METHOD *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH UNDRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 3147. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-1.2909E-01	0.00
-1.00	5.8612E+00	18.	-9.6842E-02	35.17
-2.00	4.6890E+01	70.	-6.4591E-02	70.33
-3.00	1.5825E+02	158.	-3.2322E-02	105.50
-3.70	2.9689E+02	241.	-9.7059E-03	130.12
-3.70	2.9689E+02	241.	-9.7059E-03	0.00
-4.00	3.6910E+02	241.	0.0000E+00	0.00
-4.00	3.6910E+02	-2907.	0.0000E+00	0.00
-4.18	-1.4382E+02	-2907.	5.7133E-03	0.00
-5.00	-2.5280E+03	-2872.	3.2273E-02	84.00
-6.00	-5.3410E+03	-2737.	6.3729E-02	186.00
-7.00	-7.9679E+03	-2500.	9.3461E-02	288.00
-7.40	-8.9438E+03	-2377.	1.0468E-01	328.80
-7.50	-9.1798E+03	-2343.	1.0741E-01	333.76
-8.00	-1.0309E+04	-2172.	1.2062E-01	354.06
-9.00	-1.2297E+04	-1797.	1.4445E-01	394.66
-10.00	-1.3890E+04	-1382.	1.6431E-01	435.26
-11.00	-1.5048E+04	-927.	1.7968E-01	475.86
-12.00	-1.5730E+04	-431.	1.9019E-01	516.46
-13.00	-1.5895E+04	106.	1.9563E-01	557.06
-14.00	-1.5504E+04	684.	1.9593E-01	597.66
-15.00	-1.4514E+04	1302.	1.9122E-01	638.26
-16.00	-1.2887E+04	1960.	1.8183E-01	678.86
-16.05	-1.2788E+04	1994.	1.8125E-01	680.89
-16.05	-1.2788E+04	1994.	1.8125E-01	483.52
-17.00	-1.0675E+04	2453.	1.6829E-01	483.52
-17.05	-1.0552E+04	2478.	1.6751E-01	483.52
-18.00	-7.9802E+03	2937.	1.5130E-01	483.52
-19.00	-4.8014E+03	3421.	1.3174E-01	483.52
-20.00	-1.1391E+03	3904.	1.1064E-01	483.52
-20.26	-9.5355E+01	3968.	1.0494E-01	0.00
-20.30	4.5646E+01	3967.	1.0418E-01	-64.98
-21.00	2.7452E+03	3659.	8.9175E-02	-815.47
-22.00	5.9841E+03	2807.	6.8582E-02	-888.07
-22.32	6.8332E+03	2520.	6.2379E-02	-911.21
-23.00	8.3387E+03	1899.	4.9903E-02	-911.21
-24.00	9.7825E+03	988.	3.3900E-02	-911.21
-25.00	1.0317E+04	84.	2.1041E-02	-897.29
-26.00	9.9577E+03	-798.	1.1498E-02	-867.04
-27.00	8.7295E+03	-1655.	5.1567E-03	-845.73
-28.00	6.6540E+03	-2495.	1.6195E-03	-834.06
-29.00	3.7445E+03	-3322.	2.1452E-04	-821.75
-30.00	1.3025E+01	-4139.	6.9311E-12	-810.91
-31.00	0.0000E+00	-4141.	0.0000E+00	-810.87

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	219.
-2.00	0.	0.	0.	70.	438.
-3.00	0.	0.	0.	106.	657.
-3.70+	0.	0.	0.	130.	810.
-3.70+	0.	0.	0.	0.	649.
-4.00	0.	0.	0.	0.	679.
-4.18	0.	0.	0.	0.	697.
-5.00	0.	0.	0.	84.	781.
-6.00	0.	0.	0.	186.	883.
-7.00	0.	0.	0.	288.	985.
-7.40	0.	0.	0.	329.	1026.
-7.50	0.	0.	0.	334.	1031.
-8.00	0.	0.	0.	354.	1051.
-9.00	0.	0.	0.	395.	1092.
-10.00	0.	0.	0.	435.	1133.
-11.00	0.	0.	0.	476.	1173.
-12.00	0.	0.	0.	516.	1214.
-13.00	0.	0.	0.	557.	1254.
-14.00	0.	0.	0.	598.	1295.
-15.00	0.	0.	0.	638.	1336.
-16.00	0.	0.	0.	679.	1376.
-16.05+	0.	0.	0.	681.	1378.
-16.05+	0.	197.	0.	681.	1378.
-17.00	0.	236.	0.	719.	1417.
-17.05	0.	238.	0.	721.	1419.
-18.00	0.	277.	0.	760.	1457.
-19.00	0.	317.	0.	801.	1498.
-20.00	0.	358.	0.	841.	1539.
-20.26	0.	476.	0.	852.	1549.
-20.30+	0.	492.	0.	853.	1551.
-20.30+	0.	492.	0.	0.	1946.
-21.00	0.	815.	0.	0.	1996.
-22.00	0.	888.	0.	0.	2069.
-22.32	0.	911.	0.	0.	2092.
-23.00	0.	961.	0.	49.	2142.
-24.00	0.	1033.	0.	122.	2214.
-25.00	0.	1092.	0.	195.	2287.
-26.00	0.	1134.	0.	267.	2359.
-27.00	0.	1186.	0.	340.	2432.
-28.00	0.	1247.	0.	412.	2505.
-29.00	0.	1307.	0.	485.	2577.
-30.00	0.	1369.	0.	558.	2650.
-31.00	0.	1431.	0.	630.	2722.

S3 568_85 TO PROP BENCHED10 DND REV NOAD ALYS OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:43:04

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH DRAINED
'LOW WATER

II.--CONTROL
ANCHORED WALL ANALYSIS
SAME FACTOR OF SAFETY APPLIED TO BOTH ACTIVE AND PASSIVE PRESSURES.

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.
ELEVATION AT ANCHOR = -4.00 FT.
ELEVATION AT BOTTOM OF WALL = -30.00 FT.
WALL MODULUS OF ELASTACITY = 2.900E+07 PSI.
WALL MOMENT OF INERTIA = 184.00 IN^4.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-16.05
10.00	-16.05
52.00	-27.90

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	<-SAFETY-> <-FACTOR-> PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-3.70	0.00	DEF	DEF
112.00	102.00	30.00	0.00	16.20	0.00	-7.50	0.00	DEF	DEF
103.00	93.00	30.00	0.00	16.20	0.00	-20.30	0.00	DEF	DEF
135.00	129.00	33.00	0.00	17.80	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	<--BOTTOM--> SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	<-SAFETY-> <-FACTOR-> PASS.
103.00	93.00	30.00	0.00	16.20	0.00	-20.30	0.00	DEF	DEF

```
         S3 568_85 TO PROP BENCHED10 DND REV NOAD ALYS OUT
135.00  129.00   33.00    0.00    17.80    0.00                 DEF  DEF
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VI.--WATER DATA
UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -7.40 (FT)
LEFTSIDE ELEVATION = -7.40 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:43:09

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****************************
*   SUMMARY OF RESULTS FOR  *
*   ANCHORED WALL ANALYSIS  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH DRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

*****WARNING: STANDARD WEDGE SOLUTION DOES NOT EXIST
AT ALL ELEVATIONS. SEE COMPLETE OUTPUT.

METHOD	:	FREE EARTH	FIXED EARTH
FACTOR OF SAFETY	:	3.88	2.17
MAXIMUM BENDING MOMENT (LB-FT)	:	-1.5474E+04	-9.3568E+03
AT ELEVATION (FT)	:	-14.63	-12.60
MAXIMUM DEFLECTION (IN.)	:	3.1233E-01	1.1938E-01
AT ELEVATION (FT)	:	-16.05	-14.00
ANCHOR FORCE (LB)	:	2.9600E+03	2.3247E+03

S3 568_85 TO PROP BENCHED10 DND REV NOAD ALYS OUT

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:43:10

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*****************************
* COMPLETE OF RESULTS FOR   *
*  ANCHORED WALL ANALYSIS   *
*   BY FREE EARTH METHOD    *
*****************************
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH DRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 2960. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-1.6529E-01	0.00
-1.00	5.8612E+00	18.	-1.2399E-01	35.17
-2.00	4.6890E+01	70.	-8.2691E-02	70.33
-3.00	1.5825E+02	158.	-4.1372E-02	105.50
-3.70	2.9689E+02	241.	-1.2421E-02	130.12
-4.00	3.7509E+02	281.	0.0000E+00	138.94
-4.00	3.7509E+02	-2679.	0.0000E+00	138.94
-5.00	-2.2295E+03	-2525.	4.1338E-02	168.34
-6.00	-4.6657E+03	-2342.	8.1958E-02	197.74
-7.00	-6.9042E+03	-2130.	1.2107E-01	227.15
-7.40	-7.7376E+03	-2037.	1.3613E-01	238.91
-7.50	-7.9401E+03	-2013.	1.3984E-01	240.34
-8.00	-8.9161E+03	-1891.	1.5796E-01	246.19
-9.00	-1.0682E+04	-1639.	1.9196E-01	257.89
-10.00	-1.2190E+04	-1375.	2.2251E-01	269.59
-11.00	-1.3429E+04	-1100.	2.4913E-01	281.30
-12.00	-1.4386E+04	-813.	2.7140E-01	293.00
-13.00	-1.5050E+04	-514.	2.8902E-01	304.70
-14.00	-1.5409E+04	-203.	3.0177E-01	316.41
-15.00	-1.5453E+04	119.	3.0954E-01	328.11
-16.00	-1.5168E+04	453.	3.1232E-01	339.81
-16.05	-1.5144E+04	470.	3.1233E-01	340.40
-17.00	-1.4551E+04	772.	3.1019E-01	295.30
-17.05	-1.4512E+04	787.	3.0996E-01	292.92
-18.00	-1.3639E+04	1044.	3.0336E-01	247.82
-19.00	-1.2480E+04	1268.	2.9212E-01	200.35
-20.00	-1.1120E+04	1444.	2.7685E-01	152.87
-20.30	-1.0681E+04	1483.	2.7154E-01	105.77
-21.00	-9.6240E+03	1525.	2.5798E-01	14.76
-21.30	-9.1653E+03	1527.	2.5167E-01	0.00
-22.00	-8.0996E+03	1515.	2.3599E-01	-34.36
-23.00	-6.6114E+03	1451.	2.1137E-01	-94.32
-24.00	-5.1968E+03	1389.	1.8462E-01	-30.01
-25.00	-3.8320E+03	1332.	1.5618E-01	-84.21
-26.00	-2.5656E+03	1178.	1.2649E-01	-223.81
-27.00	-1.5089E+03	926.	9.5971E-02	-279.26
-28.00	-7.2034E+02	653.	6.4954E-02	-267.17
-29.00	-2.0655E+02	369.	3.3697E-02	-301.00
-30.00	-1.0998E+00	29.	2.3643E-03	-378.82
-30.08	0.0000E+00	0.	0.0000E+00	-390.26

S3 568_85 TO PROP BENCHED10 DND REV NOAD ALYS OUT

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	178.
-2.00	0.	0.	0.	70.	355.
-3.00	0.	0.	0.	106.	533.
-3.70	0.	0.	0.	130.	657.
-4.00	0.	0.	0.	139.	701.
-5.00	0.	0.	0.	168.	850.
-6.00	0.	0.	0.	198.	998.
-7.00	0.	0.	0.	227.	1147.
-7.40	0.	0.	0.	239.	1206.
-7.50	0.	0.	0.	240.	1213.
-8.00	0.	0.	0.	246.	1243.
-9.00	0.	0.	0.	258.	1302.
-10.00	0.	0.	0.	270.	1361.
-11.00	0.	0.	0.	281.	1420.
-12.00	0.	0.	0.	293.	1479.
-13.00	0.	0.	0.	305.	1538.
-14.00	0.	0.	0.	316.	1597.
-15.00	0.	0.	0.	328.	1656.
-16.00	0.	0.	0.	340.	1715.
-16.05	0.	0.	0.	340.	1718.
-17.00	0.	56.	11.	352.	1774.
-17.05	0.	59.	12.	352.	1777.
-18.00	0.	115.	23.	363.	1834.
-19.00	0.	175.	35.	375.	1893.
-20.00	0.	234.	46.	387.	1952.
-20.30+	0.	261.	49.	390.	1969.
-20.30+	0.	261.	49.	343.	2067.
-21.00	0.	341.	58.	356.	2145.
-21.30	0.	361.	63.	361.	2178.
-22.00	0.	409.	75.	374.	2256.
-23.00	0.	487.	94.	393.	2367.
-24.00	0.	441.	112.	411.	2478.
-25.00	0.	514.	131.	430.	2589.
-26.00	0.	672.	149.	448.	2700.
-27.00	0.	746.	167.	466.	2810.
-28.00	0.	752.	186.	485.	2921.
-29.00	0.	804.	204.	503.	3032.
-30.00	0.	900.	223.	522.	3143.
-31.00	0.	1070.	241.	540.	3254.

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE AT THIS ELEVATION.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:43:10

****
* COMPLETE OF RESULTS FOR *
* ANCHORED WALL ANALYSIS *
* BY FIXED EARTH METHOD *

S3 568_85 TO PROP BENCHED10 DND REV NOAD ALYS OUT
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 568.85 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH DRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 2325. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-7.8620E-02	0.00
-1.00	5.8612E+00	18.	-5.8989E-02	35.17
-2.00	4.6890E+01	70.	-3.9356E-02	70.33
-3.00	1.5825E+02	158.	-1.9705E-02	105.50
-3.70	2.9689E+02	241.	-5.9206E-03	130.12
-4.00	3.7509E+02	281.	0.0000E+00	138.94
-4.00	3.7509E+02	-2044.	0.0000E+00	138.94
-5.00	-1.5942E+03	-1890.	1.9705E-02	168.34
-6.00	-3.3951E+03	-1707.	3.8898E-02	197.74
-7.00	-4.9983E+03	-1495.	5.6996E-02	227.15
-7.40	-5.5776E+03	-1401.	6.3811E-02	238.91
-7.50	-5.7166E+03	-1377.	6.5471E-02	240.34
-8.00	-6.3750E+03	-1256.	7.3483E-02	246.19
-9.00	-7.5056E+03	-1004.	8.7911E-02	257.89
-10.00	-8.3784E+03	-740.	9.9916E-02	269.59
-11.00	-8.9816E+03	-464.	1.0921E-01	281.30
-12.00	-9.3035E+03	-177.	1.1561E-01	293.00
-13.00	-9.3324E+03	122.	1.1901E-01	304.70
-14.00	-9.0566E+03	432.	1.1938E-01	316.41
-15.00	-8.4644E+03	754.	1.1684E-01	328.11
-16.00	-7.5441E+03	1088.	1.1156E-01	339.81
-16.05	-7.4892E+03	1105.	1.1123E-01	340.40
-17.00	-6.2955E+03	1397.	1.0385E-01	274.54
-17.05	-6.2253E+03	1411.	1.0341E-01	271.07
-18.00	-4.7724E+03	1637.	9.4107E-02	205.22
-19.00	-3.0441E+03	1808.	8.2824E-02	135.89
-20.00	-1.1799E+03	1909.	7.0559E-02	66.57
-20.30	-6.0510E+02	1919.	6.6777E-02	2.75
-20.31	-5.7711E+02	1919.	6.6593E-02	0.00
-21.00	7.2841E+02	1875.	5.7913E-02	-129.22
-22.00	2.5222E+03	1696.	4.5500E-02	-229.68
-23.00	4.0871E+03	1418.	3.3898E-02	-325.92
-24.00	5.3240E+03	1038.	2.3610E-02	-434.09
-25.00	6.1271E+03	550.	1.5035E-02	-540.94
-26.00	6.3894E+03	-44.	8.4288E-03	-647.12
-27.00	6.0045E+03	-744.	3.8748E-03	-753.30
-28.00	4.8666E+03	-1549.	1.2449E-03	-857.81
-29.00	2.8813E+03	-2428.	1.6799E-04	-900.09
-30.00	3.2173E+00	-3327.	1.5994E-13	-898.22
-31.00	0.0000E+00	-3328.	0.0000E+00	-898.26

III.--WATER AND SOIL PRESSURES

		<-------------SOIL	PRESSURES-------------	------------->	
		<----LEFTSIDE	----->	<---RIGHTSIDE	---->
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	243.
-2.00	0.	0.	0.	70.	486.

-3.00	0.	0.	0.	106.	729.
-3.70	0.	0.	0.	130.	899.
-4.00	0.	0.	0.	139.	960.
-5.00	0.	0.	0.	168.	1163.
-6.00	0.	0.	0.	198.	1366.
-7.00	0.	0.	0.	227.	1569.
-7.40	0.	0.	0.	239.	1651.
-7.50	0.	0.	0.	240.	1660.
-8.00	0.	0.	0.	246.	1701.
-9.00	0.	0.	0.	258.	1782.
-10.00	0.	0.	0.	270.	1863.
-11.00	0.	0.	0.	281.	1943.
-12.00	0.	0.	0.	293.	2024.
-13.00	0.	0.	0.	305.	2105.
-14.00	0.	0.	0.	316.	2186.
-15.00	0.	0.	0.	328.	2267.
-16.00	0.	0.	0.	340.	2348.
-16.05	0.	0.	0.	340.	2352.
-17.00	0.	77.	11.	352.	2429.
-17.05	0.	81.	12.	352.	2433.
-18.00	0.	158.	23.	363.	2509.
-19.00	0.	239.	35.	375.	2590.
-20.00	0.	320.	46.	387.	2671.
-20.30+	0.	364.	49.	390.	2695.
-20.30+	0.	364.	49.	343.	2936.
-20.31	0.	366.	50.	343.	2938.
-21.00	0.	485.	58.	356.	3046.
-22.00	0.	604.	75.	374.	3203.
-23.00	0.	719.	94.	393.	3361.
-24.00	0.	845.	112.	411.	3518.
-25.00	0.	970.	131.	430.	3676.
-26.00	0.	1095.	149.	448.	3833.
-27.00	0.	1220.	167.	466.	3991.
-28.00	0.	1343.	186.	485.	4148.
-29.00	0.	1403.	204.	503.	4306.
-30.00	0.	1420.	223.	522.	4463.
-31.00	0.	1476.	241.	540.	4621.

CONTROLLING SECTION DUE TO ANCHOR FORCE FOR S3

S3 570_35 TO PROP BENCHED10 UND REV NOAD ALYS OUT.out
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 30-NOVEMBER-2006 TIME: 9:46:20

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 570.35 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH UNDRAINED
'LOW WATER

II.--CONTROL
ANCHORED WALL ANALYSIS
SAME FACTOR OF SAFETY APPLIED TO BOTH ACTIVE AND PASSIVE PRESSURES.

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.
ELEVATION AT ANCHOR = -4.00 FT.
ELEVATION AT BOTTOM OF WALL = -30.00 FT.
WALL MODULUS OF ELASTACITY = 2.900E+07 PSI.
WALL MOMENT OF INERTIA = 184.00 IN^4.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-14.55
10.00	-14.55
52.00	-27.90

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-3.70	0.00	DEF	DEF
112.00	102.00	0.00	250.00	0.00	0.00	-7.50	0.00	DEF	DEF
103.00	93.00	0.00	250.00	0.00	0.00	-20.30	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	0.00	250.00	0.00	0.00	-20.30	0.00	DEF	DEF

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135.00  129.00     0.00  750.00     0.00     0.00                  DEF   DEF
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      VI.--WATER DATA
          UNIT WEIGHT          = 62.40 (PCF)
          RIGHTSIDE ELEVATION = -7.40 (FT)
          LEFTSIDE ELEVATION  = -7.40 (FT)
          NO SEEPAGE

     VII.--VERTICAL SURCHARGE LOADS
          NONE

    VIII.--HORIZONTAL LOADS
          NONE
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PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 30-NOVEMBER-2006 TIME: 9:46:42

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*  SUMMARY OF RESULTS FOR  *
*  ANCHORED WALL ANALYSIS  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 570.35 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH UNDRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

*****WARNING: STANDARD WEDGE SOLUTION DOES NOT EXIST
AT ALL ELEVATIONS. SEE COMPLETE OUTPUT.

METHOD	:	FREE EARTH	FIXED EARTH
FACTOR OF SAFETY	:	167.20	3.08
MAXIMUM BENDING MOMENT (LB-FT)	:	-2.6955E+04	-1.4950E+04
AT ELEVATION (FT)	:	-14.55	-12.61
MAXIMUM DEFLECTION (IN.)	:	5.2127E-01	1.8259E-01
AT ELEVATION (FT)	:	-16.00	-13.00
ANCHOR FORCE (LB)	:	4.2770E+03	3.0375E+03

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 30-NOVEMBER-2006 TIME: 9:46:42

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*****************************
* COMPLETE OF RESULTS FOR   *
*  ANCHORED WALL ANALYSIS   *
*   BY FREE EARTH METHOD    *
*****************************
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 570.35 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH UNDRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 4277. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-2.7736E-01	0.00
-1.00	5.8612E+00	18.	-2.0804E-01	35.17
-2.00	4.6890E+01	70.	-1.3872E-01	70.33
-3.00	1.5825E+02	158.	-6.9389E-02	105.50
-3.70	2.9689E+02	241.	-2.0826E-02	130.12
-3.70	2.9689E+02	241.	-2.0826E-02	0.00
-4.00	3.6910E+02	241.	0.0000E+00	0.00
-4.00	3.6910E+02	-4036.	0.0000E+00	0.00
-4.18	-3.4319E+02	-4036.	1.2254E-02	0.00
-5.00	-3.6577E+03	-4002.	6.9278E-02	84.00
-6.00	-7.6005E+03	-3867.	1.3737E-01	186.00
-7.00	-1.1357E+04	-3630.	2.0301E-01	288.00
-7.40	-1.2785E+04	-3506.	2.2831E-01	328.80
-7.50	-1.3134E+04	-3473.	2.3453E-01	333.76
-8.00	-1.4828E+04	-3301.	2.6498E-01	354.06
-9.00	-1.7946E+04	-2927.	3.2216E-01	394.66
-10.00	-2.0668E+04	-2512.	3.7354E-01	435.26
-11.00	-2.2956E+04	-2056.	4.1823E-01	475.86
-12.00	-2.4768E+04	-1560.	4.5551E-01	516.46
-13.00	-2.6063E+04	-1023.	4.8477E-01	557.06
-14.00	-2.6801E+04	-446.	5.0562E-01	597.66
-14.55	-2.6955E+04	-111.	5.1339E-01	619.99
-14.55	-2.6955E+04	-111.	5.1339E-01	617.00
-15.00	-2.6943E+04	166.	5.1780E-01	617.00
-15.55	-2.6758E+04	506.	5.2078E-01	617.00
-16.00	-2.6468E+04	783.	5.2127E-01	617.00
-17.00	-2.5376E+04	1400.	5.1618E-01	617.00
-18.00	-2.3667E+04	2017.	5.0290E-01	617.00
-19.00	-2.1341E+04	2634.	4.8197E-01	617.00
-20.00	-1.8398E+04	3251.	4.5414E-01	617.00
-20.30	-1.7402E+04	3372.	4.4458E-01	185.13
-20.57	-1.6484E+04	3397.	4.3552E-01	0.00
-21.00	-1.5035E+04	3334.	4.2037E-01	-293.24
-22.00	-1.1860E+04	3004.	3.8172E-01	-365.84
-22.32	-1.0921E+04	2884.	3.6855E-01	-388.98
-23.00	-9.0461E+03	2622.	3.3922E-01	-380.01
-24.00	-6.6141E+03	2242.	2.9378E-01	-380.01
-25.00	-4.5620E+03	1862.	2.4619E-01	-380.01
-26.00	-2.8900E+03	1482.	1.9712E-01	-380.01
-27.00	-1.5979E+03	1102.	1.4709E-01	-380.01

-28.00	-6.8591E+02	722.	9.6543E-02	-380.01
-29.00	-1.5390E+02	342.	4.5760E-02	-380.01
-29.90	0.0000E+00	0.	0.0000E+00	-380.01

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES-------------->			
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	123.
-2.00	0.	0.	0.	70.	246.
-3.00	0.	0.	0.	106.	370.
-3.70+	0.	0.	0.	130.	456.
-3.70+	0.	0.	0.	0.	454.
-4.00	0.	0.	0.	0.	485.
-4.18	0.	0.	0.	0.	503.
-5.00	0.	0.	0.	84.	587.
-6.00	0.	0.	0.	186.	689.
-7.00	0.	0.	0.	288.	791.
-7.40	0.	0.	0.	329.	832.
-7.50	0.	0.	0.	334.	837.
-8.00	0.	0.	0.	354.	857.
-9.00	0.	0.	0.	395.	898.
-10.00	0.	0.	0.	435.	938.
-11.00	0.	0.	0.	476.	979.
-12.00	0.	0.	0.	516.	1019.
-13.00	0.	0.	0.	557.	1060.
-14.00	0.	0.	0.	598.	1101.
-14.55+	0.	0.	0.	620.	1123.
-14.55+	0.	3.	0.	620.	1123.
-15.00	0.	21.	0.	638.	1141.
-15.55	0.	44.	0.	661.	1164.
-16.00	0.	62.	0.	679.	1182.
-17.00	0.	102.	0.	719.	1222.
-18.00	0.	143.	0.	760.	1263.
-19.00	0.	184.	0.	801.	1304.
-20.00	0.	224.	0.	841.	1344.
-20.30+	0.	242.	0.	853.	1356.
-20.30+	0.	242.	0.	0.	1362.
-20.57	0.	262.	0.	0.	1382.
-21.00	0.	293.	0.	0.	1413.
-22.00	0.	366.	0.	0.	1486.
-22.32	0.	389.	0.	0.	1509.
-23.00	0.	429.	0.	49.	1558.
-24.00	0.	502.	0.	122.	1631.
-25.00	0.	575.	0.	195.	1704.
-26.00	0.	647.	0.	267.	1776.
-27.00	0.	720.	0.	340.	1849.
-28.00	0.	792.	0.	412.	1921.
-29.00	0.	865.	0.	485.	1994.
-30.00	0.	938.	0.	558.	2067.

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE AT THIS ELEVATION.

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*****************************
* COMPLETE OF RESULTS FOR   *
*  ANCHORED WALL ANALYSIS   *
*   BY FIXED EARTH METHOD   *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 3
'EL. 570.35 TO PROPOSED CHANNEL BOTTOM W/ 10' BENCH UNDRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 3038. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-1.2138E-01	0.00
-1.00	5.8612E+00	18.	-9.1057E-02	35.17
-2.00	4.6890E+01	70.	-6.0734E-02	70.33
-3.00	1.5825E+02	158.	-3.0394E-02	105.50
-3.70	2.9689E+02	241.	-9.1273E-03	130.12
-3.70	2.9689E+02	241.	-9.1273E-03	0.00
-4.00	3.6910E+02	241.	0.0000E+00	0.00
-4.00	3.6910E+02	-2797.	0.0000E+00	0.00
-4.18	-1.2445E+02	-2797.	5.3730E-03	0.00
-5.00	-2.4182E+03	-2762.	3.0350E-02	84.00
-6.00	-5.1214E+03	-2627.	5.9919E-02	186.00
-7.00	-7.6387E+03	-2390.	8.7835E-02	288.00
-7.40	-8.5706E+03	-2267.	9.8354E-02	328.80
-7.50	-8.7957E+03	-2234.	1.0092E-01	333.76
-8.00	-9.8700E+03	-2062.	1.1329E-01	354.06
-9.00	-1.1748E+04	-1687.	1.3555E-01	394.66
-10.00	-1.3231E+04	-1272.	1.5402E-01	435.26
-11.00	-1.4279E+04	-817.	1.6821E-01	475.86
-12.00	-1.4852E+04	-321.	1.7780E-01	516.46
-13.00	-1.4907E+04	216.	1.8259E-01	557.06
-14.00	-1.4406E+04	793.	1.8257E-01	597.66
-14.55	-1.3878E+04	1128.	1.8055E-01	619.99
-14.55	-1.3878E+04	1128.	1.8055E-01	457.50
-15.00	-1.3324E+04	1334.	1.7789E-01	457.50
-15.55	-1.2521E+04	1586.	1.7346E-01	457.50
-16.00	-1.1761E+04	1792.	1.6892E-01	457.50
-17.00	-9.7409E+03	2249.	1.5615E-01	457.50
-18.00	-7.2630E+03	2707.	1.4023E-01	457.50
-19.00	-4.3277E+03	3164.	1.2198E-01	457.50
-20.00	-9.3487E+02	3622.	1.0234E-01	457.50
-20.26	1.7611E+01	3681.	9.7134E-02	0.00
-20.30	1.6428E+02	3680.	9.6336E-02	-70.08
-21.00	2.6656E+03	3385.	8.2403E-02	-771.75
-22.00	5.6527E+03	2577.	6.3311E-02	-844.35
-22.32	6.4308E+03	2304.	5.7567E-02	-867.49
-23.00	7.7993E+03	1713.	4.6027E-02	-867.49
-24.00	9.0845E+03	863.	3.1245E-02	-832.62
-25.00	9.5371E+03	48.	1.9383E-02	-798.01
-26.00	9.1871E+03	-747.	1.0587E-02	-791.04
-27.00	8.0472E+03	-1531.	4.7458E-03	-777.79
-28.00	6.1292E+03	-2303.	1.4893E-03	-765.75
-29.00	3.4454E+03	-3063.	1.9693E-04	-753.70
-30.00	8.2870E+00	-3809.	2.1077E-12	-739.99
-31.00	0.0000E+00	-3811.	0.0000E+00	-739.96

III.--WATER AND SOIL PRESSURES

		<--------------SOIL PRESSURES--------------			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	35.	196.
-2.00	0.	0.	0.	70.	392.
-3.00	0.	0.	0.	106.	588.
-3.70+	0.	0.	0.	130.	725.
-3.70+	0.	0.	0.	0.	614.
-4.00	0.	0.	0.	0.	644.
-4.18	0.	0.	0.	0.	662.
-5.00	0.	0.	0.	84.	746.
-6.00	0.	0.	0.	186.	848.
-7.00	0.	0.	0.	288.	950.
-7.40	0.	0.	0.	329.	991.
-7.50	0.	0.	0.	334.	996.
-8.00	0.	0.	0.	354.	1017.
-9.00	0.	0.	0.	395.	1057.
-10.00	0.	0.	0.	435.	1098.
-11.00	0.	0.	0.	476.	1138.
-12.00	0.	0.	0.	516.	1179.
-13.00	0.	0.	0.	557.	1220.
-14.00	0.	0.	0.	598.	1260.
-14.55+	0.	0.	0.	620.	1282.
-14.55+	0.	162.	0.	620.	1282.
-15.00	0.	181.	0.	638.	1301.
-15.55	0.	203.	0.	661.	1323.
-16.00	0.	221.	0.	679.	1341.
-17.00	0.	262.	0.	719.	1382.
-18.00	0.	303.	0.	760.	1423.
-19.00	0.	343.	0.	801.	1463.
-20.00	0.	384.	0.	841.	1504.
-20.26	0.	482.	0.	852.	1514.
-20.30+	0.	497.	0.	853.	1516.
-20.30+	0.	497.	0.	0.	1841.
-21.00	0.	772.	0.	0.	1892.
-22.00	0.	844.	0.	0.	1964.
-22.32	0.	867.	0.	0.	1987.
-23.00	0.	917.	0.	49.	2037.
-24.00	0.	955.	0.	122.	2110.
-25.00	0.	993.	0.	195.	2182.
-26.00	0.	1058.	0.	267.	2255.
-27.00	0.	1118.	0.	340.	2327.
-28.00	0.	1178.	0.	412.	2400.
-29.00	0.	1239.	0.	485.	2473.
-30.00	0.	1298.	0.	558.	2545.
-31.00	0.	1356.	0.	630.	2618.

S6 571_0 PROPOSED BENCHED10 UND REV NOAD ALYS OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:43:53

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- UNDRAINED
'LOW WATER

II.--CONTROL
ANCHORED WALL ANALYSIS
SAME FACTOR OF SAFETY APPLIED TO BOTH ACTIVE AND PASSIVE PRESSURES.

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.
ELEVATION AT ANCHOR = -3.40 FT.
ELEVATION AT BOTTOM OF WALL = -19.84 FT. ← FROM "DESIGN" MODE RESULTS
WALL MODULUS OF ELASTACITY = 2.900E+07 PSI. PROGRAM FAILED W/ 30' SHEET
WALL MOMENT OF INERTIA = 184.00 IN^4.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-2.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-13.30
10.00	-13.30
70.00	-28.70

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-2.90	0.00	DEF	DEF
112.00	102.00	0.00	250.00	0.00	0.00	-9.30	0.00	DEF	DEF
103.00	93.00	0.00	250.00	0.00	0.00	-25.20	0.00	DEF	DEF
112.00	102.00	0.00	250.00	0.00	0.00	-32.00	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.

S6 571_0 PROPOSED BENCHED10 UND REV NOAD ALYS OUT

103.00	93.00	0.00	250.00	0.00	0.00	-25.20	0.00	DEF	DEF
112.00	102.00	0.00	250.00	0.00	0.00	-32.00	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

VI.--WATER DATA
UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -6.80 (FT)
LEFTSIDE ELEVATION = -6.80 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 29-NOVEMBER-2006 TIME: 14:43:58

****
* SUMMARY OF RESULTS FOR *
* ANCHORED WALL ANALYSIS *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- UNDRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

METHOD	:	FREE EARTH	FIXED EARTH
FACTOR OF SAFETY	:	1.30	0.98
MAXIMUM BENDING MOMENT (LB-FT)	:	-2.6053E+03	-1.4583E+03
AT ELEVATION (FT)	:	-10.88	-9.96
MAXIMUM DEFLECTION (IN.)	:	1.9532E-02	7.1096E-03
AT ELEVATION (FT)	:	-11.00	-10.00
ANCHOR FORCE (LB)	:	4.4695E+02	2.8390E+02

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:43:59

****
* COMPLETE OF RESULTS FOR *
* ANCHORED WALL ANALYSIS *
* BY FREE EARTH METHOD *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- UNDRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 447. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-1.3179E-02	0.00
-1.00	0.0000E+00	0.	-9.3031E-03	0.00
-2.00	0.0000E+00	0.	-5.4270E-03	0.00
-2.90	4.2728E+00	14.	-1.9385E-03	31.65
-2.90	4.2728E+00	14.	-1.9385E-03	0.00
-3.00	5.6971E+00	14.	-1.5508E-03	0.00
-3.40	1.1394E+01	14.	0.0000E+00	0.00
-3.40	1.1394E+01	-433.	0.0000E+00	0.00
-4.00	-2.4823E+02	-433.	2.3222E-03	0.00
-5.00	-6.8095E+02	-433.	6.1133E-03	0.00
-6.00	-1.1137E+03	-433.	9.6839E-03	0.00
-6.73	-1.4276E+03	-433.	1.2057E-02	0.00
-6.80	-1.4598E+03	-432.	1.2287E-02	7.60
-7.00	-1.5461E+03	-430.	1.2894E-02	17.52
-8.00	-1.9590E+03	-388.	1.5604E-02	67.12
-9.00	-2.3048E+03	-296.	1.7681E-02	116.72
-9.30	-2.3880E+03	-258.	1.8163E-02	131.60
-10.00	-2.5343E+03	-156.	1.9015E-02	160.02
-11.00	-2.6039E+03	24.	1.9532E-02	200.62
-12.00	-2.4729E+03	245.	1.9212E-02	241.22
-13.00	-2.1006E+03	506.	1.8097E-02	281.82
-13.30	-1.9358E+03	593.	1.7624E-02	294.00
-13.30	-1.9358E+03	593.	1.7624E-02	-90.76
-14.00	-1.5431E+03	529.	1.6309E-02	-90.76
-14.30	-1.3884E+03	502.	1.5667E-02	-90.76
-15.00	-1.0593E+03	438.	1.4018E-02	-90.76
-16.00	-6.6616E+02	348.	1.1382E-02	-90.76
-17.00	-3.6381E+02	257.	8.5279E-03	-90.76
-18.00	-1.5221E+02	166.	5.5534E-03	-90.76
-19.00	-3.1373E+01	75.	2.5271E-03	-90.76
-19.83	0.0000E+00	0.	0.0000E+00	-90.76

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	0.	0.
-2.00	0.	0.	0.	0.	0.

-2.90+	0.	0.	0.	32.	356.
-2.90+	0.	0.	0.	0.	495.
-3.00	0.	0.	0.	0.	505.
-3.40	0.	0.	0.	0.	546.
-4.00	0.	0.	0.	0.	607.
-5.00	0.	0.	0.	0.	709.
-6.00	0.	0.	0.	0.	811.
-6.73	0.	0.	0.	0.	885.
-6.80	0.	0.	0.	8.	892.
-7.00	0.	0.	0.	18.	902.
-8.00	0.	0.	0.	67.	952.
-9.00	0.	0.	0.	117.	1001.
-9.30	0.	0.	0.	132.	1016.
-10.00	0.	0.	0.	160.	1045.
-11.00	0.	0.	0.	201.	1085.
-12.00	0.	0.	0.	241.	1126.
-13.00	0.	0.	0.	282.	1167.
-13.30+	0.	0.	0.	294.	1179.
-13.30+	0.	385.	0.	294.	1179.
-14.00	0.	413.	0.	322.	1207.
-14.30	0.	425.	0.	335.	1219.
-15.00	0.	454.	0.	363.	1248.
-16.00	0.	494.	0.	404.	1288.
-17.00	0.	535.	0.	444.	1329.
-18.00	0.	576.	0.	485.	1370.
-19.00	0.	616.	0.	525.	1410.
-20.00	0.	657.	0.	566.	1451.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:44:00

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*****************************
* COMPLETE OF RESULTS FOR   *
*  ANCHORED WALL ANALYSIS   *
*   BY FIXED EARTH METHOD   *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- UNDRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 284. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-5.7428E-03	0.00
-1.00	5.4570E-12	0.	-4.0539E-03	0.00
-2.00	0.0000E+00	0.	-2.3650E-03	0.00
-2.90	4.2728E+00	14.	-8.4488E-04	31.65
-2.90	4.2728E+00	14.	-8.4488E-04	0.00
-3.00	5.6971E+00	14.	-6.7595E-04	0.00
-3.40	1.1394E+01	14.	0.0000E+00	0.00
-3.40	1.1394E+01	-270.	0.0000E+00	0.00
-4.00	-1.5040E+02	-270.	1.0118E-03	0.00
-5.00	-4.2005E+02	-270.	2.6499E-03	0.00

-6.00	-6.8971E+02	-270.	4.1520E-03	0.00
-6.73	-8.8534E+02	-270.	5.1069E-03	0.00
-6.80	-9.0542E+02	-269.	5.1970E-03	7.60
-7.00	-9.5908E+02	-267.	5.4307E-03	17.52
-8.00	-1.2089E+03	-225.	6.3993E-03	67.12
-9.00	-1.3916E+03	-133.	6.9782E-03	116.72
-9.30	-1.4259E+03	-95.	7.0664E-03	131.60
-10.00	-1.4581E+03	7.	7.1096E-03	160.02
-11.00	-1.3647E+03	187.	6.7731E-03	200.62
-12.00	-1.0706E+03	408.	6.0001E-03	241.22
-13.00	-5.3526E+02	669.	4.8869E-03	281.82
-13.30	-3.2156E+02	756.	4.5104E-03	294.00
-13.30	-3.2156E+02	756.	4.5104E-03	-217.22
-14.00	1.5430E+02	604.	3.6063E-03	-217.22
-14.30	3.2566E+02	539.	3.2221E-03	-217.22
-15.00	6.4947E+02	387.	2.3699E-03	-217.22
-16.00	9.2741E+02	169.	1.3379E-03	-217.22
-17.00	9.8814E+02	-48.	6.0045E-04	-217.22
-18.00	8.3164E+02	-265.	1.7710E-04	-217.22
-19.00	4.5793E+02	-482.	1.7197E-05	-217.22
-20.00	0.0000E+00	-657.	0.0000E+00	-217.22

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	0.	0.
-2.00	0.	0.	0.	0.	0.
-2.90+	0.	0.	0.	32.	550.
-2.90+	0.	0.	0.	0.	621.
-3.00	0.	0.	0.	0.	631.
-3.40	0.	0.	0.	0.	672.
-4.00	0.	0.	0.	0.	733.
-5.00	0.	0.	0.	0.	835.
-6.00	0.	0.	0.	0.	937.
-6.73	0.	0.	0.	0.	1011.
-6.80	0.	0.	0.	8.	1019.
-7.00	0.	0.	0.	18.	1029.
-8.00	0.	0.	0.	67.	1078.
-9.00	0.	0.	0.	117.	1128.
-9.30	0.	0.	0.	132.	1143.
-10.00	0.	0.	0.	160.	1171.
-11.00	0.	0.	0.	201.	1212.
-12.00	0.	0.	0.	241.	1252.
-13.00	0.	0.	0.	282.	1293.
-13.30+	0.	0.	0.	294.	1305.
-13.30+	0.	511.	0.	294.	1305.
-14.00	0.	540.	0.	322.	1334.
-14.30	0.	552.	0.	335.	1346.
-15.00	0.	580.	0.	363.	1374.
-16.00	0.	621.	0.	404.	1415.
-17.00	0.	661.	0.	444.	1455.
-18.00	0.	702.	0.	485.	1496.
-19.00	0.	743.	0.	525.	1537.
-20.00	0.	783.	0.	566.	1577.

S6 571_0 PROPOSED BENCHED10 DND REV NOAD ALYS OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:45:10

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****************
*  INPUT DATA  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- DRAINED
'LOW WATER

II.--CONTROL
ANCHORED WALL ANALYSIS
SAME FACTOR OF SAFETY APPLIED TO BOTH ACTIVE AND PASSIVE PRESSURES.

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.
ELEVATION AT ANCHOR = -3.40 FT.
ELEVATION AT BOTTOM OF WALL = -22.14 FT. ← FROM "DESIGN" MODE RESULTS
WALL MODULUS OF ELASTACITY = 2.900E+07 PSI. PROGRAM FAILED W/ 30' SHEET
WALL MOMENT OF INERTIA = 184.00 IN^4.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-2.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-13.30
10.00	-13.30
70.00	-28.70

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
130.00	122.00	30.00	0.00	16.20	0.00	-2.90	0.00	DEF	DEF
112.00	102.00	30.00	0.00	16.20	0.00	-9.30	0.00	DEF	DEF
103.00	93.00	30.00	0.00	16.20	0.00	-25.20	0.00	DEF	DEF
112.00	102.00	30.00	0.00	16.20	0.00	-32.00	0.00	DEF	DEF
135.00	129.00	33.00	0.00	17.80	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = DEFAULT
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = DEFAULT

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.

S6 571_0 PROPOSED BENCHED10 DND REV NOAD ALYS OUT

103.00	93.00	30.00	0.00	16.20	0.00	-25.20	0.00	DEF	DEF
112.00	102.00	30.00	0.00	16.20	0.00	-32.00	0.00	DEF	DEF
135.00	129.00	33.00	0.00	17.80	0.00			DEF	DEF

VI.--WATER DATA
UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -6.80 (FT)
LEFTSIDE ELEVATION = -6.80 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:45:15

****
* SUMMARY OF RESULTS FOR *
* ANCHORED WALL ANALYSIS *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- DRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

METHOD	:	FREE EARTH	FIXED EARTH
FACTOR OF SAFETY	:	2.00	1.23
MAXIMUM BENDING MOMENT (LB-FT)	:	-5.2503E+03	-3.0751E+03
AT ELEVATION (FT)	:	-11.30	-9.75
MAXIMUM DEFLECTION (IN.)	:	5.4807E-02	2.0438E-02
AT ELEVATION (FT)	:	-12.00	-10.00
ANCHOR FORCE (LB)	:	1.1598E+03	8.5510E+02

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:45:16

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* COMPLETE OF RESULTS FOR    *
*  ANCHORED WALL ANALYSIS    *
*   BY FREE EARTH METHOD     *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- DRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 1160. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-3.4103E-02	0.00
-1.00	0.0000E+00	0.	-2.4073E-02	0.00
-2.00	-4.3656E-11	0.	-1.4043E-02	0.00
-2.90	4.2728E+00	14.	-5.0156E-03	31.65
-3.00	5.8602E+00	18.	-4.0125E-03	34.59
-3.40	1.5963E+01	34.	0.0000E+00	46.35
-3.40	1.5963E+01	-1126.	0.0000E+00	46.35
-4.00	-6.5027E+02	-1093.	6.0071E-03	63.99
-5.00	-1.7063E+03	-1014.	1.5814E-02	93.39
-6.00	-2.6690E+03	-906.	2.5071E-02	122.80
-6.80	-3.3521E+03	-799.	3.1870E-02	146.32
-7.00	-3.5089E+03	-769.	3.3466E-02	149.18
-8.00	-4.2009E+03	-613.	4.0730E-02	163.48
-9.00	-4.7294E+03	-442.	4.6637E-02	177.77
-9.30	-4.8540E+03	-388.	4.8118E-02	182.06
-10.00	-5.0803E+03	-258.	5.1018E-02	190.25
-11.00	-5.2410E+03	-62.	5.3758E-02	201.96
-12.00	-5.1997E+03	146.	5.4807E-02	213.66
-13.00	-4.9447E+03	366.	5.4178E-02	225.36
-13.30	-4.8248E+03	434.	5.3672E-02	228.88
-14.00	-4.4693E+03	576.	5.1953E-02	176.83
-14.30	-4.2889E+03	626.	5.0996E-02	154.53
-15.00	-3.8174E+03	715.	4.8286E-02	102.48
-16.00	-3.0631E+03	781.	4.3386E-02	28.14
-16.38	-2.7663E+03	786.	4.1259E-02	0.00
-17.00	-2.2806E+03	772.	3.7494E-02	-46.21
-18.00	-1.5442E+03	689.	3.0862E-02	-119.83
-19.00	-9.2103E+02	552.	2.3727E-02	-153.53
-20.00	-4.4651E+02	396.	1.6290E-02	-158.21
-21.00	-1.3317E+02	227.	8.7043E-03	-180.71
-22.00	-2.1124E+00	30.	1.0703E-03	-212.59
-22.14	0.0000E+00	0.	0.0000E+00	-217.32

III.--WATER AND SOIL PRESSURES

		<-------------SOIL	PRESSURES------------>		
		<----LEFTSIDE---->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	0.	0.

-2.00	0.	0.	0.	0.	0.
-2.90	0.	0.	0.	32.	231.
-3.00	0.	0.	0.	35.	252.
-3.40	0.	0.	0.	46.	338.
-4.00	0.	0.	0.	64.	467.
-5.00	0.	0.	0.	93.	681.
-6.00	0.	0.	0.	123.	895.
-6.80	0.	0.	0.	146.	1067.
-7.00	0.	0.	0.	149.	1088.
-8.00	0.	0.	0.	163.	1192.
-9.00	0.	0.	0.	178.	1296.
-9.30	0.	0.	0.	182.	1327.
-10.00	0.	0.	0.	190.	1387.
-11.00	0.	0.	0.	202.	1472.
-12.00	0.	0.	0.	214.	1558.
-13.00	0.	0.	0.	225.	1643.
-13.30	0.	0.	0.	229.	1669.
-14.00	0.	60.	8.	237.	1728.
-14.30	0.	86.	12.	241.	1754.
-15.00	0.	146.	20.	249.	1814.
-16.00	0.	232.	32.	260.	1899.
-16.38	0.	265.	36.	265.	1931.
-17.00	0.	318.	43.	272.	1984.
-18.00	0.	404.	55.	284.	2070.
-19.00	0.	449.	67.	296.	2155.
-20.00	0.	465.	78.	307.	2240.
-21.00	0.	500.	90.	319.	2326.
-22.00	0.	543.	102.	331.	2411.
-23.00	0.	589.	114.	342.	2496.

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHOREDOR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:45:17

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* COMPLETE OF RESULTS FOR  *
*  ANCHORED WALL ANALYSIS  *
*   BY FIXED EARTH METHOD  *
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I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 6
'ELEV. 571.0 (PROPOSED) W/ 10' BENCH- DRAINED
'LOW WATER

II.--RESULTS (ANCHOR FORCE= 855. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	-1.5915E-02	0.00
-1.00	0.0000E+00	0.	-1.1234E-02	0.00
-2.00	-2.1828E-11	0.	-6.5534E-03	0.00
-2.90	4.2728E+00	14.	-2.3408E-03	31.65
-3.00	5.8602E+00	18.	-1.8727E-03	34.59
-3.40	1.5963E+01	34.	0.0000E+00	46.35
-3.40	1.5963E+01	-821.	0.0000E+00	46.35
-4.00	-4.6745E+02	-788.	2.8009E-03	63.99

-5.00	-1.2188E+03	-710.	7.3219E-03	93.39
-6.00	-1.8768E+03	-601.	1.1451E-02	122.80
-6.80	-2.3161E+03	-494.	1.4327E-02	146.32
-7.00	-2.4120E+03	-464.	1.4975E-02	149.18
-8.00	-2.7992E+03	-308.	1.7722E-02	163.48
-9.00	-3.0231E+03	-137.	1.9567E-02	177.77
-9.30	-3.0562E+03	-83.	1.9933E-02	182.06
-10.00	-3.0693E+03	47.	2.0438E-02	190.25
-11.00	-2.9252E+03	243.	2.0321E-02	201.96
-12.00	-2.5792E+03	451.	1.9261E-02	213.66
-13.00	-2.0195E+03	670.	1.7372E-02	225.36
-13.30	-1.8082E+03	739.	1.6668E-02	228.88
-14.00	-1.2428E+03	866.	1.4835E-02	135.87
-14.30	-9.7740E+02	901.	1.3983E-02	96.02
-15.00	-3.3079E+02	936.	1.1899E-02	3.02
-15.02	-3.0954E+02	936.	1.1830E-02	0.00
-16.00	5.8422E+02	872.	8.8556E-03	-129.84
-17.00	1.3703E+03	679.	5.9983E-03	-257.10
-18.00	1.9073E+03	382.	3.5780E-03	-336.59
-19.00	2.1136E+03	23.	1.7663E-03	-380.48
-20.00	1.9374E+03	-385.	6.2882E-04	-436.49
-21.00	1.3238E+03	-852.	1.0691E-04	-497.84
-22.00	2.1187E+02	-1382.	2.5678E-07	-562.21
-23.00	0.0000E+00	-1467.	0.0000E+00	-572.19

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES------------->			
	WATER	<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	0.	0.
-2.00	0.	0.	0.	0.	0.
-2.90	0.	0.	0.	32.	387.
-3.00	0.	0.	0.	35.	423.
-3.40	0.	0.	0.	46.	567.
-4.00	0.	0.	0.	64.	783.
-5.00	0.	0.	0.	93.	1143.
-6.00	0.	0.	0.	123.	1503.
-6.80	0.	0.	0.	146.	1790.
-7.00	0.	0.	0.	149.	1825.
-8.00	0.	0.	0.	163.	2000.
-9.00	0.	0.	0.	178.	2175.
-9.30	0.	0.	0.	182.	2228.
-10.00	0.	0.	0.	190.	2328.
-11.00	0.	0.	0.	202.	2471.
-12.00	0.	0.	0.	214.	2614.
-13.00	0.	0.	0.	225.	2758.
-13.30	0.	0.	0.	229.	2801.
-14.00	0.	101.	8.	237.	2901.
-14.30	0.	145.	12.	241.	2944.
-15.00	0.	246.	20.	249.	3044.
-15.02	0.	249.	20.	249.	3047.
-16.00	0.	390.	32.	260.	3187.
-17.00	0.	529.	43.	272.	3331.
-18.00	0.	620.	55.	284.	3474.
-19.00	0.	676.	67.	296.	3617.
-20.00	0.	744.	78.	307.	3760.
-21.00	0.	817.	90.	319.	3903.
-22.00	0.	893.	102.	331.	4047.
-23.00	0.	972.	114.	342.	4190.

S14 570_5 BENCH 10 TO 50 UNDRAINED REV NOAD ALYS OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:49:30

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 14
'ELEV. 570.50 TO PROPOSED CHANNEL BOTTOM - UNDRAINED
'LOW WATER

II.--CONTROL
CANTILEVER WALL ANALYSIS
SAME FACTOR OF SAFETY APPLIED TO BOTH ACTIVE AND PASSIVE PRESSURES.

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.
ELEVATION AT BOTTOM OF WALL = -24.85 FT. ← FROM "DESIGN" MODE RESULTS
WALL MODULUS OF ELASTACITY = 2.900E+07 PSI. PROGRAM FAILED W/ 30' SHEETS
WALL MOMENT OF INERTIA = 184.00 IN^4.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-11.60
10.00	-11.60
50.00	-29.10

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
112.00	102.00	0.00	250.00	0.00	0.00	-8.00	0.00	DEF	DEF
80.00	50.00	26.60	0.00	14.30	0.00	-16.00	0.00	DEF	DEF
103.00	93.00	0.00	250.00	0.00	0.00	-34.00	0.00	DEF	DEF
128.00	117.00	28.00	0.00	15.10	0.00	-40.10	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	0.00	250.00	0.00	0.00	-34.00	0.00	DEF	DEF

S14 570_5 BENCH 10 TO 50 UNDRAINED REV NOAD ALYS OUT

128.00	117.00	28.00	0.00	15.10	0.00	-40.10	0.00	DEF	DEF
135.00	129.00	0.00	750.00	0.00	0.00			DEF	DEF

VI.--WATER DATA
UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -3.10 (FT)
LEFTSIDE ELEVATION = -4.60 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL ANALYSIS *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 14
'ELEV. 570.50 TO PROPOSED CHANNEL BOTTOM - UNDRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS
AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

FACTOR OF SAFETY : 1.00

MAX. BEND. MOMENT (LB-FT) : 8.3327E+03
AT ELEVATION (FT) : -16.66

MAXIMUM DEFLECTION (IN.) : 4.3773E-01
AT ELEVATION (FT) : 0.00

****

S14 570_5 BENCH 10 TO 50 UNDRAINED REV NOAD ALYS OUT
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL ANALYSIS *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 14
'ELEV. 570.50 TO PROPOSED CHANNEL BOTTOM - UNDRAINED
'LOW WATER

II.--RESULTS1160. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	4.3773E-01	0.00
-1.00	3.4925E-10	0.	4.1078E-01	0.00
-2.00	3.4925E-10	0.	3.8383E-01	0.00
-3.00	3.4925E-10	0.	3.5688E-01	0.00
-3.10	-6.8690E-08	0.	3.5419E-01	0.00
-4.00	7.5816E+00	25.	3.2994E-01	56.16
-4.60	3.5100E+01	70.	3.1377E-01	93.60
-5.00	7.0668E+01	108.	3.0299E-01	93.60
-6.00	2.2511E+02	201.	2.7607E-01	93.60
-6.81	4.1761E+02	277.	2.5444E-01	93.60
-7.00	4.7321E+02	296.	2.4923E-01	103.24
-8.00	8.2887E+02	424.	2.2255E-01	152.84
-8.00	8.2887E+02	424.	2.2255E-01	279.70
-9.00	1.3935E+03	706.	1.9613E-01	285.55
-10.00	2.2437E+03	995.	1.7018E-01	291.41
-11.00	3.3853E+03	1289.	1.4496E-01	297.27
-11.60	4.2126E+03	1469.	1.3033E-01	300.78
-11.60	4.2126E+03	1469.	1.3033E-01	-199.22
-12.00	4.7838E+03	1386.	1.2085E-01	-213.12
-12.60	5.5759E+03	1252.	1.0709E-01	-233.96
-13.00	6.0576E+03	1156.	9.8275E-02	-247.86
-14.00	7.0836E+03	890.	7.7659E-02	-282.60
-15.00	7.8270E+03	591.	5.9330E-02	-317.35
-16.00	8.2503E+03	248.	4.3526E-02	-368.54
-17.00	8.3109E+03	-129.	3.0385E-02	-385.00
-18.00	7.9892E+03	-514.	1.9925E-02	-385.00
-19.00	7.2825E+03	-899.	1.2041E-02	-385.00
-20.00	6.2153E+03	-1211.	6.5058E-03	-237.92
-21.00	4.9071E+03	-1384.	2.9769E-03	-109.53
-22.00	3.4670E+03	-1497.	1.0338E-03	-115.23
-22.82	2.2056E+03	-1582.	2.9881E-04	-93.59
-23.00	1.9178E+03	-1585.	2.1041E-04	62.56
-24.00	5.0747E+02	-1092.	1.0590E-05	923.12
-24.85	0.0000E+00	0.	0.0000E+00	1652.87

III.--WATER AND SOIL PRESSURES

		<--------------SOIL	PRESSURES-------------->		
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)
0.00	0.	0.	0.	0.	500.
-1.00	0.	0.	0.	0.	602.
-2.00	0.	0.	0.	0.	704.
-3.00	0.	0.	0.	0.	806.
-3.10	0.	0.	0.	0.	816.
-4.00	56.	0.	0.	0.	861.
-4.60	94.	0.	0.	0.	891.

S14 570_5 BENCH 10 TO 50 UNDRAINED REV NOAD ALYS OUT

-5.00	94.	0.	0.	0.	910.
-6.00	94.	0.	0.	0.	960.
-6.81	94.	0.	0.	0.	1000.
-7.00	94.	0.	0.	10.	1010.
-8.00+	94.	0.	0.	59.	1059.
-8.00+	94.	0.	0.	186.	2181.
-9.00	94.	0.	0.	192.	2250.
-10.00	94.	0.	0.	198.	2319.
-11.00	94.	0.	0.	204.	2387.
-11.60+	94.	0.	0.	207.	2429.
-11.60+	94.	500.	0.	207.	2429.
-12.00	94.	516.	0.	210.	2456.
-12.60	94.	541.	0.	213.	2497.
-13.00	94.	557.	0.	215.	2525.
-14.00	94.	597.	0.	221.	2593.
-15.00	94.	638.	0.	227.	2662.
-16.00+	94.	679.	0.	233.	2731.
-16.00+	94.	679.	0.	200.	1200.
-17.00	94.	719.	0.	241.	1241.
-18.00	94.	760.	0.	281.	1281.
-19.00	94.	800.	0.	322.	1322.
-20.00	94.	694.	0.	362.	1362.
-21.00	94.	606.	0.	403.	1403.
-22.00	94.	652.	0.	444.	1444.
-22.82	94.	664.	0.	477.	1477.
-23.00	94.	667.	0.	484.	1484.
-24.00	94.	680.	0.	525.	1525.
-24.85	94.	691.	0.	565.	1565.
-26.00	94.	700.	0.	606.	1606.

S14 570_5 BENCH 10 TO 50 DRAINED REV NOAD ALYS OUT
PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS

DATE: 29-NOVEMBER-2006 TIME: 14:50:02

****
* INPUT DATA *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 14
'ELEV. 570.50 TO PROPOSED CHANNEL BOTTOM - DRAINED
'LOW WATER

II.--CONTROL
CANTILEVER WALL ANALYSIS
SAME FACTOR OF SAFETY APPLIED TO BOTH ACTIVE AND PASSIVE PRESSURES.

III.--WALL DATA
ELEVATION AT TOP OF WALL = 0.00 FT.
ELEVATION AT BOTTOM OF WALL = -30.00 FT. ← FROM GEOPHYSICAL REPORT
WALL MODULUS OF ELASTACITY = 2.900E+07 PSI.
WALL MOMENT OF INERTIA = 184.00 IN^4.

IV.--SURFACE POINT DATA

IV.A.--RIGHTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	0.00

IV.B.--LEFTSIDE

DIST. FROM WALL (FT)	ELEVATION (FT)
0.00	-11.60
10.00	-11.60
50.00	-29.10

V.--SOIL LAYER DATA

V.A.--RIGHTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
112.00	102.00	30.00	0.00	16.20	0.00	-8.00	0.00	DEF	DEF
80.00	50.00	26.60	0.00	16.20	0.00	-16.00	0.00	DEF	DEF
103.00	93.00	30.00	0.00	16.20	0.00	-34.00	0.00	DEF	DEF
128.00	117.00	28.00	0.00	15.10	0.00	-40.10	0.00	DEF	DEF
135.00	129.00	33.00	0.00	17.80	0.00			DEF	DEF

V.B.--LEFTSIDE
LEVEL 2 FACTOR OF SAFETY FOR ACTIVE PRESSURE = 1.00
LEVEL 2 FACTOR OF SAFETY FOR PASSIVE PRESSURE = 1.00

SAT. WGHT. (PCF)	MOIST WGHT. (PCF)	ANGLE OF INTERNAL FRICTION (DEG)	COH-ESION (PSF)	ANGLE OF WALL FRICTION (DEG)	ADH-ESION (PSF)	<--BOTTOM--> ELEV. (FT)	SLOPE (FT/FT)	<-SAFETY-> <-FACTOR-> ACT.	PASS.
103.00	93.00	30.00	0.00	16.20	0.00	-34.00	0.00	DEF	DEF

S14 570_5 BENCH 10 TO 50 DRAINED REV NOAD ALYS OUT

128.00	117.00	28.00	0.00	15.10	0.00	-40.10	0.00	DEF	DEF
135.00	129.00	33.00	0.00	17.80	0.00			DEF	DEF

VI.--WATER DATA
UNIT WEIGHT = 62.40 (PCF)
RIGHTSIDE ELEVATION = -3.10 (FT)
LEFTSIDE ELEVATION = -4.60 (FT)
NO SEEPAGE

VII.--VERTICAL SURCHARGE LOADS
NONE

VIII.--HORIZONTAL LOADS
NONE

PROGRAM CWALSHT-DESIGN/ANALYSIS OF ANCHORED OR CANTILEVER SHEET PILE WALLS
BY CLASSICAL METHODS
DATE: 29-NOVEMBER-2006 TIME: 14:50:09

****
* SUMMARY OF RESULTS FOR *
* CANTILEVER WALL ANALYSIS *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 14
'ELEV. 570.50 TO PROPOSED CHANNEL BOTTOM - DRAINED
'LOW WATER

II.--SUMMARY

RIGHTSIDE SOIL PRESSURES DETERMINED BY COULOMB COEFFICIENTS AND THEORY OF ELASTICITY EQUATIONS FOR SURCHARGE LOADS.

LEFTSIDE SOIL PRESSURES DETERMINED BY SWEEP SEARCH WEDGE METHOD.

*****WARNING: STANDARD WEDGE SOLUTION DOES NOT EXIST AT ALL ELEVATIONS. SEE COMPLETE OUTPUT.

FACTOR OF SAFETY : 1.02

MAX. BEND. MOMENT (LB-FT) : 2.3461E+04
AT ELEVATION (FT) : -20.75

MAXIMUM DEFLECTION (IN.) : 2.0644E+00
AT ELEVATION (FT) : 0.00

****
* COMPLETE OF RESULTS FOR *
* CANTILEVER WALL ANALYSIS *
****

I.--HEADING
'KINNICKINNIC RIVER WALL SECTIONS
'SECTION 14
'ELEV. 570.50 TO PROPOSED CHANNEL BOTTOM - DRAINED
'LOW WATER

II.--RESULTS1160. (LB))

ELEVATION (FT)	BENDING MOMENT (LB-FT)	SHEAR (LB)	DEFLECTION (IN)	NET PRESSURE (PSF)
0.00	0.0000E+00	0.	2.0644E+00	0.00
-1.00	4.9003E+00	15.	1.9571E+00	29.40
-2.00	3.9203E+01	59.	1.8499E+00	58.80
-3.00	1.3231E+02	132.	1.7427E+00	88.21
-3.10	1.4599E+02	141.	1.7320E+00	91.15
-4.00	3.1937E+02	254.	1.6355E+00	160.17
-4.60	5.0358E+02	364.	1.5713E+00	206.19
-5.00	6.6594E+02	448.	1.5285E+00	211.91
-6.00	1.2222E+03	667.	1.4217E+00	226.21
-7.00	2.0046E+03	900.	1.3152E+00	240.51
-8.00	3.0276E+03	1148.	1.2094E+00	254.80
-8.00	3.0276E+03	1148.	1.2094E+00	276.66
-9.00	4.3149E+03	1428.	1.1047E+00	282.42
-10.00	5.8845E+03	1713.	1.0013E+00	288.18
-11.00	7.7424E+03	2004.	8.9979E-01	293.94
-11.60	8.9978E+03	2181.	8.4008E-01	297.40
-12.00	9.8921E+03	2285.	8.0084E-01	220.69
-12.60	1.1296E+04	2383.	7.4296E-01	105.64
-13.00	1.2255E+04	2410.	7.0509E-01	28.93
-13.15	1.2619E+04	2412.	6.9097E-01	0.00
-14.00	1.4648E+04	2343.	6.1331E-01	-162.83
-15.00	1.6887E+04	2114.	5.2627E-01	-295.19
-16.00	1.8849E+04	1805.	4.4470E-01	-321.37
-17.00	2.0493E+04	1484.	3.6922E-01	-321.66
-18.00	2.1811E+04	1145.	3.0036E-01	-356.36
-19.00	2.2770E+04	767.	2.3856E-01	-398.78
-20.00	2.3331E+04	345.	1.8412E-01	-445.02
-21.00	2.3446E+04	-123.	1.3723E-01	-492.67
-22.00	2.3068E+04	-639.	9.7913E-02	-538.61
-23.00	2.2151E+04	-1203.	6.6053E-02	-590.22
-24.00	2.0642E+04	-1826.	4.1352E-02	-655.33
-25.00	1.8475E+04	-2520.	2.3317E-02	-731.38
-26.00	1.5577E+04	-3292.	1.1246E-02	-812.76
-27.00	1.1864E+04	-4148.	4.1965E-03	-899.91
-27.93	7.6270E+03	-5021.	1.1054E-03	-986.39
-28.00	7.2509E+03	-5085.	9.6524E-04	-740.79
-29.00	2.3454E+03	-4176.	6.8302E-05	2560.09
-29.99	0.0000E+00	0.	0.0000E+00	5841.24

III.--WATER AND SOIL PRESSURES

		<-------------SOIL PRESSURES------------->			
		<----LEFTSIDE----->		<---RIGHTSIDE---->	
ELEVATION (FT)	WATER PRESSURE (PSF)	PASSIVE (PSF)	ACTIVE (PSF)	ACTIVE (PSF)	PASSIVE (PSF)

S14 570_5 BENCH 10 TO 50 DRAINED REV NOAD ALYS OUT

0.00	0.	0.	0.	0.	0.
-1.00	0.	0.	0.	29.	479.
-2.00	0.	0.	0.	59.	958.
-3.00	0.	0.	0.	88.	1437.
-3.10	0.	0.	0.	91.	1485.
-4.00	56.	0.	0.	104.	1695.
-4.60	94.	0.	0.	113.	1834.
-5.00	94.	0.	0.	118.	1928.
-6.00	94.	0.	0.	133.	2160.
-7.00	94.	0.	0.	147.	2393.
-8.00+	94.	0.	0.	161.	2626.
-8.00+	94.	0.	0.	183.	2214.
-9.00	94.	0.	0.	189.	2284.
-10.00	94.	0.	0.	195.	2354.
-11.00	94.	0.	0.	200.	2423.
-11.60	94.	0.	0.	204.	2465.
-12.00	94.	79.	5.	206.	2493.
-12.60	94.	198.	12.	210.	2535.
-13.00	94.	277.	16.	212.	2563.
-13.15	94.	306.	18.	213.	2573.
-14.00	94.	474.	28.	218.	2632.
-15.00	94.	612.	40.	223.	2702.
-16.00+	94.	630.	51.	229.	2772.
-16.00+	94.	630.	51.	202.	3288.
-17.00	94.	629.	63.	213.	3478.
-18.00	94.	675.	75.	225.	3669.
-19.00	94.	729.	87.	237.	3860.
-20.00	94.	787.	98.	249.	4050.
-21.00	94.	847.	110.	260.	4241.
-22.00	94.*	904.	122.	272.	4432.
-23.00	94.*	968.	133.	284.	4622.
-24.00	94.*	1044.	145.	295.	4813.
-25.00	94.*	1132.	157.	307.	5004.
-26.00	94.*	1225.	169.	319.	5194.
-27.00	94.*	1324.	180.	331.	5385.
-27.93	94.*	1421.	189.	341.	5561.
-28.00	94.*	1429.	189.	342.	5576.
-29.00	94.*	1464.	198.	354.	5766.
-29.99	94.	1473.	208.	366.	5957.
-31.00	94.	1628.	219.	377.	6147.

* STANDARD WEDGE SOLUTION DOES NOT EXIST FOR INDICATED PRESSURE AT THIS ELEVATION.

SSP WALL

INDIVIDUAL MEMBER STRESSES

BARR ENGINEERING CO.

KK River Walls

CHECKED BY JAD2
DATE 12/04/06

NAME TSH
DATE 10-18-06
SHEET 1 IN SET
PAGE IN FILE

CHECK SECTION 1 WALL STRESS

$M_{max} = \cancel{29,272}$ 33085 LB-ft UNDRAINED ✓

Pile is assumed PZ27 $S_x = 30.2\ in^3/ft$ ✓

$F_y = 38.5\ ksi$ $F_b = .5F_y = 19.25\ ksi$ ✓

$f_b = \dfrac{\cancel{24.3}\ 33.1\ k\text{-}ft \times 12\ in/ft}{30.2\ in^3} = \cancel{9.7}\ 13.15\ ksi$, ok ✓

SECTION 2 -

CHECK WALL STRESS, ANCHOR STRESS, WALE STRESS

FROM DRAINED CONDITION FOR FIXED EARTH

$M = \cancel{6917}\ 2673$ LB-Ft DRAINED $T = \cancel{2047}\ 1375$ LBS/Ft ✓

WALL IS 27#/SF 3/8" THICK CARNEGIE M116 $S_x = 10.7\ in^3/ft$ ✓

~~(NO AVAILABLE DATA ON THIS WALL SECTION)~~
~~SIMILAR WEIGHT + THICKNESS TO PZ27~~

USE $S_x = \cancel{30.2}\ 10.7\ in^2$ ✓

WALE 2C8×13.75

TIE ROD 1½" φ AT 5'-4" SPACING $A = 1.77\ in^2$ ✓

$f_b = \dfrac{\cancel{6.9}\ 2.7 \times 12}{\cancel{30.2}\ 10.7} = \cancel{2.7}\ \cancel{1.07}\ 3\ ksi \times 1.3$ ✓

MULT. BY 1.3 FOR FS DUE TO UNCERTAINTY IN PROGRAM ~~APPROX. RATIO TO UNDRAINED CONDITION~~

$\cancel{2.7}\ \cancel{1.07}\ 3 \times 1.3 = \cancel{3.5}\ \cancel{1.4}\ 3.9$ ksi, ok ✓

BARR ENGINEERING CO.

NAME TSH
DATE 10-18-06
SHEET 2 IN SET
PAGE ____ IN FILE

CHECKED BY JAD2
DATE 12/14/06

KK RIVER WALLS

SECTION 2 CONT'D

CHECK ANCHOR

$\cancel{2.05}\ 1.375^k/ft \times 5.33' = \cancel{10.93}\ 7.33^k/\text{ANCHOR}$ ✓

$f_t = \dfrac{\cancel{10.93}\ 7.33^k}{\cancel{1.77}in^2\ 1.41} = \cancel{6.2}\ 5.2\ ksi$ ✓ $F_T = .4F_y = .4 \times 36 = 14.4\ ksi$, ~~x1.33~~ ✓

~~Temp over for undrain~~

increase factor ~~undrained~~

$\cancel{6.2}\ 5.2 \times 1.3 = \cancel{8.1\ ksi}\ 6.8 < \cancel{14.4\ ksi}\ \cancel{19.2}\ 14.4$, OK ✓

CHECK WALE C8x13.75 $S_x = 18 in^3$ ✓

$m = \dfrac{wl^2}{10\ 9} = \dfrac{\cancel{2.05}\ 1.375^k \times (5.33')^2}{\cancel{10}\ 9} = \cancel{5.82}\ 4.34$ ft·k ✓

$f_b = \dfrac{\cancel{5.82}\ 4.34 \times 12}{18} = \cancel{3.88}\ 2.9\ ksi$ ✓

$\cancel{3.88}\ 2.9 \times 1.3 = \cancel{5}\ 3.8\ ksi$ ✓ $F_b = .66 \times 36 = 23.8\ ksi > \cancel{5}\ 3.8\ ksi$ ✓ OK

SECTION 3

$m = \cancel{6945}$ 15905 UNDRAINED ft-lb ✓ $T = \cancel{1981}$ 3147 UNDRAINED lbs/ft ✓

WALL MZ27 $S_x = 30.2 in^3$ ✓
WALE 2C9x15 $S_x = 22.6 in^3$ ✓
ROD 1½"Ø @ 9' SPACING $A_{ROD} = 1.77 in^2$

$F_T = 14.4 \times 1.33 = 19.2$ ✓
Temp over for undrained temp condition

$f_{b\,sheet}$ = ~~3.5 ksi per section 2~~ $\dfrac{15.9 \times 12}{30.2} = 6.3$, OK ✓

$f_t \approx$ ~~8.1 ksi per section 2~~ $\dfrac{3.147 \times 9}{1.41} = 20.1\ ksi > 19.2$ ✓ N.G.

ADJUST FILL HEIGHT

$M_{wale} = \cancel{1.98}\ 3.147 \times 9^2 / \cancel{10}\ 9 = \cancel{16}\ 28.3$ ft·k

$f_{b\,wale} = \dfrac{\cancel{16}\ 28.3 \times 12}{22.6} = \cancel{8.5}\ 15.0\ ksi \times 1.3 = \cancel{11}\ 19.6\ ksi < 23.8$, OK

$f_{t\,revised} = \dfrac{3 \times 9}{1.41} = 19.14\ ksi < 19.2\ ksi$, OK
use revised bench elev.

BARR ENGINEERING CO.

KK RIVER WALLS

CHECKED BY JAD2
DATE 12/4/06

NAME TSH
DATE 10-18-06
SHEET 3 IN SET
PAGE ____ IN FILE

SECTION 6

M_{MAX} = ~~4145~~ 4292 ft-k ✓ T = ~~930~~ 1034 lbs/ft ✓

same wall members as ~~section~~ section 3 and moment & anchor force are smaller,

$fb = \frac{4.3 \times 12}{30.2} = 1.71$ ksi ok ✓

Therefore member stresses okay by inspection

$ft = \frac{1.034 \times 9}{1.41} = 6.6$ ksi < 19.2 ksi, ok ✓

Section 14

M_{max} = ~~15698~~ 23461 lb·ft < ~~24272~~ 33085 (from section 1) ✓

same wall section, therefore okay by inspection

DEADMAN ANALYSES

SECTION 6

DEADMAN ANCHOR

Calcs using textbook formula

h1=	7	
h2=	6	
sat. unit weight=	103	
Ka=	0.333333	~~0.34~~
Kp=	3	~~4.85~~ NOT USED
moist unit weight=	93	
unit weight' =	40.6	
Pp=	15793.1	
Pa=	3428.3	0
h (NAV) =	13	
Total force=	12364.8	lbs PER FOOT

MAX ANCHOR FORCE = 1034 lbs / ft × 9' = 9.3^k

MAX DEADMAN CAPACITY = 12.4^k × 2' WIDE Deadman

= 24.8^k

h2 (NAV) =	7

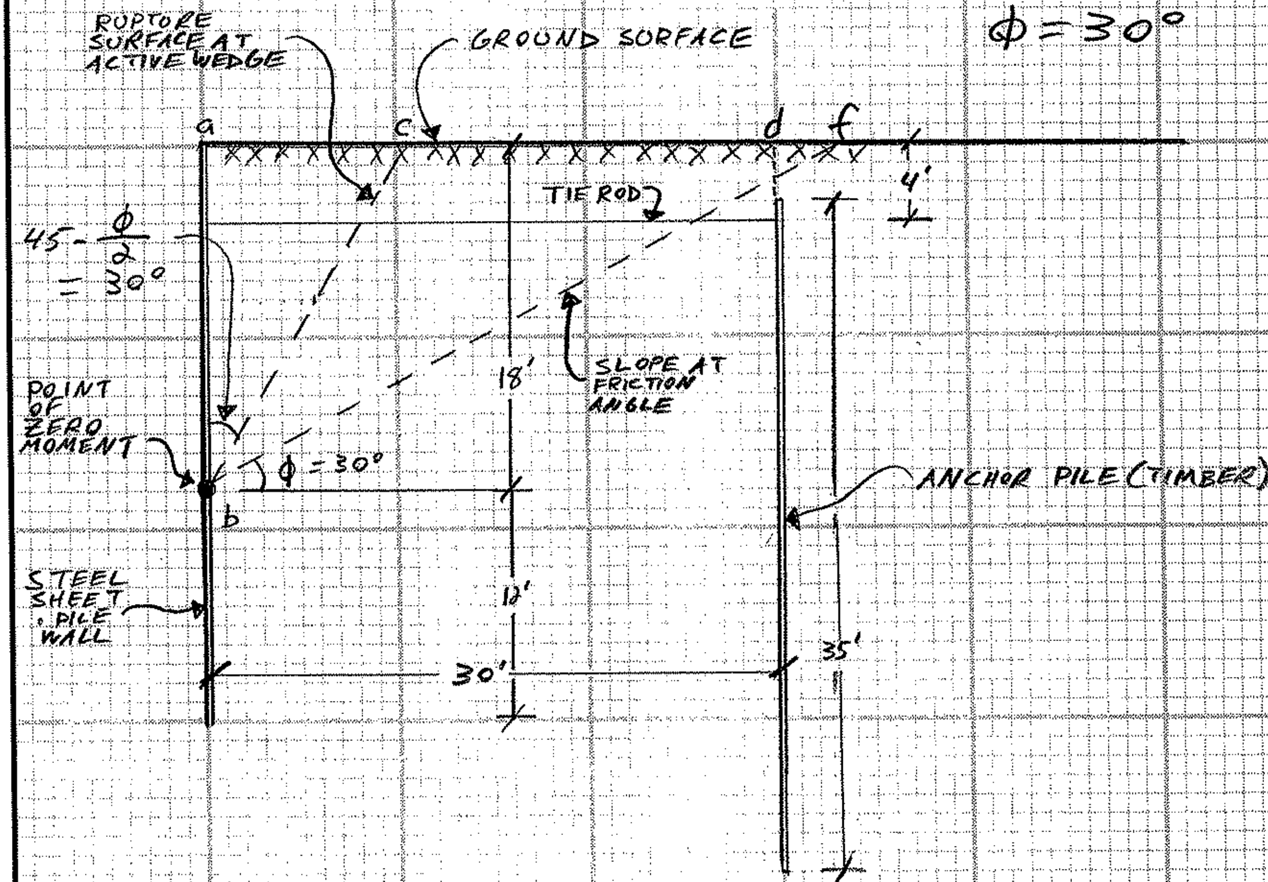
$$FS = \frac{24.8}{9.3} = 2.67 \quad \text{OK}$$

BARR

MINNEAPOLIS, MINNESOTA - HIBBING, MINNESOTA
DULUTH, MINNESOTA
ANN ARBOR, MICHIGAN - JEFFERSON CITY, MISSOURI

COMPUTED	CHECKED	SUBMITTED	DATE 05 DEC 06 / SHEET NO. 1
BY JES	BY BH	TO	PROJECT NAME KINNICKINNIC RIVER
DATE 05 DEC 06	DATE 12-11-06	DATE	PROJECT NUMBER 49/41-023

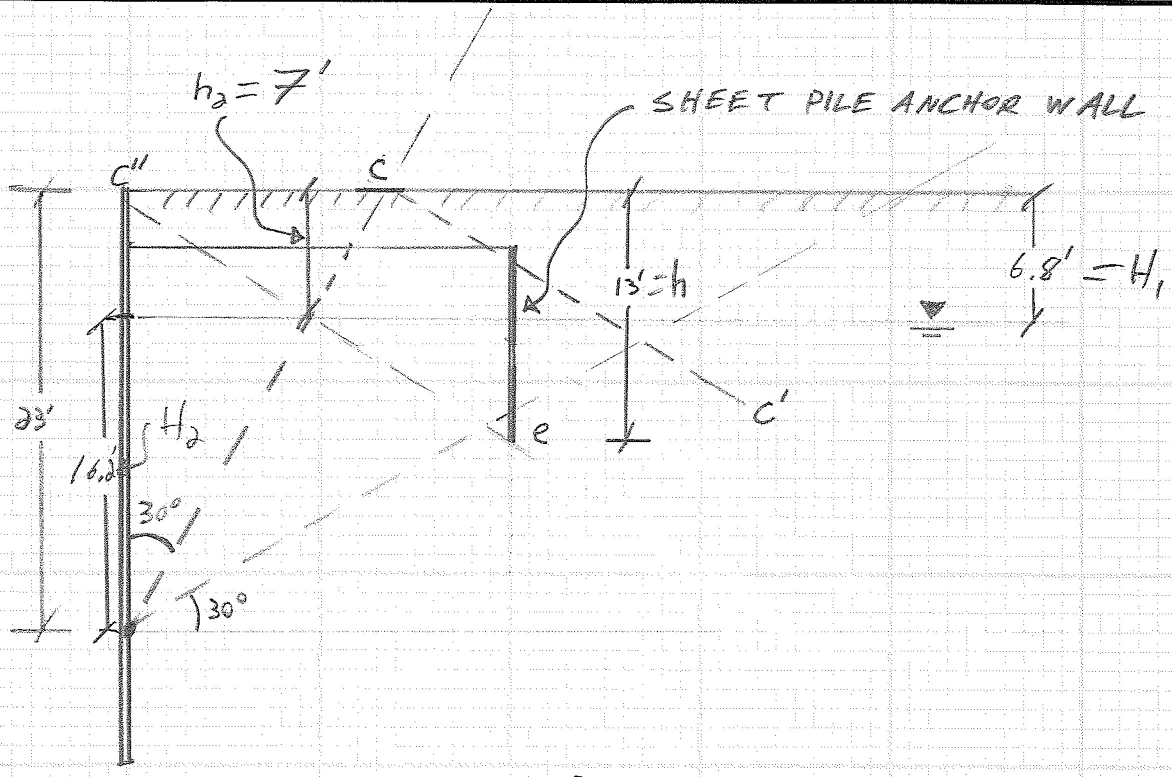
SUBJECT SSP SECTION 2
ANCHOR RESISTANCE CALCS



- Anchor is located to the right of line bf and provides full resistance w/ no load transferred to base of wall

* SECTION IS BASED ON UNDRAINED, MIN. PASSING SECTION w/ NO ADHESION INPUT

BARR — MINNEAPOLIS, MINNESOTA - HIBBING, MINNESOTA DULUTH, MINNESOTA ANN ARBOR, MICHIGAN - JEFFERSON CITY, MISSOURI			DATE Ø1 DEC Ø6	SHEET NO. 1
COMPUTED	CHECKED	SUBMITTED	PROJECT NAME KINNICKINNIC RIVER	
BY JES	BY	TO	PROJECT NUMBER 49/41-023	
DATE 01DEC06	DATE	DATE	SUBJECT Anchor Resistance Calcs Section 6	



$h = 13'$
$h_2 = 7'$
$\gamma = 103 \text{ lbs/ft}^3$
$\gamma_1 = 40.6 \text{ lbs/ft}^3$

$K_A = 0.33$
$K_p = 4.85$
$= 3$

$H_1 = 6.8$
$H_2 = 16.2$

$$P_p = \left[\tfrac{1}{2} K_p \gamma H_1^2 + K_p \gamma H_1 H_2 + \tfrac{1}{2}(K_p \gamma' + \gamma_w) H_2^2\right]$$

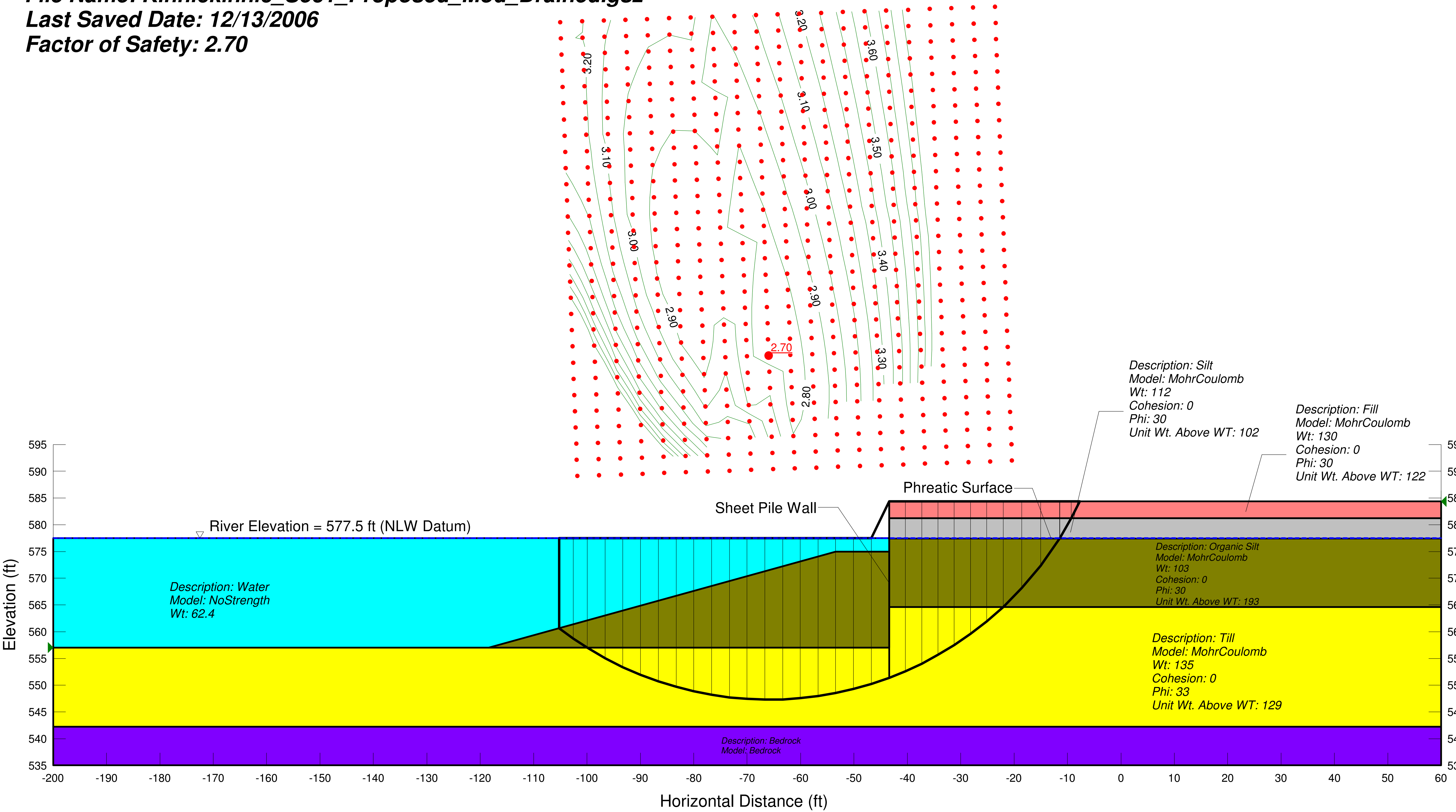
$$- \left[\tfrac{1}{2} K_p \gamma h_2^2 - \tfrac{1}{2} K_A \gamma h_2^2\right] - \left[\tfrac{1}{2} K_A \gamma H_1^2 + K_A \gamma H_1 H_2 + \tfrac{1}{2}(K_p \gamma' + \gamma_w) H_2^2\right]$$

H:RLGINHOUSE\COMPPADS.CDR

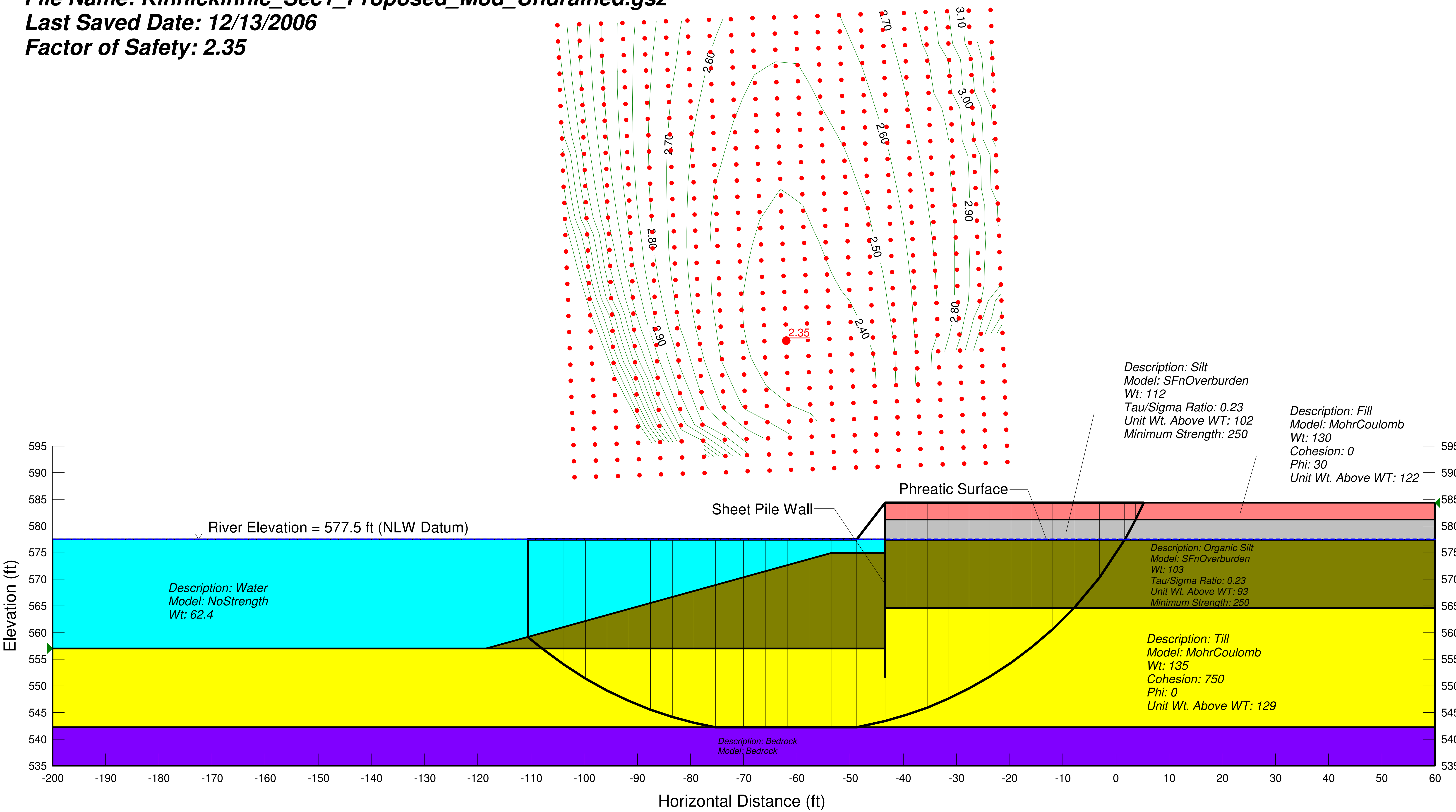
REV.12/1/98

Deep-Seated Failure Analysis of Steel Sheet Pile Walls

Kinnickinnic River Dredging Stability Analysis
Section 8, Proposed (Modified), Long-Term (Drained)
File Name: Kinnickinnic_Sec1_Proposed_Mod_Drained.gsz
Last Saved Date: 12/13/2006
Factor of Safety: 2.70

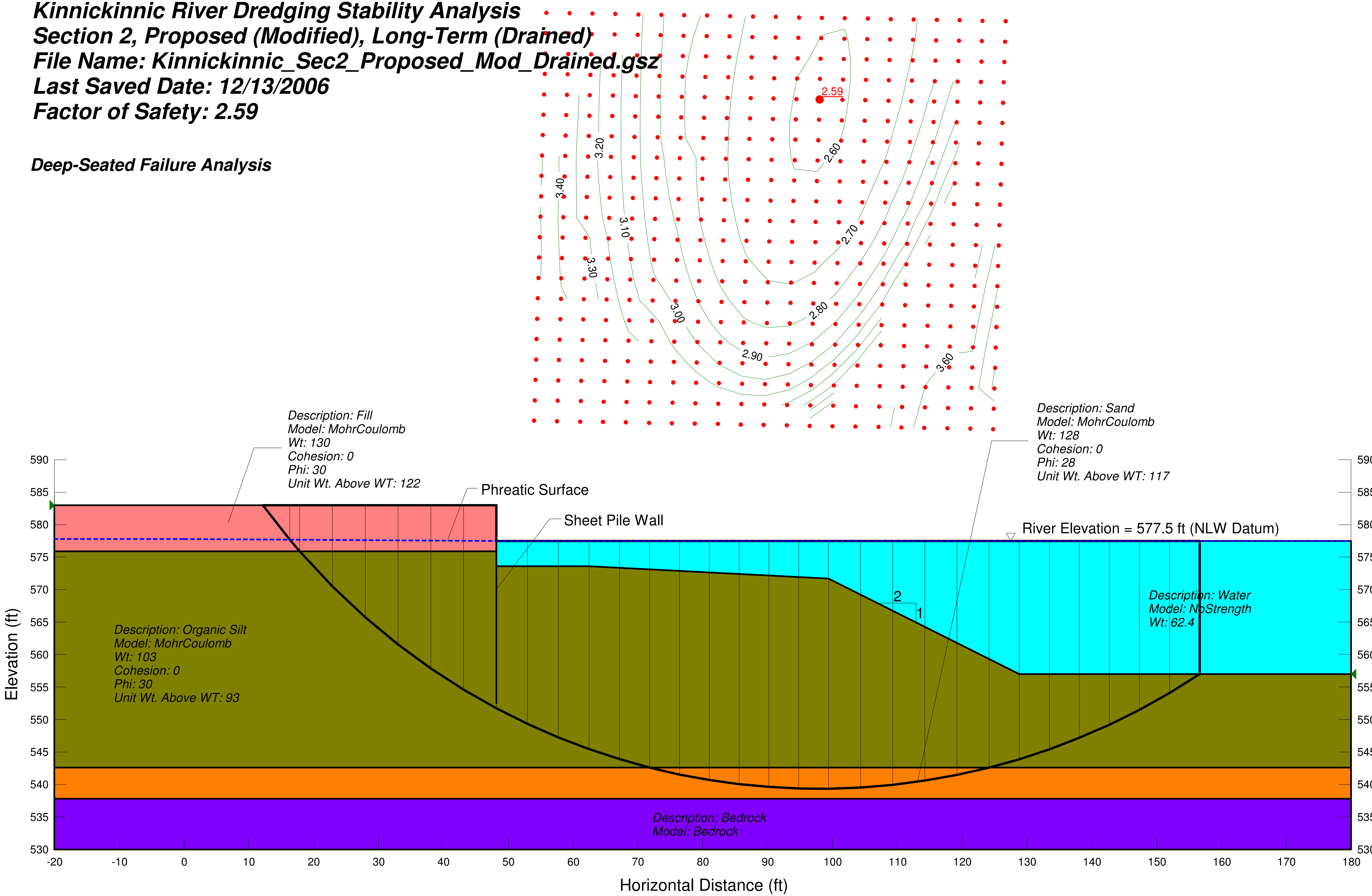


Kinnickinnic River Dredging Stability Analysis
Section 8, Proposed (Modified), End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec1_Proposed_Mod_Undrained.gsz
Last Saved Date: 12/13/2006
Factor of Safety: 2.35



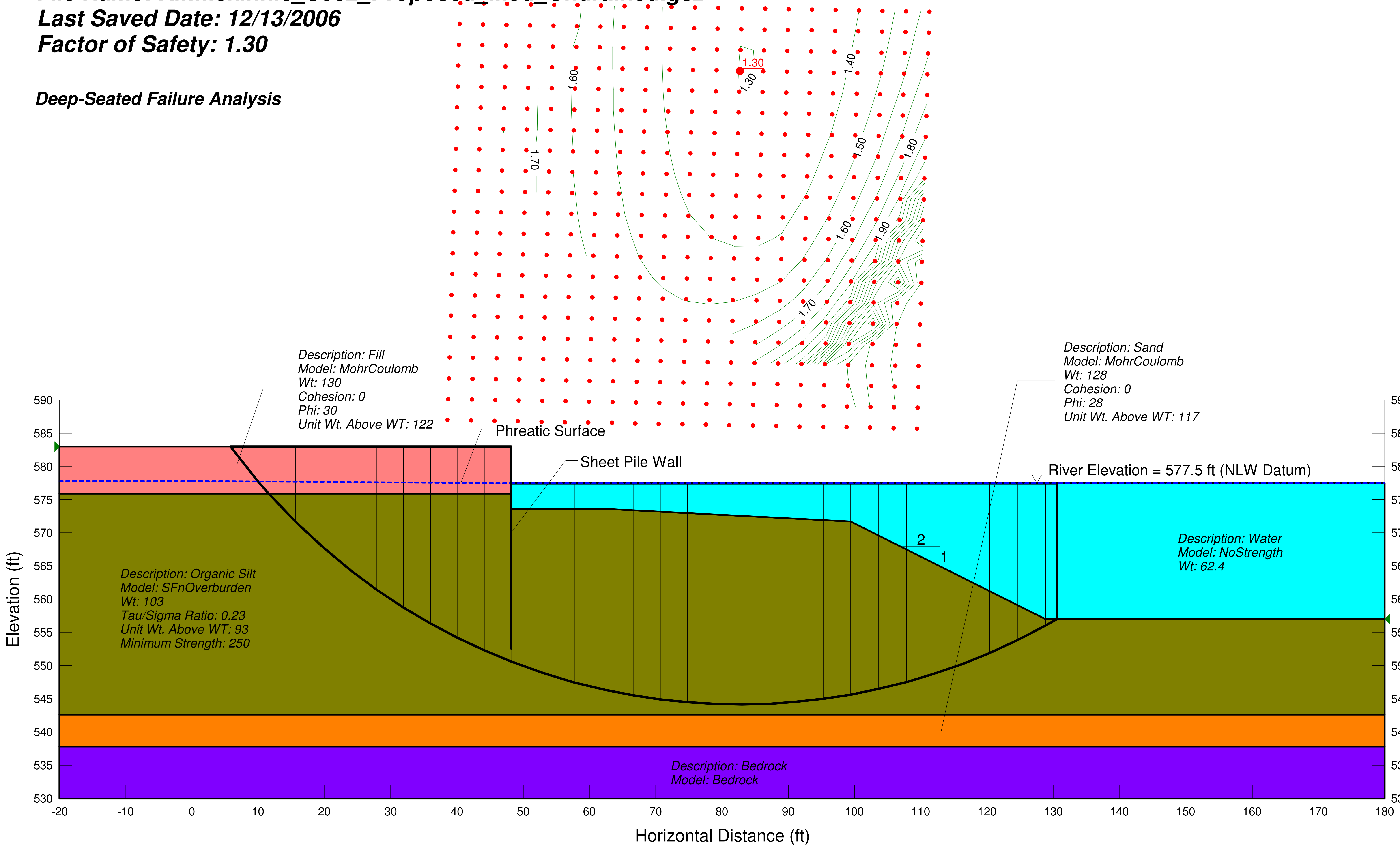
Kinnickinnic River Dredging Stability Analysis
Section 2, Proposed (Modified), Long-Term (Drained)
_File Name: Kinnickinnic_Sec2_Proposed_Mod_Drained.gsz_
Last Saved Date: 12/13/2006
Factor of Safety: 2.59

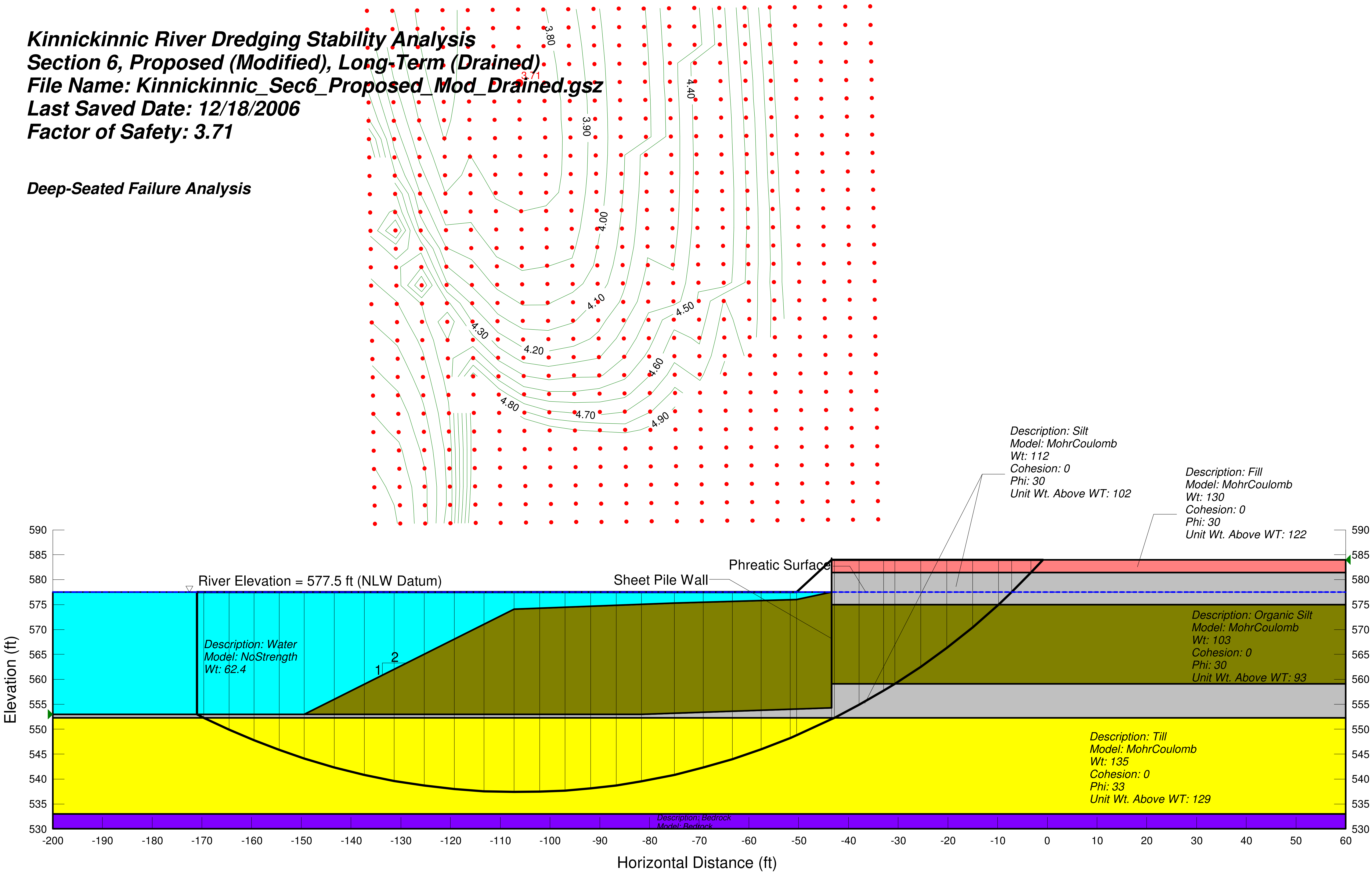
Deep-Seated Failure Analysis



Kinnickinnic River Dredging Stability Analysis
Section 2, Proposed (Modified), End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec2_Proposed_Mod_Undrained.gsz
Last Saved Date: 12/13/2006
Factor of Safety: 1.30

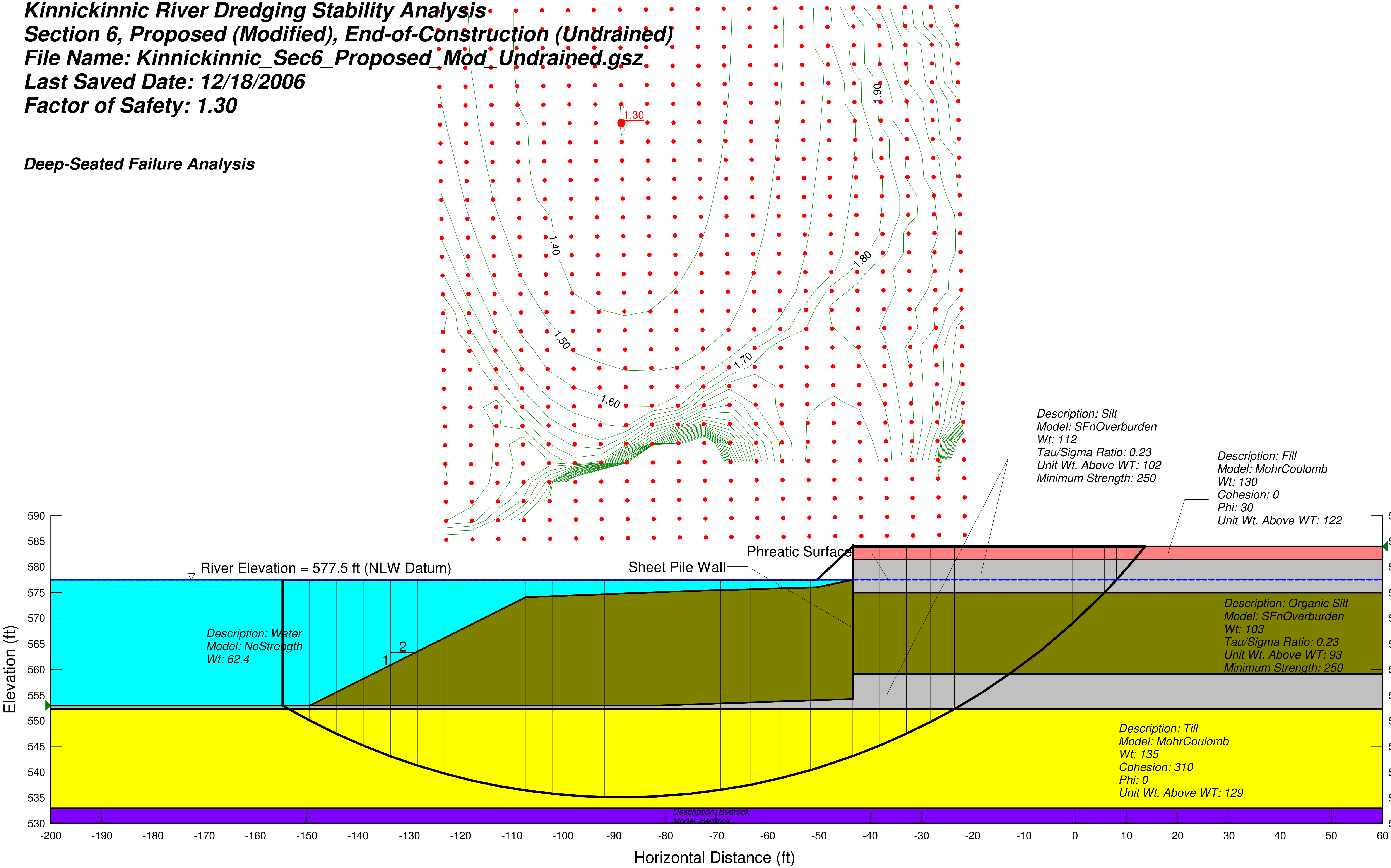
Deep-Seated Failure Analysis



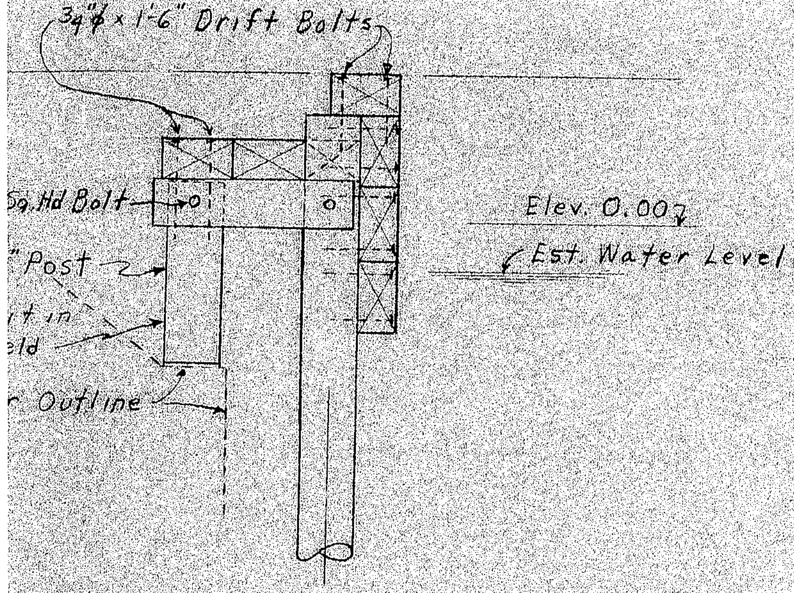

Kinnickinnic River Dredging Stability Analysis
Section 6, Proposed (Modified), Long-Term (Drained)
File Name: Kinnickinnic_Sec6_Proposed_Mod_Drained.gsz
Last Saved Date: 12/18/2006
Factor of Safety: 3.71
Deep-Seated Failure Analysis
3.71
3.80
3.90
4.00
4.10
4.20
4.30
4.40
4.50
4.60
4.70
4.80
4.90
Description: Silt
Model: MohrCoulomb
Wt: 112
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 102
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Phreatic Surface
Sheet Pile Wall
River Elevation = 577.5 ft (NLW Datum)
Description: Water
Model: NoStrength
Wt: 62.4
2
1
Description: Organic Silt
Model: MohrCoulomb
Wt: 103
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 93
Description: Till
Model: MohrCoulomb
Wt: 135
Cohesion: 0
Phi: 33
Unit Wt. Above WT: 129
Description: Bedrock
Model: Bedrock
Elevation (ft)
Horizontal Distance (ft)
590
585
580
575
570
565
560
555
550
545
540
535
530
-200
-190
-180
-170
-160
-150
-140
-130
-120
-110
-100
-90
-80
-70
-60
-50
-40
-30
-20
-10
0
10
20
30
40
50
60

Kinnickinnic River Dredging Stability Analysis
Section 6, Proposed (Modified), End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec6_Proposed_Mod_Undrained.gsz
Last Saved Date: 12/18/2006
Factor of Safety: 1.30

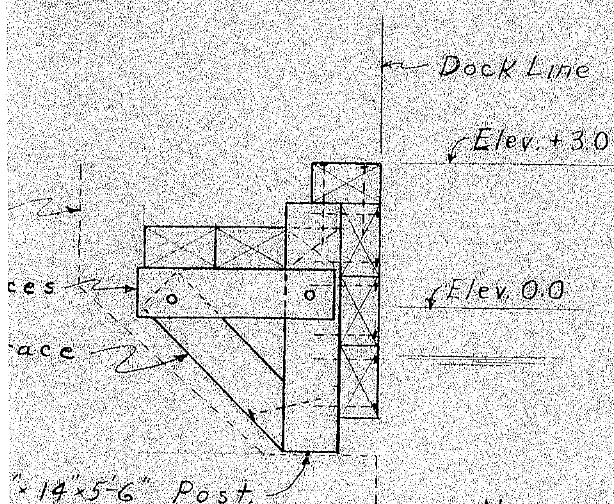
Deep-Seated Failure Analysis

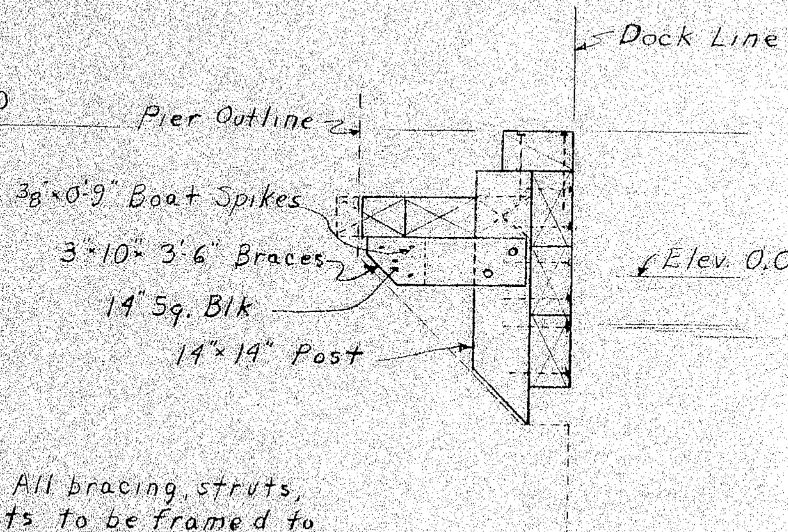


Appendix F – Timber Pile Fence Record Drawings



DETAIL CC





NOTE: All bracing, struts, & posts to be framed to fit in field.

DETAIL DD

DETAIL EE

~ GENERAL NOTES ~

Drive piling to refusal or to elevation shown.
Treat pile cut offs with 3 coats of hot creosote oil.
Treat Creosoted Lumber per C.M. St. P. & P. R.R. Spec's. #14, for the preservative treatment of Douglas Fir. Use empty cell process retaining 10# of grade #1 creosote oil per cubic foot, min. pene. 3/4".
All lumber cut after treatment shall receive 3 coats of hot creosote oil. All holes bored after treatment shall receive hot creosote oil, applied with a bolt hole treater.
All bolts or rods that have heads or nuts bearing on timber shall have washers behind them.

1 of 1

A. F. E.

A-
P-

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC RAILROAD

A-314 196'-3 3/4" COUNTERBALANCED SWING SPAN
Over Kinnikinnic River in Milw., Wisc.

PIER PROTECTION RENEWAL

Chicago, 5-17-62 Drawing H- 981

Approved:-

E. E. Burch
Bridge Engineer

Asst. Chief Engineer — Structures

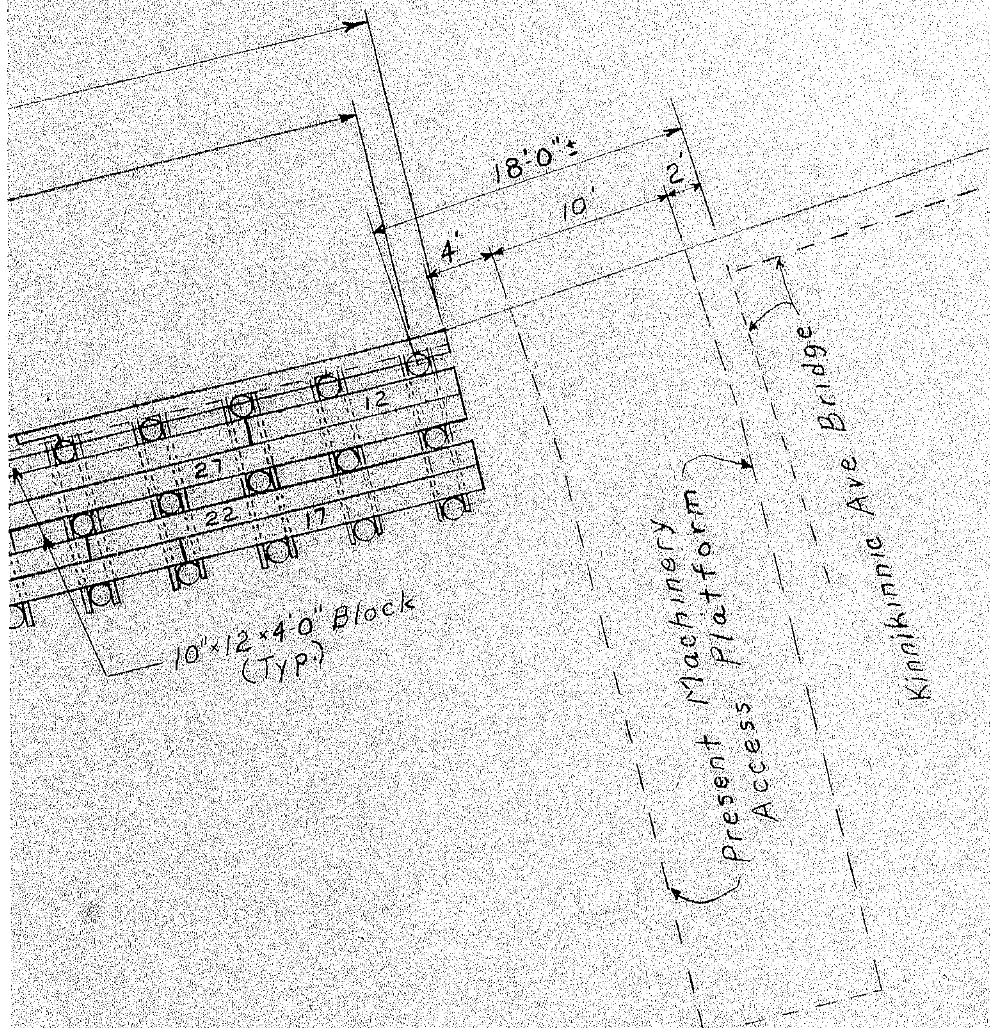
Asst. Vice President Opr. Chief Engineer

Revision	Date	By

Designed By:-	Detailed By:- R.G.K.
Design Checked By:-	Details Checked By:- C B
Des. & Det. Super. By:-	Examined By:-

188 R Lower Right

188 R upper Right...



BILL OF CREOSOTED PILES

CLASS "A" MIN. BUTT 14"

Nº	DESCRIPTION	LENGTH	LIN. FT.
37	Creosoted Piles	70'-0"	2590
68		65'-0"	4420
	TOTAL LIN. FT. =		7010

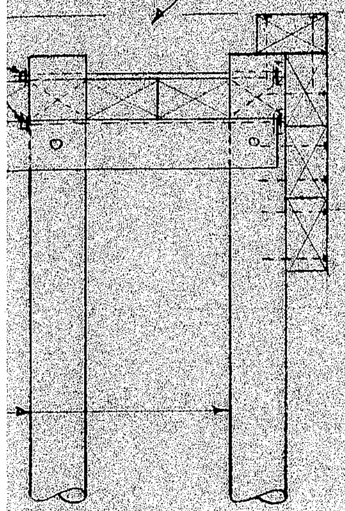
BILL OF CREOSOTED TIMBER

FIR PER W.C.L.A. BULLETON #14 PAR #214

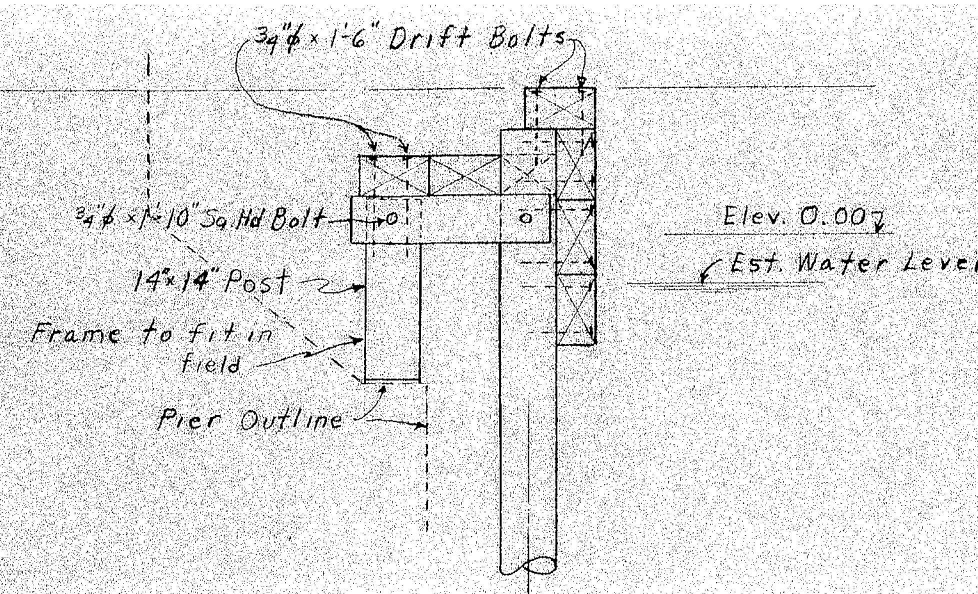
Nº	DESCRIPTION	SIZE	LENGTH	FINISH	FBM	
3	Walk Planks - (S.H. Stgrs.)	10"×18"	12-0	Rough	540	540
2	do	10"×18"	15-0	do	450	450
3	do	10"×18"	17-0	do	765	765
2	do	10"×18"	22-0	do	660	660
2	do	10"×18"	25-0	do	750	750
1	do	10"×18"	27-0	do	405	405
14	do	10"×18"	30-0	do	6300	6300
3	do	10"×18"	32-0	do	1440	1440
1	Wall Caps - (S.H. Stgrs)	10"×18"	24-0	do	360	
6	do	10"×18"	32-0	do	2880	
3	Wall Timbers - (S.H. Stgrs.)	10"×18"	24-0	do	1,080	
18	do	10"×18"	32-0	do	8,640	
70	Blocking	10"×12"	4-0	do	2800	2800
4	Sash Braces	3"×10"	3-6	do	35	35
8	do	3"×10"	4-6	do	90	90
4	do	3"×10"	8-6	do	85	85
66	do	3"×10"	9-6	do	1568	1568
2	Diagonal Braces (S.H)	14"×14"	4-6	do	147	147
4	Posts (S.H. Caps)	14"×14	4-6	do	294	294
4	" (")	14"×14"	5-6		359	359
	TOTAL F.B.M.				29,648	29648

BILL OF HARDWARE AND MISC. MATERIAL

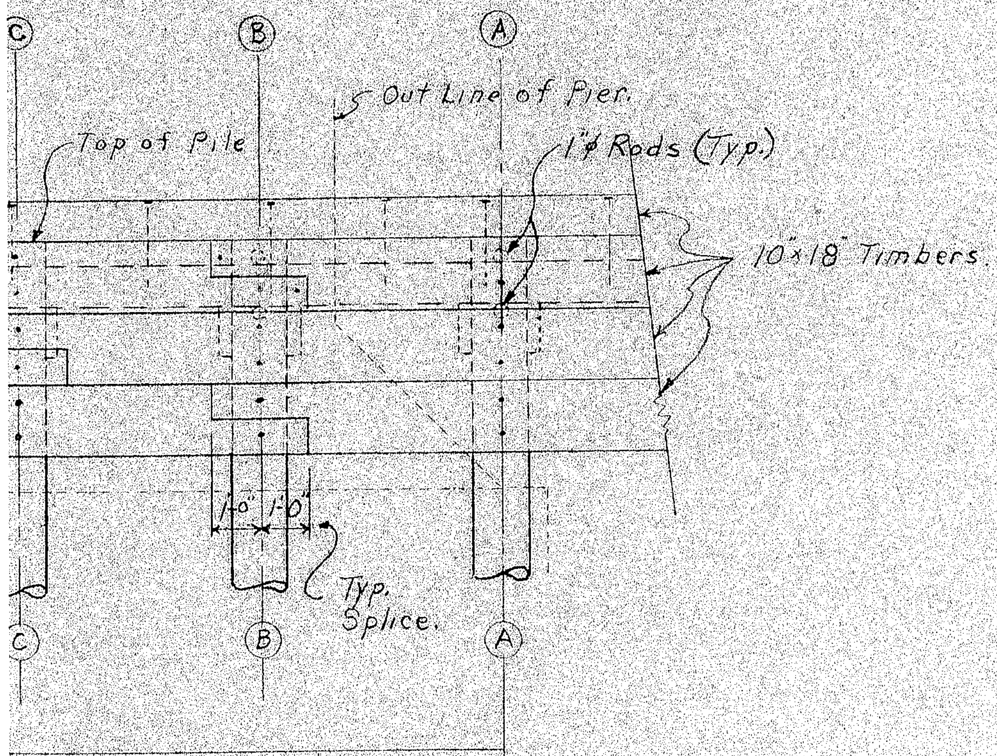
Nº	DESCRIPTIONS
116	3/4"ϕ × 1'-10" Sq. Hd. Bolts, No Nut, Std. Thrd.
4	1"ϕ × 5'-6" Rods, No Nuts, 6" Thrd. ea. end.
66	1"ϕ × 9'-6" do do

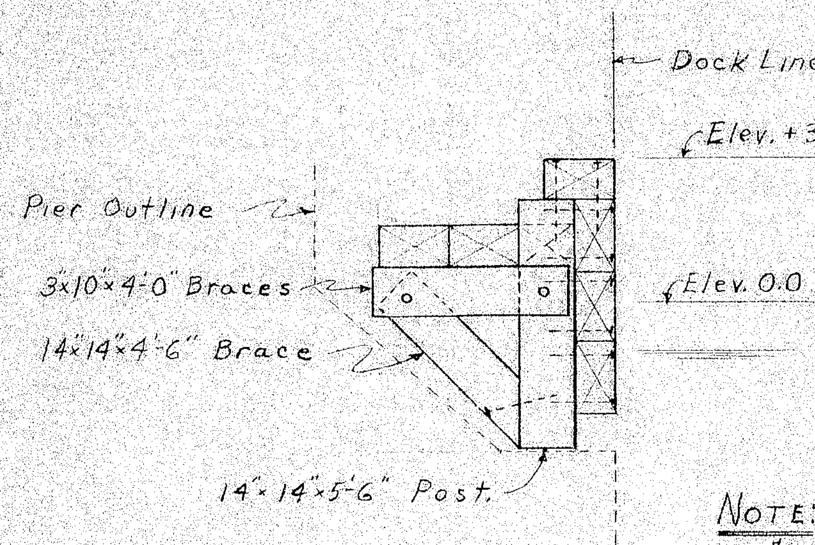


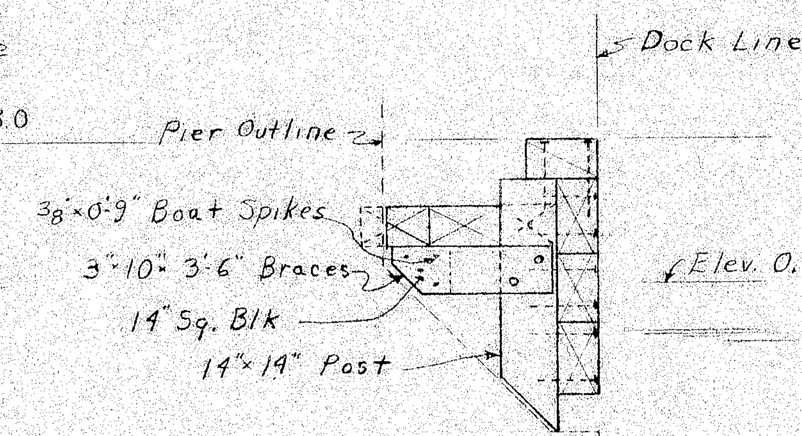
...AIL B-B



DETAIL C-C







NOTE: All bracing, struts, & posts to be framed to fit in field.

DETAIL D-D

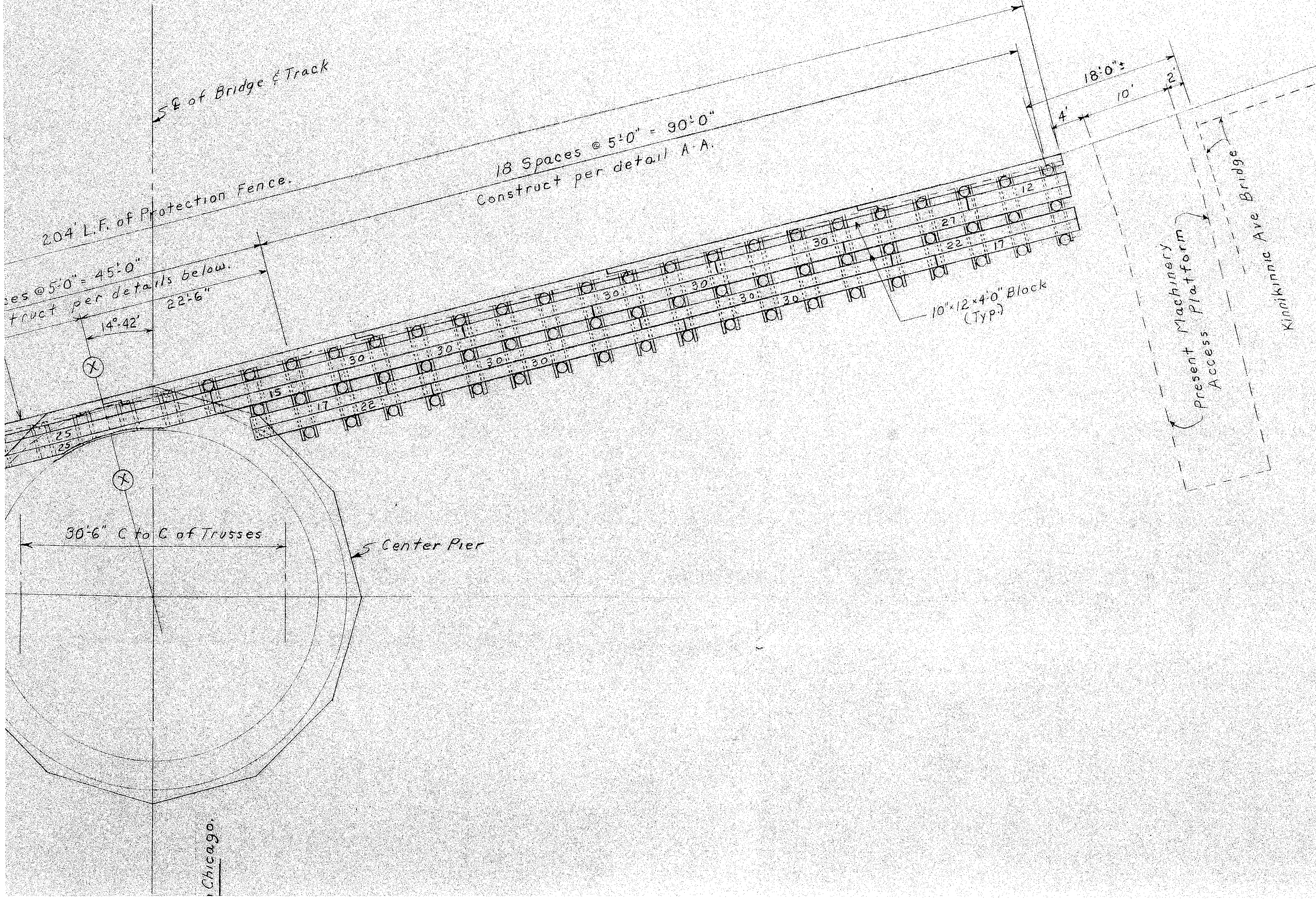
DETAIL E-E

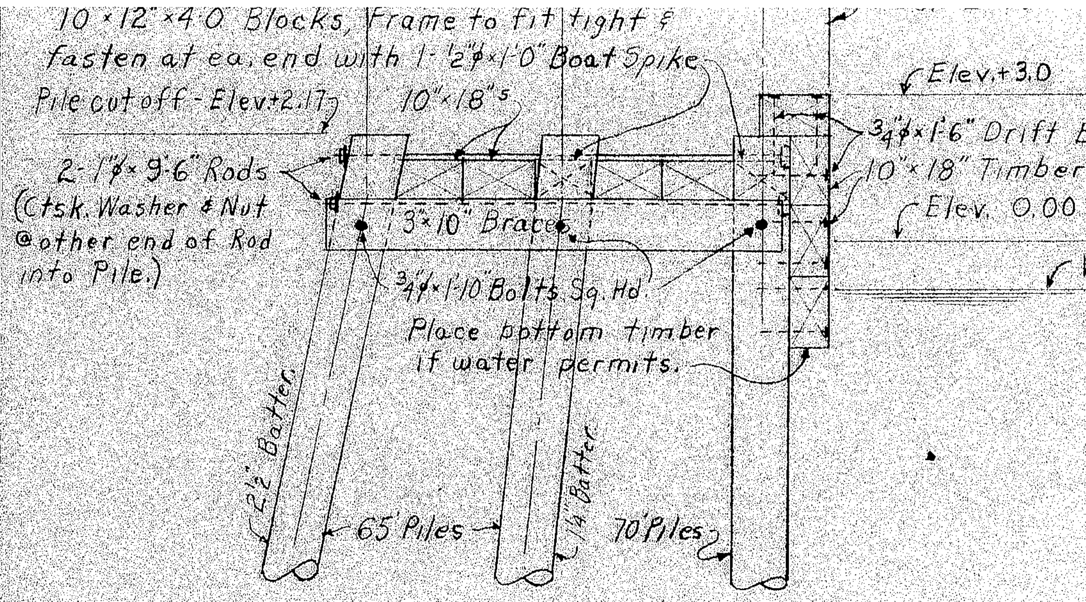
Revision	
Designed By:-	De...
Design Checked By:-	De...
Des. & Det. Super. By:-	Ex...

D...
T...
T...
A...
A...

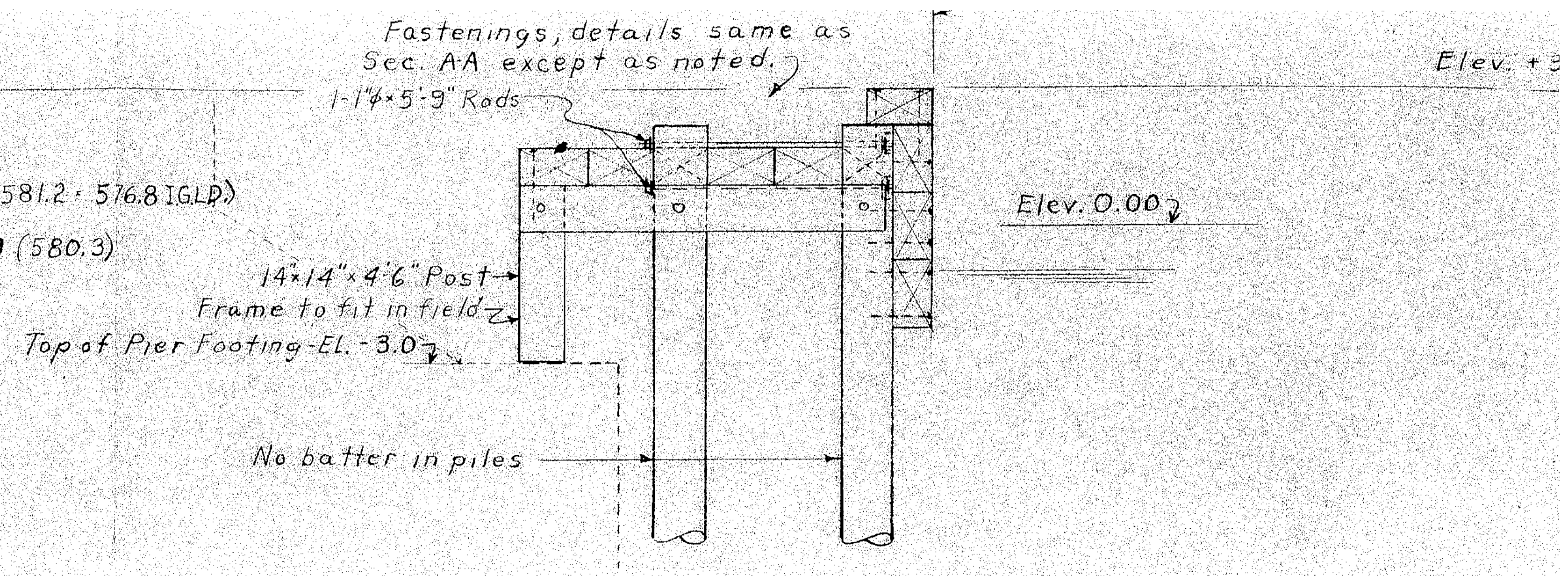
188 R Lower Middle

188 R upper Middle

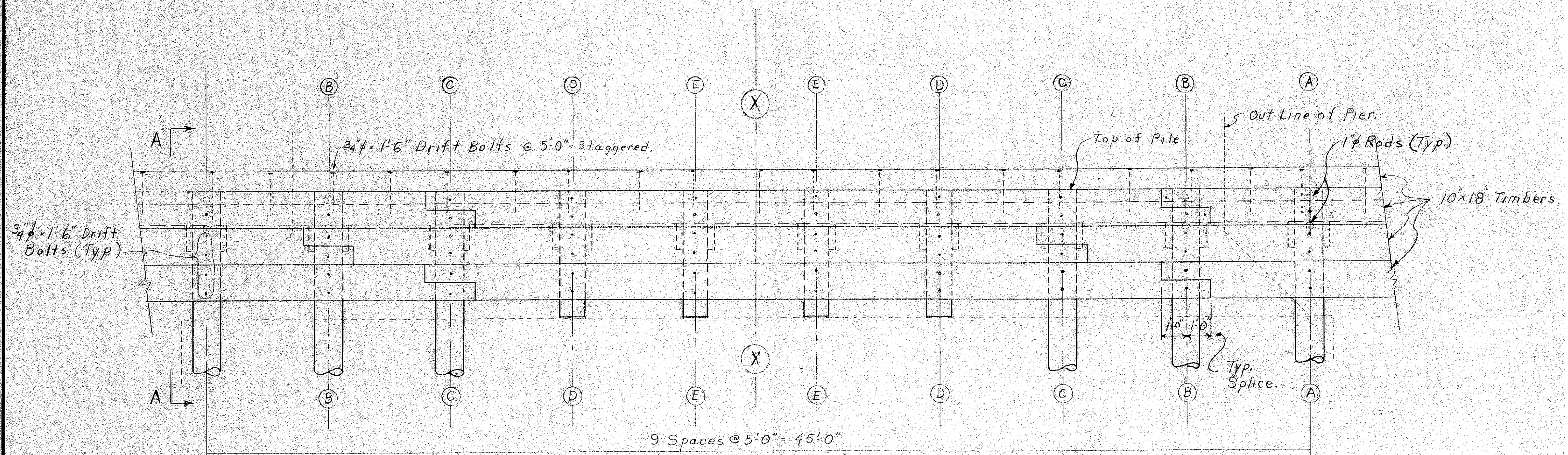




TYP SECT. & DETAIL A-A



DETAIL B-B

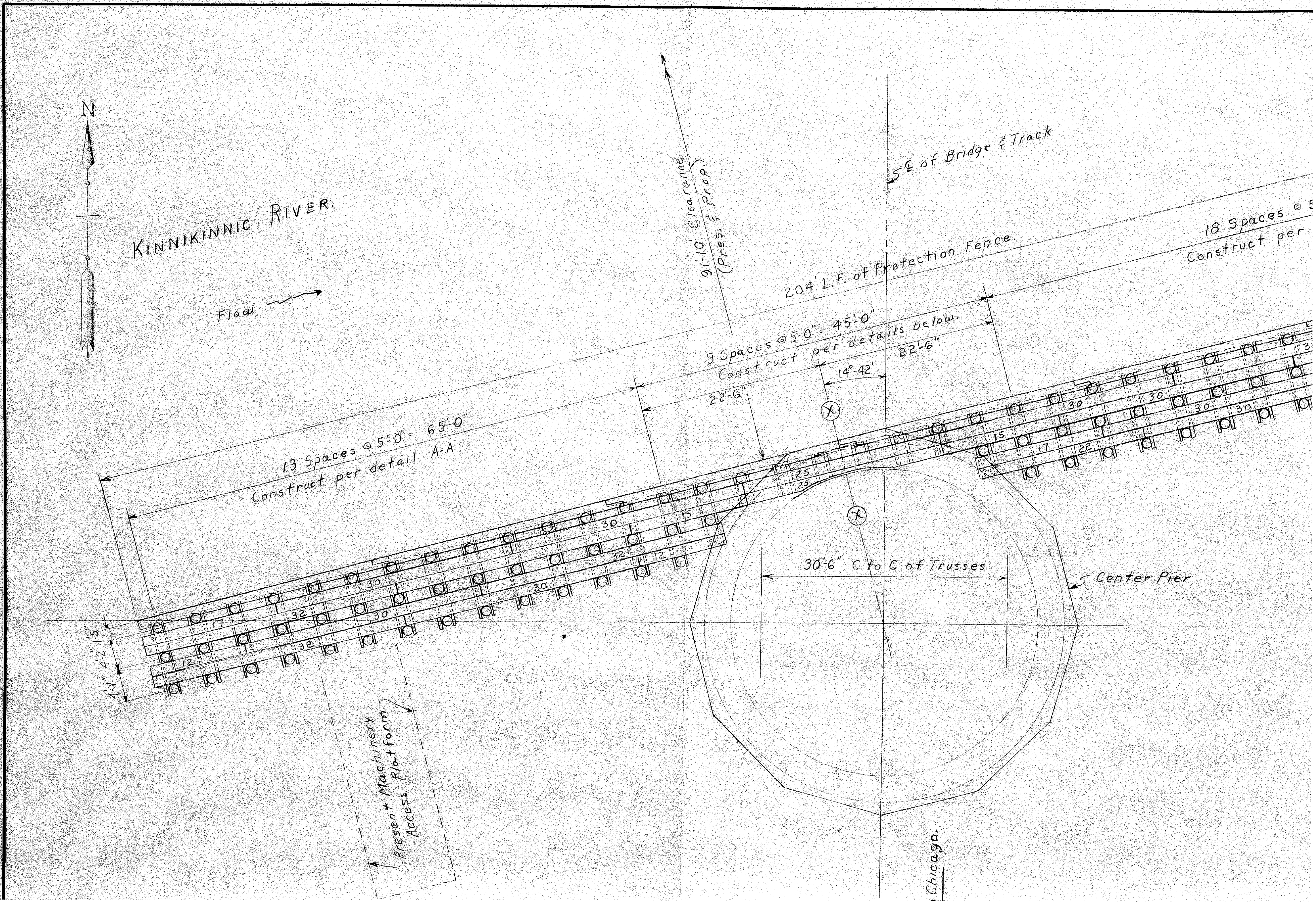


ELEVATION ALONG DOCK LINE AT PIER.

124 PENCIL TEX

188 R Lower Left

188R. Upper Loft



Appendix G – Timber Pile Fence Calculations

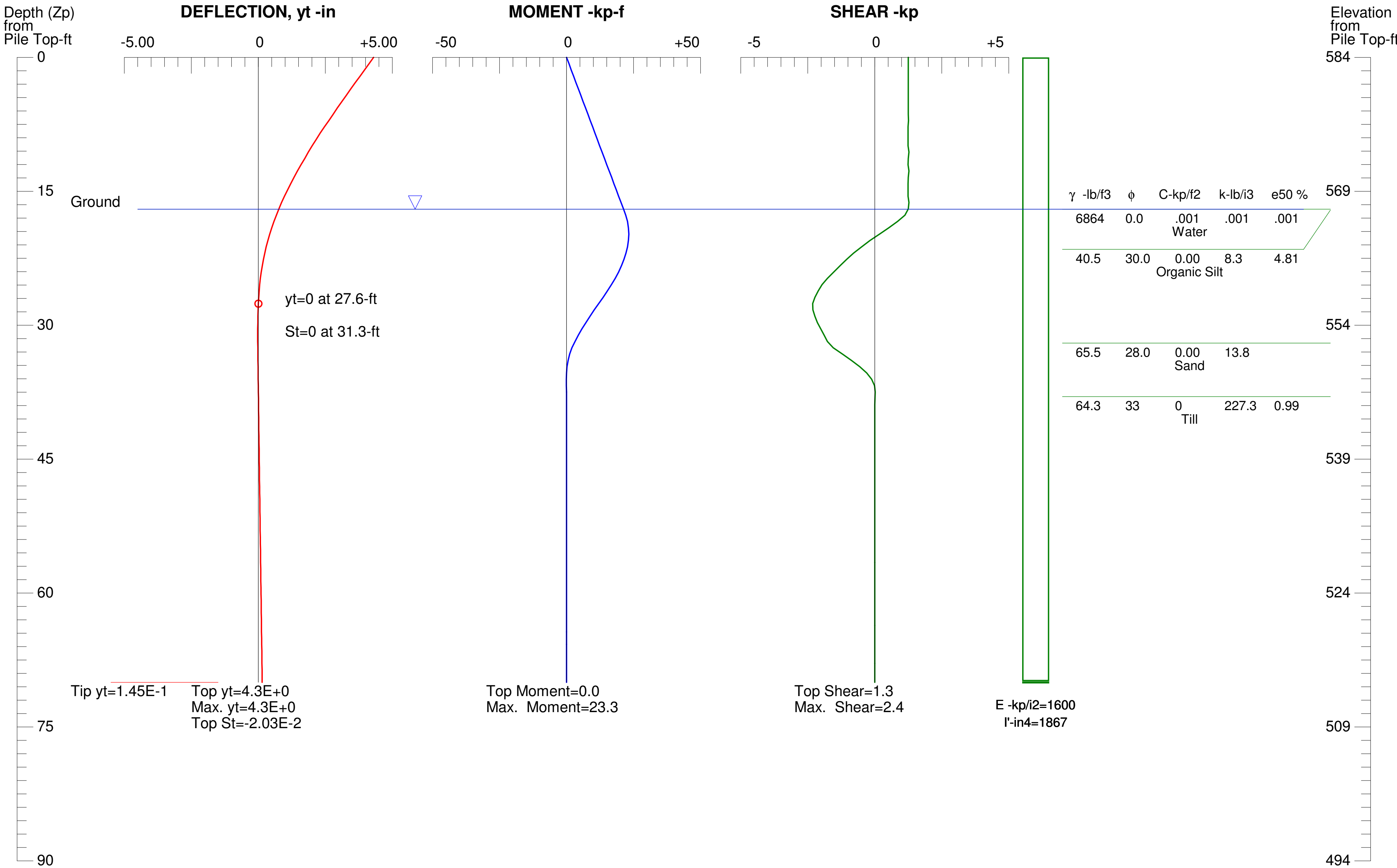
Note:

Timber pile fence elevations used in these calculations are in NGVD29.

IGLD85 = NGVD29 – 0.53 ft

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1

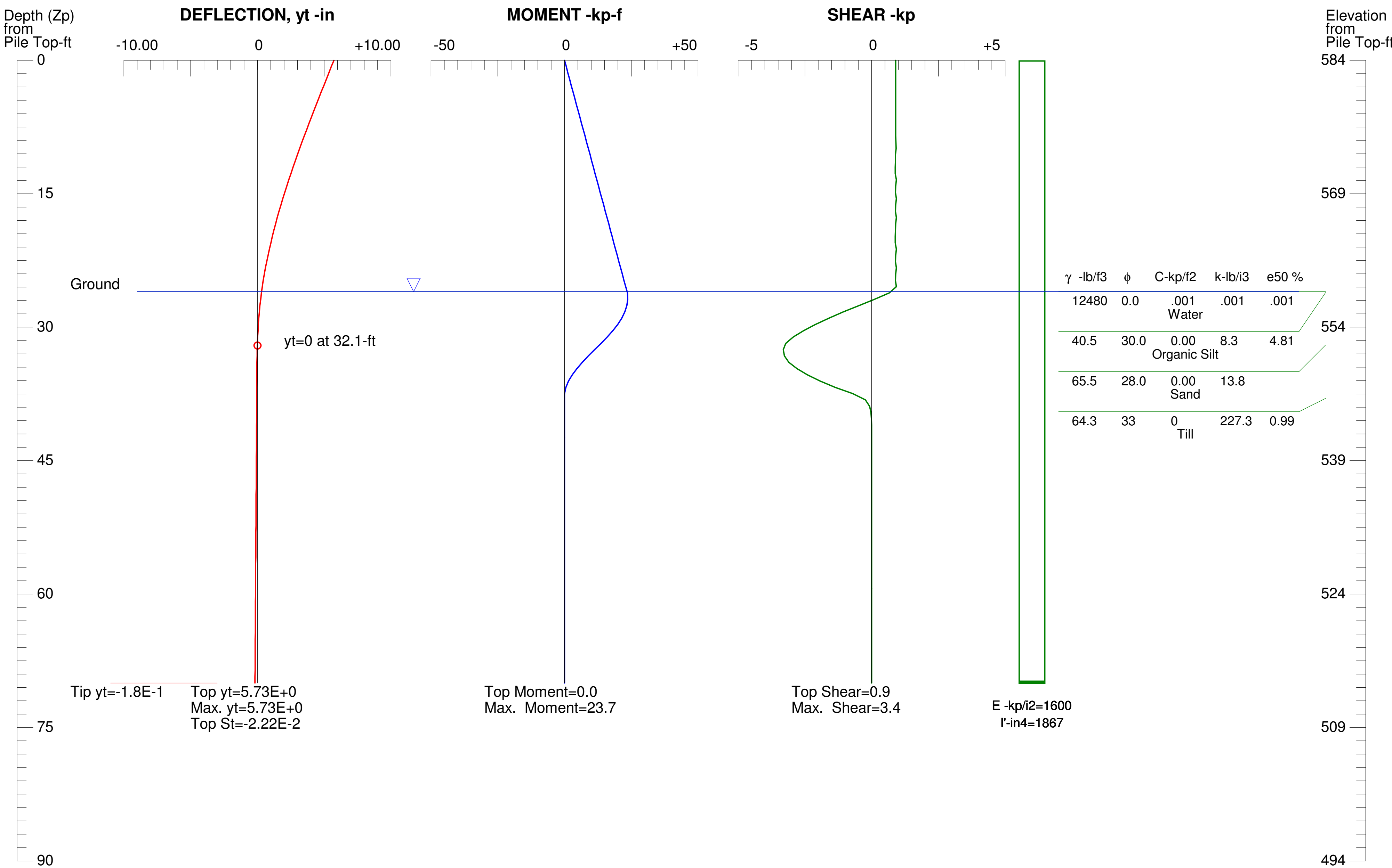


Barr Engineering Company **Kinnickinnic River Stability Analysis**
Sec. 16, 70' pile - 14", initial, NLW

Figure 1

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



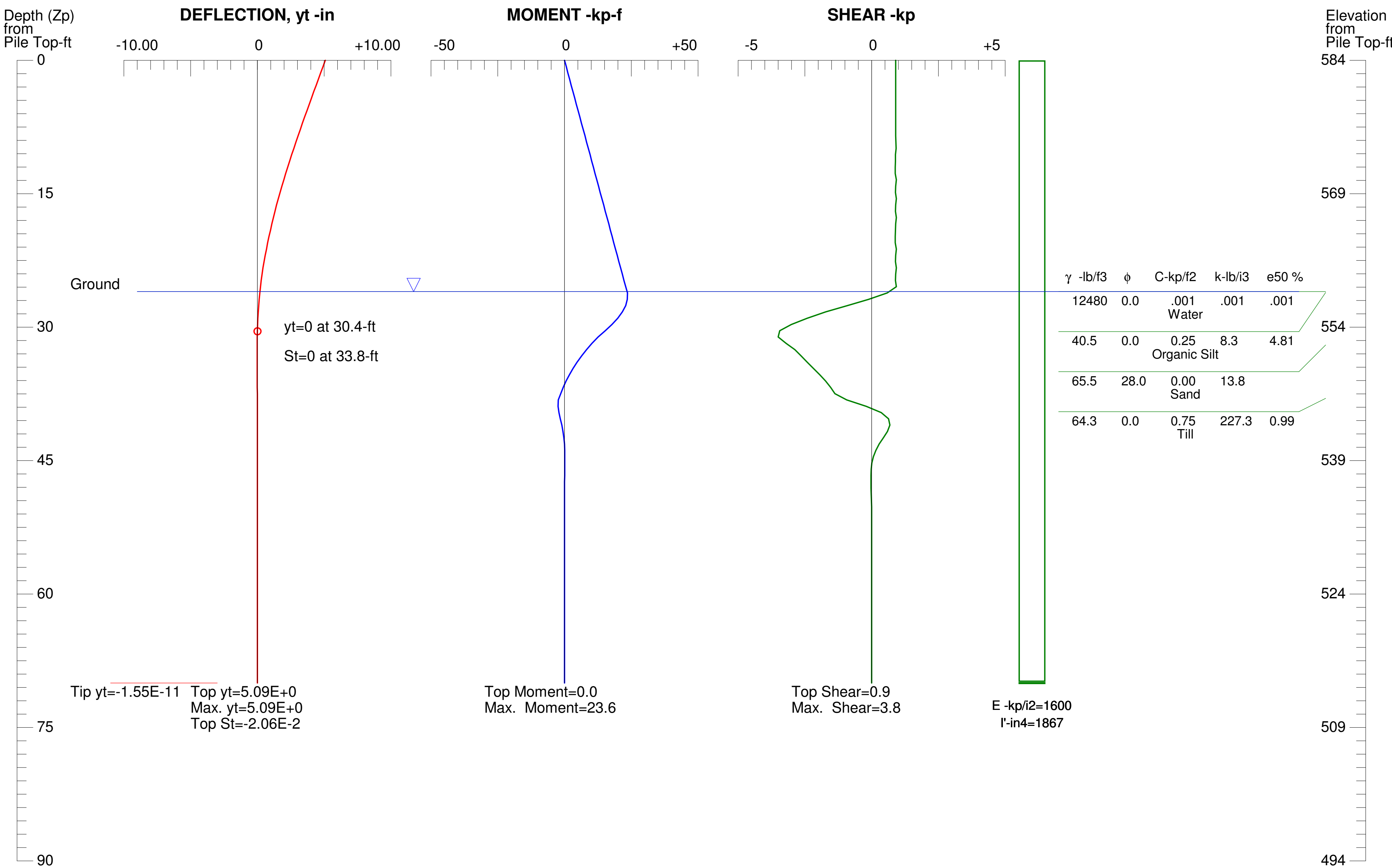
Barr Engineering Company

Kinnickinnic River Stability Analysis
Sec. 16, 70' pile - 14", drained, NLW

Figure 2

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



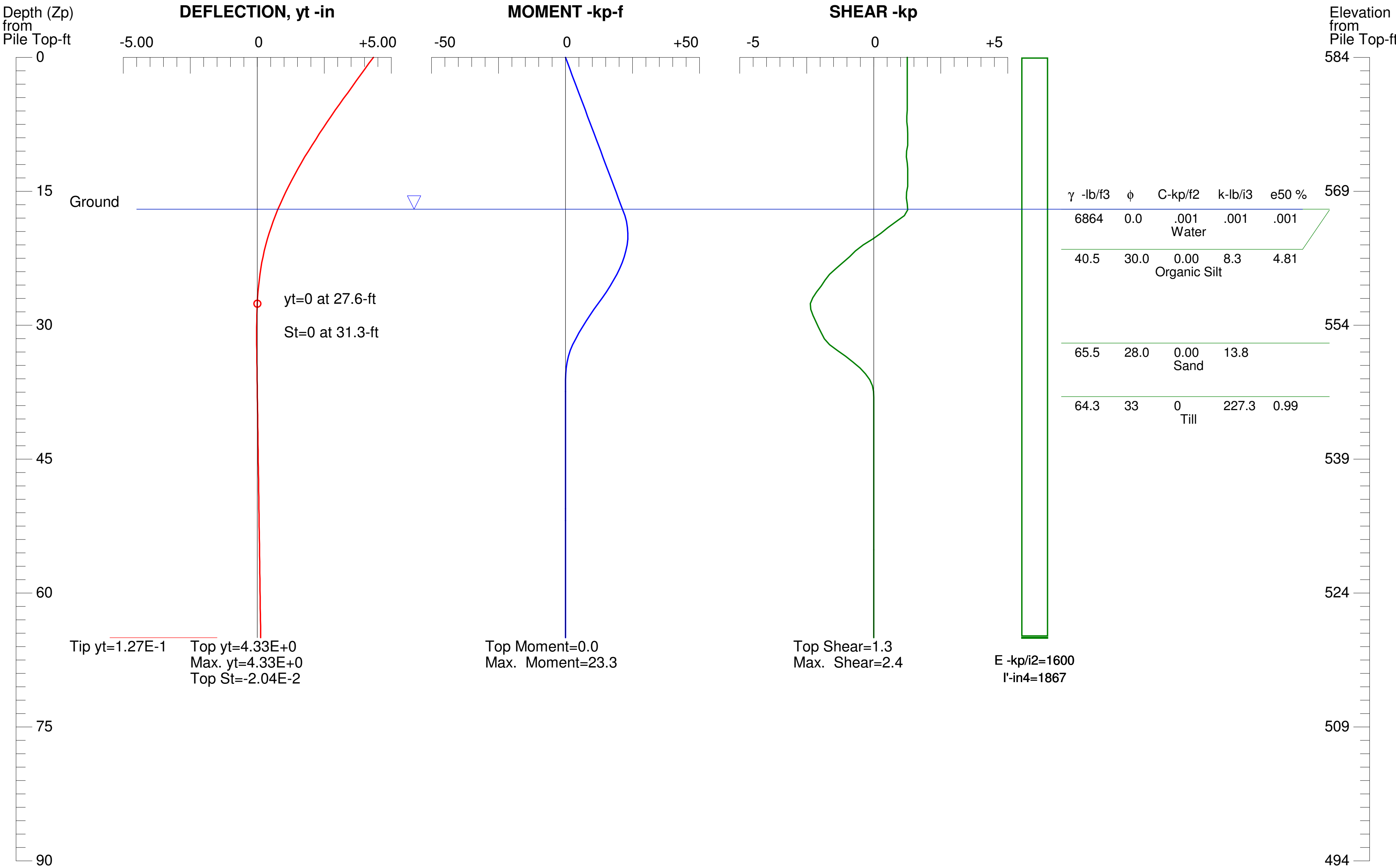
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 70' pile - 14", undrained, NLW

Figure 3

PILE DEFLECTION & FORCE vs DEPTH

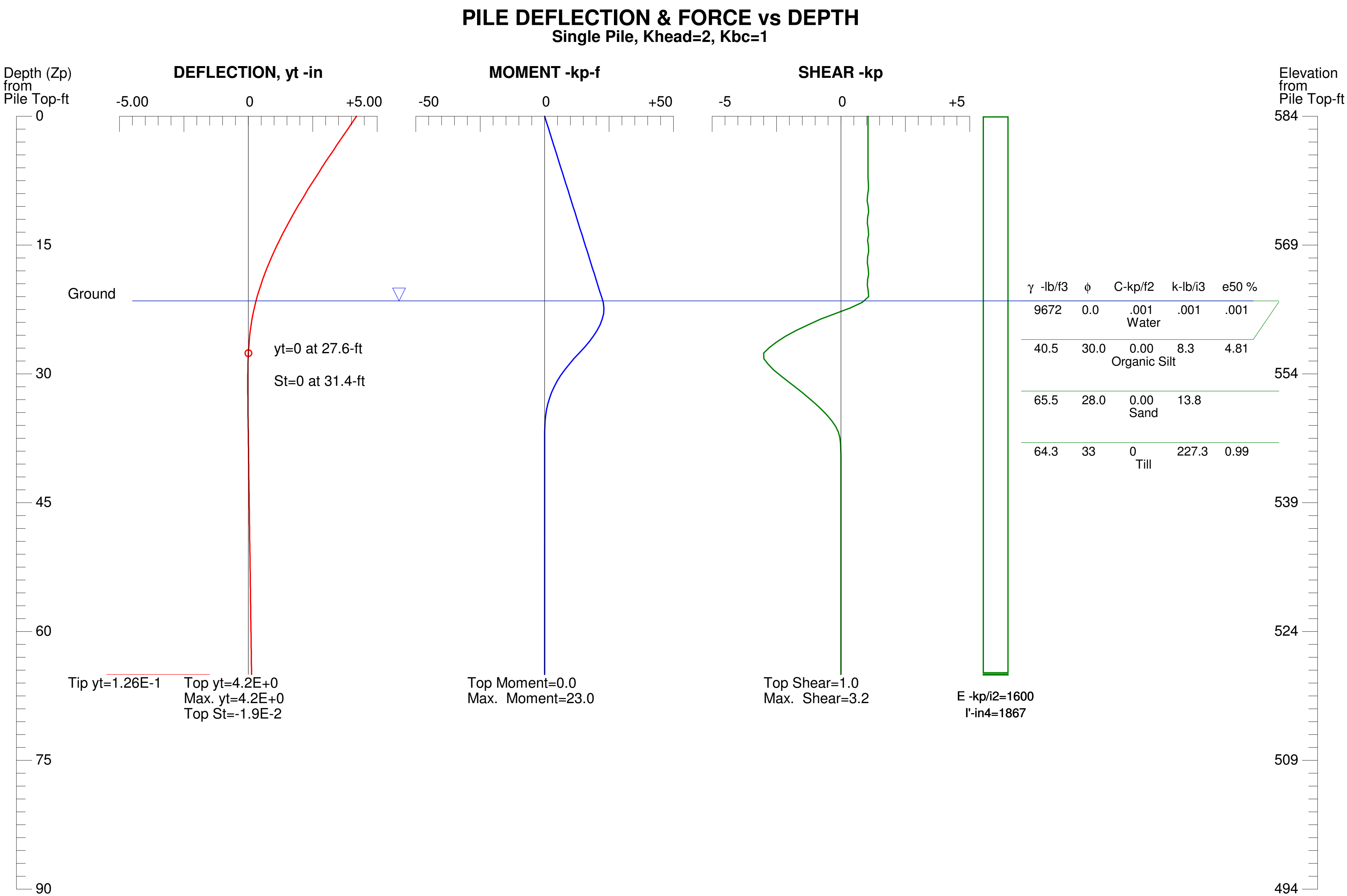
Single Pile, Khead=2, Kbc=1



Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 14" - 6 deg, initial, NLW

Figure 4



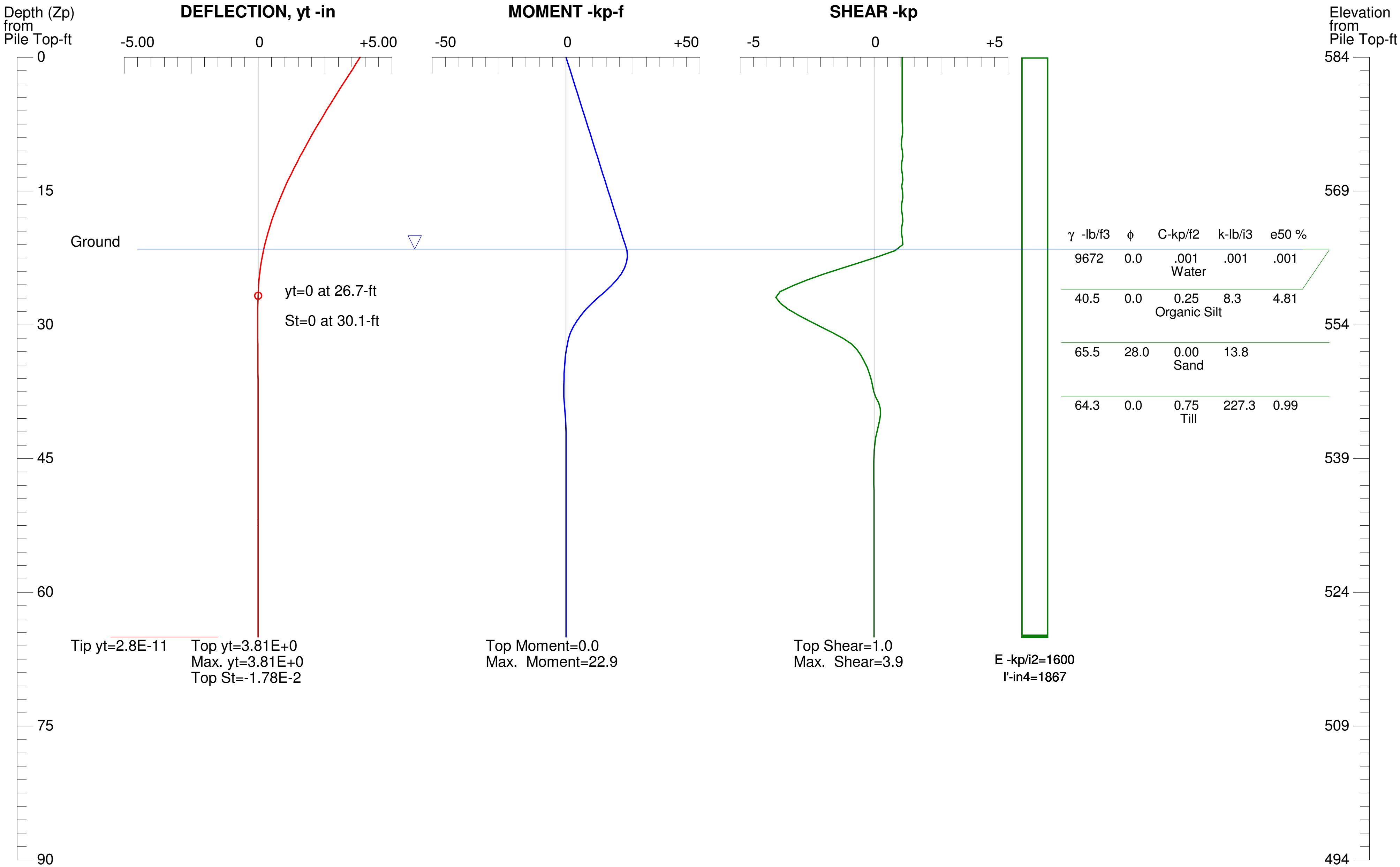
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 14" - 6 deg, drained, NLW

Figure 5

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



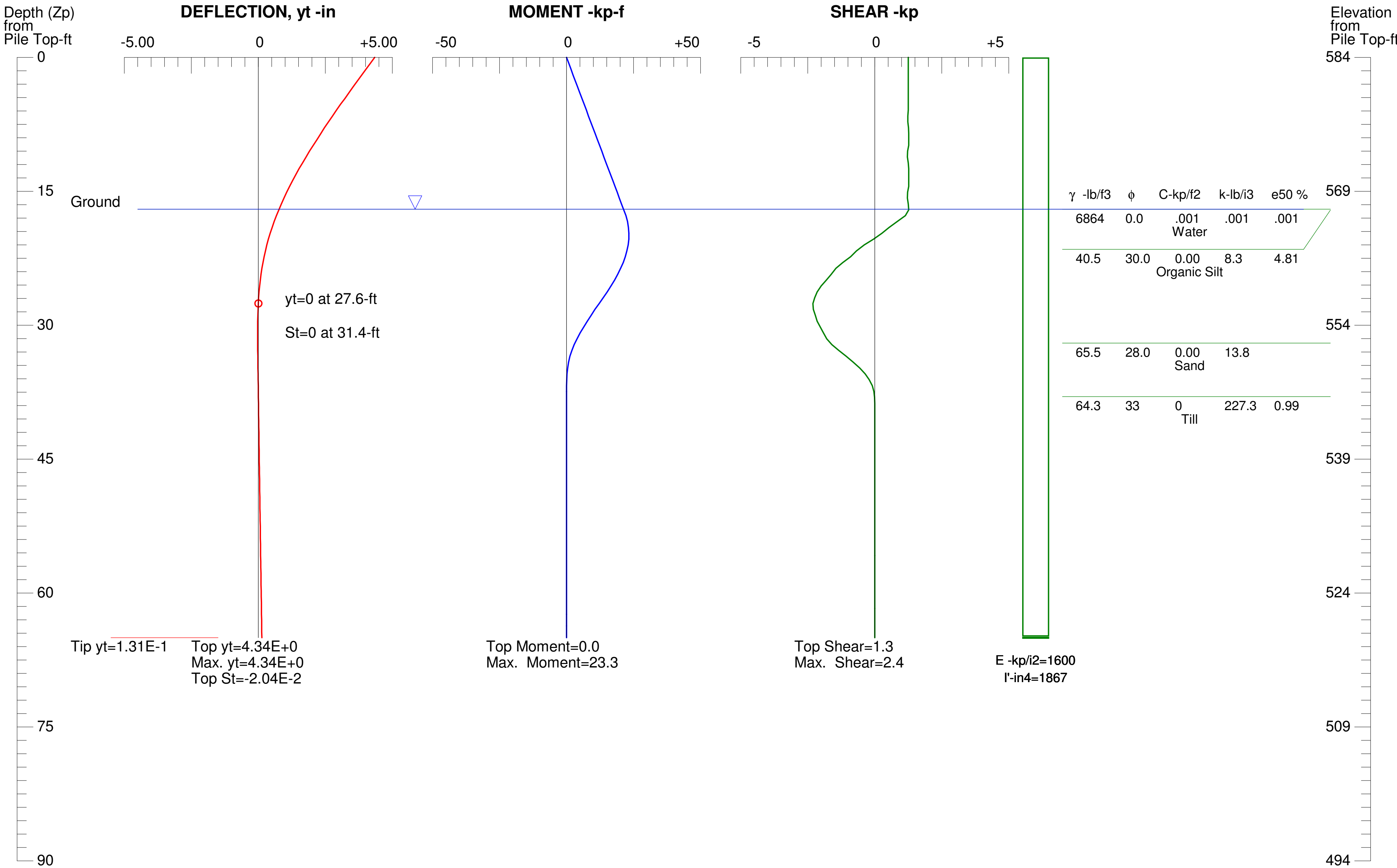
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 14" - 6 deg, undrained, NLW

Figure 6

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



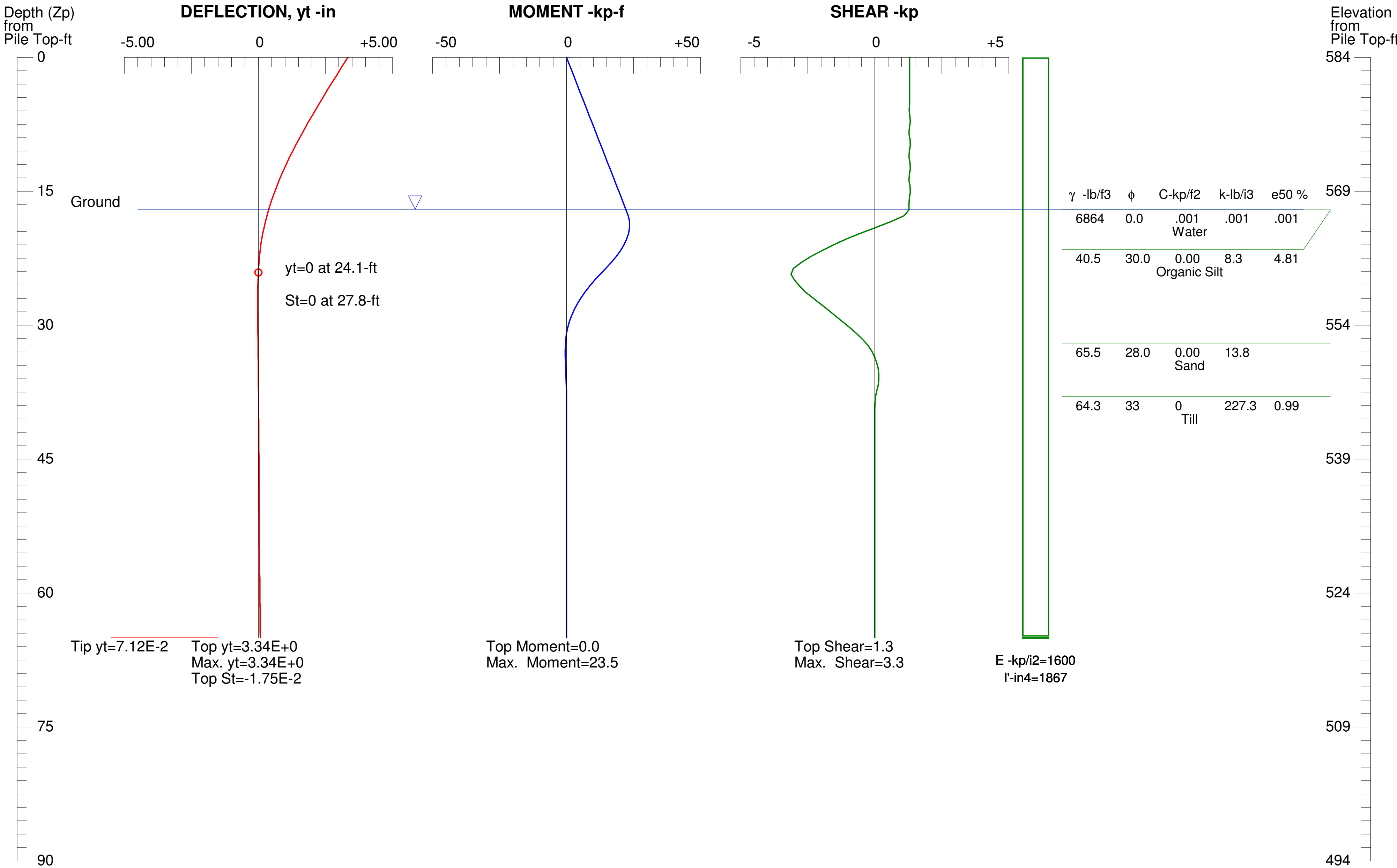
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 14" - 12 deg, initial, NLW

Figure 7

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



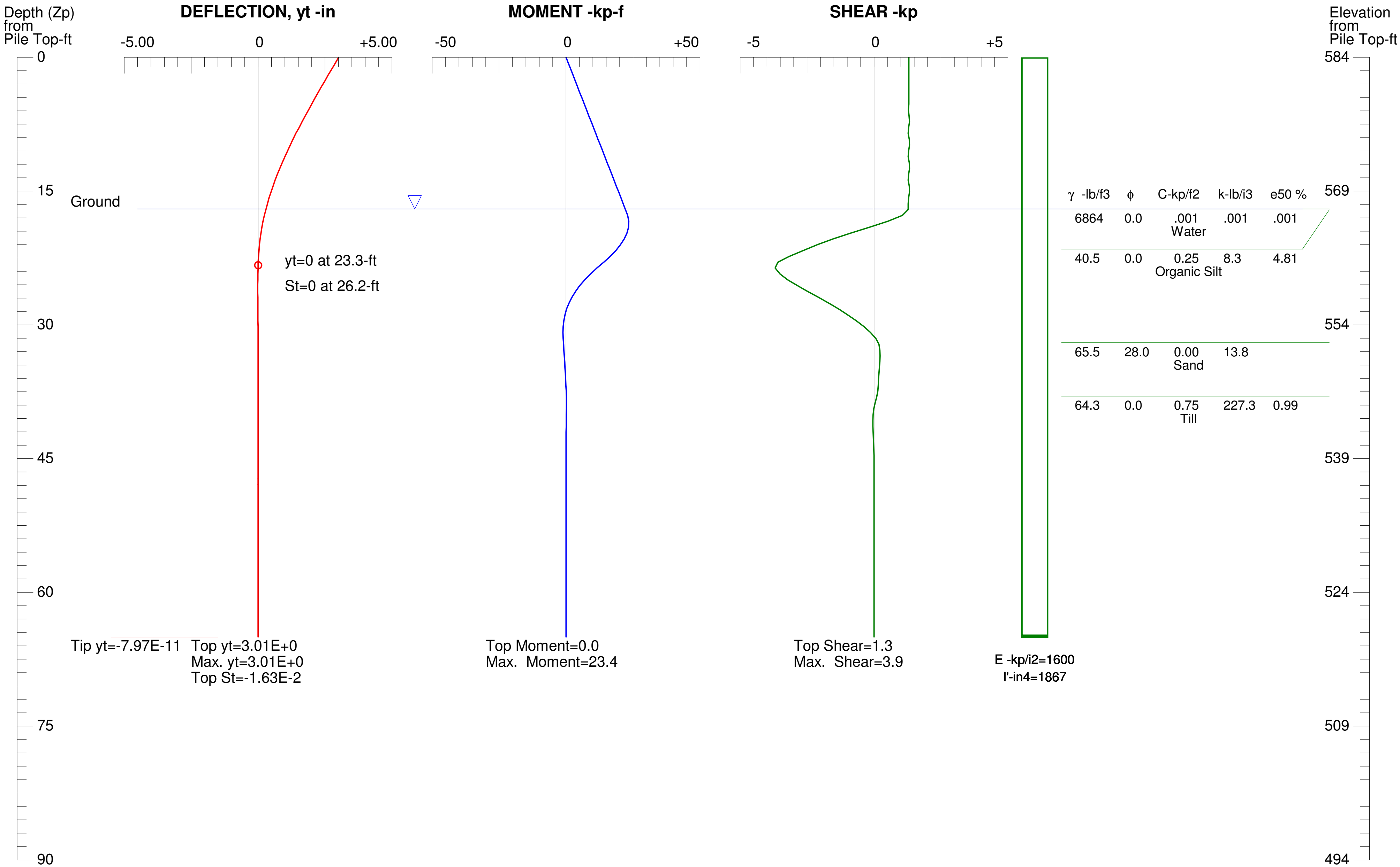
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 14" 12 deg, drained, NLW

Figure 8

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



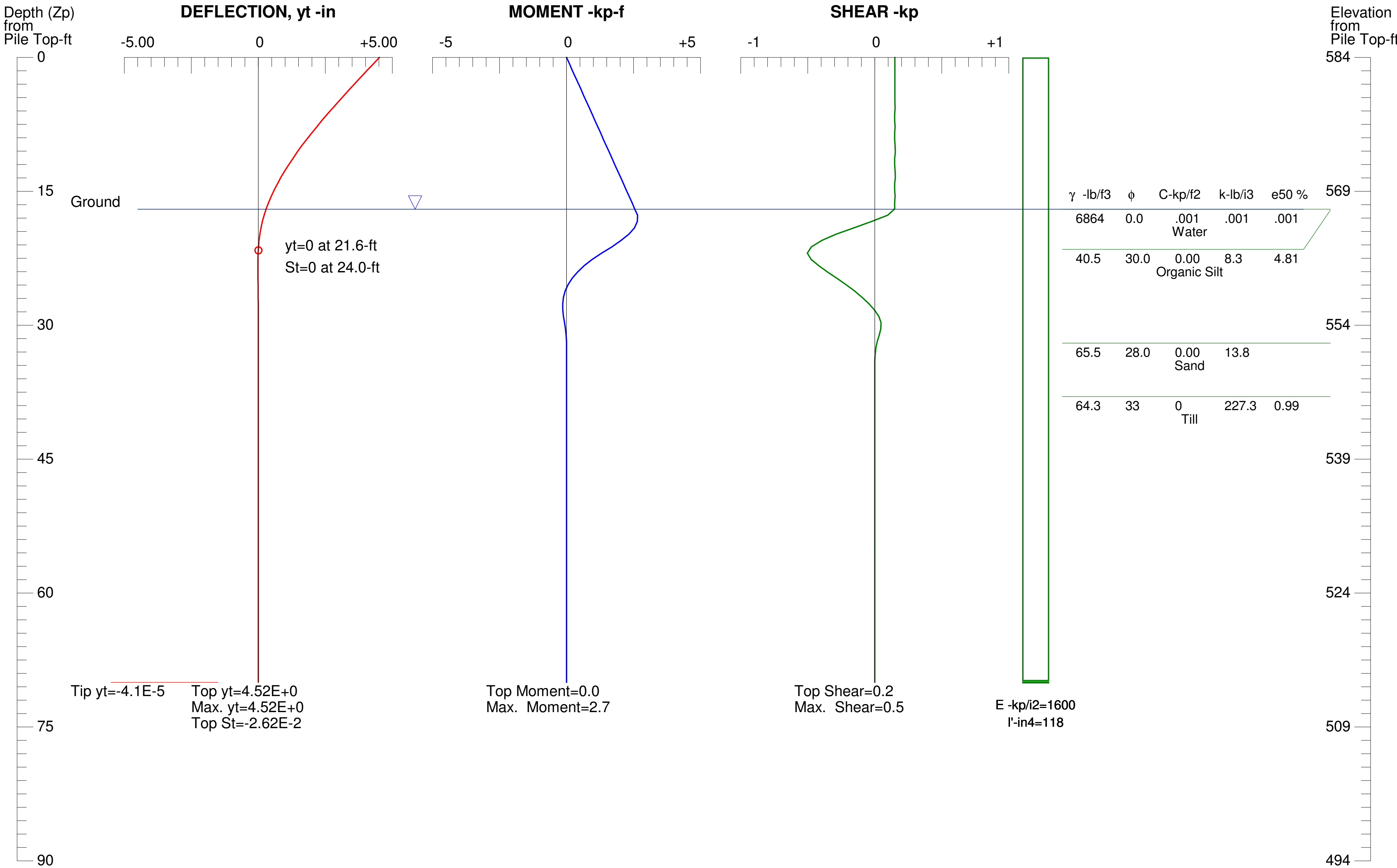
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 14" - 12 deg, undrained, NLW

Figure 9

PILE DEFLECTION & FORCE vs DEPTH

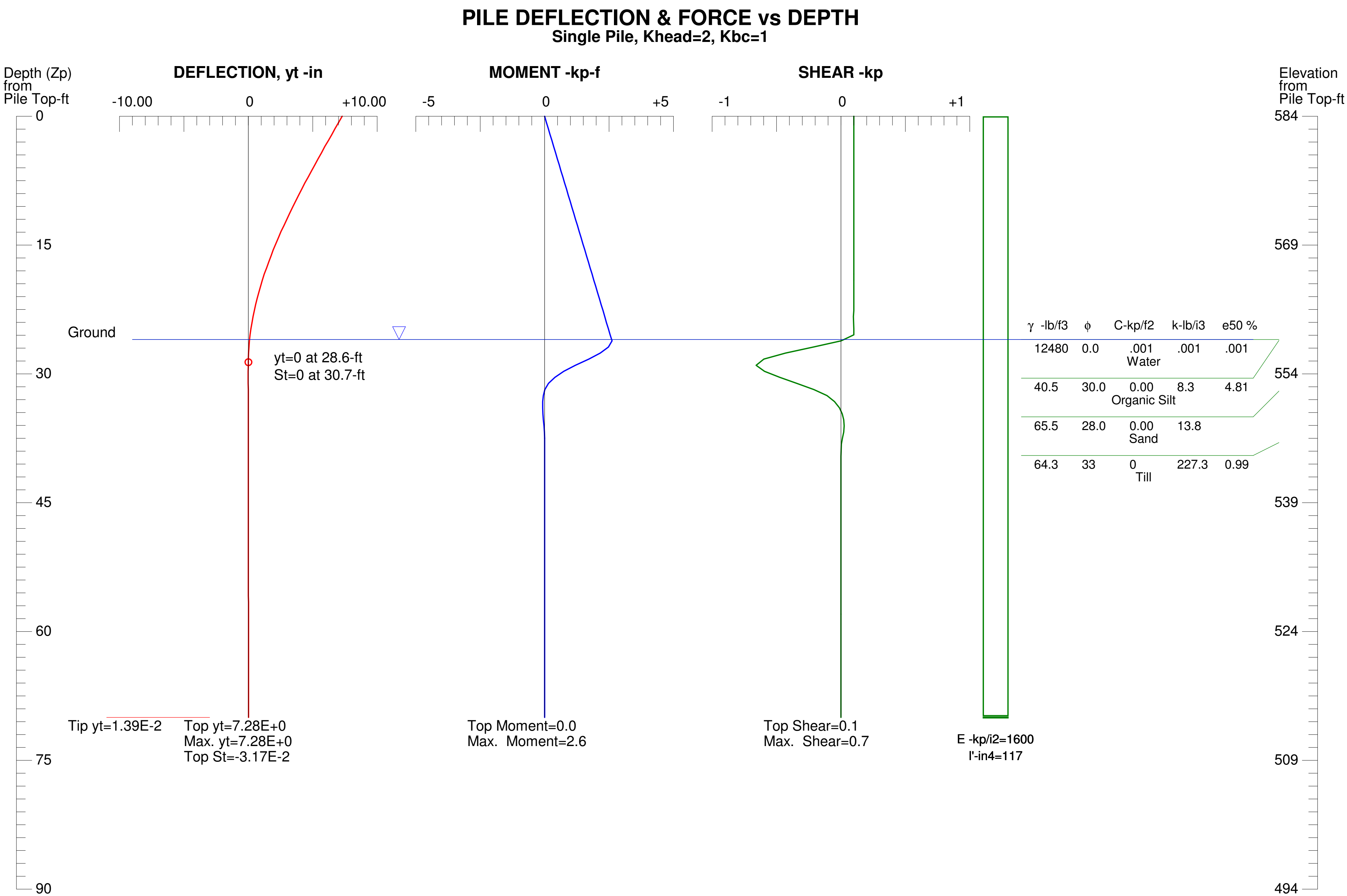
Single Pile, Khead=2, Kbc=1



Barr Engineering Company

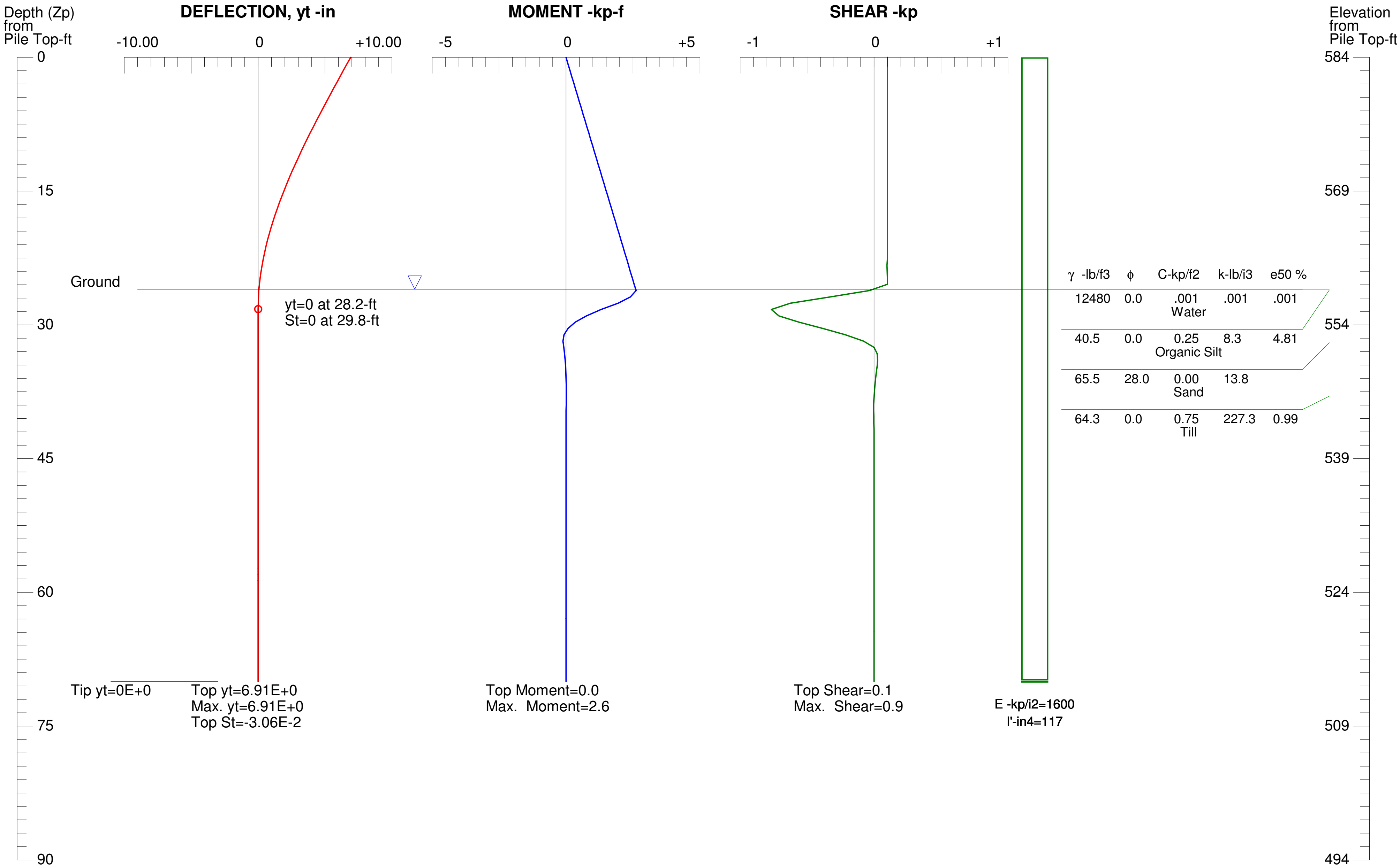
Kinnickinnic River Stability Analysis
Sec. 16, 70' pile - 7'', initial, NLW

Figure 10


PILE DEFLECTION & FORCE vs DEPTH
Single Pile, Khead=2, Kbc=1
Depth (Zp) from Pile Top-ft
DEFLECTION, yt -in
MOMENT -kp-f
SHEAR -kp
Elevation from Pile Top-ft
-10.00
0
+10.00
-5
0
+5
-1
0
+1
0
15
30
45
60
75
90
584
569
554
539
524
509
494
Ground
yt=0 at 28.6-ft
St=0 at 30.7-ft
γ -lb/f3 ϕ C-kp/f2 k-lb/i3 e50 %
12480 0.0 .001 .001 .001
Water
40.5 30.0 0.00 8.3 4.81
Organic Silt
65.5 28.0 0.00 13.8
Sand
64.3 33 0 227.3 0.99
Till
Tip yt=1.39E-2
Top yt=7.28E+0
Max. yt=7.28E+0
Top St=-3.17E-2
Top Moment=0.0
Max. Moment=2.6
Top Shear=0.1
Max. Shear=0.7
E -kp/i2=1600
I'-in4=117

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



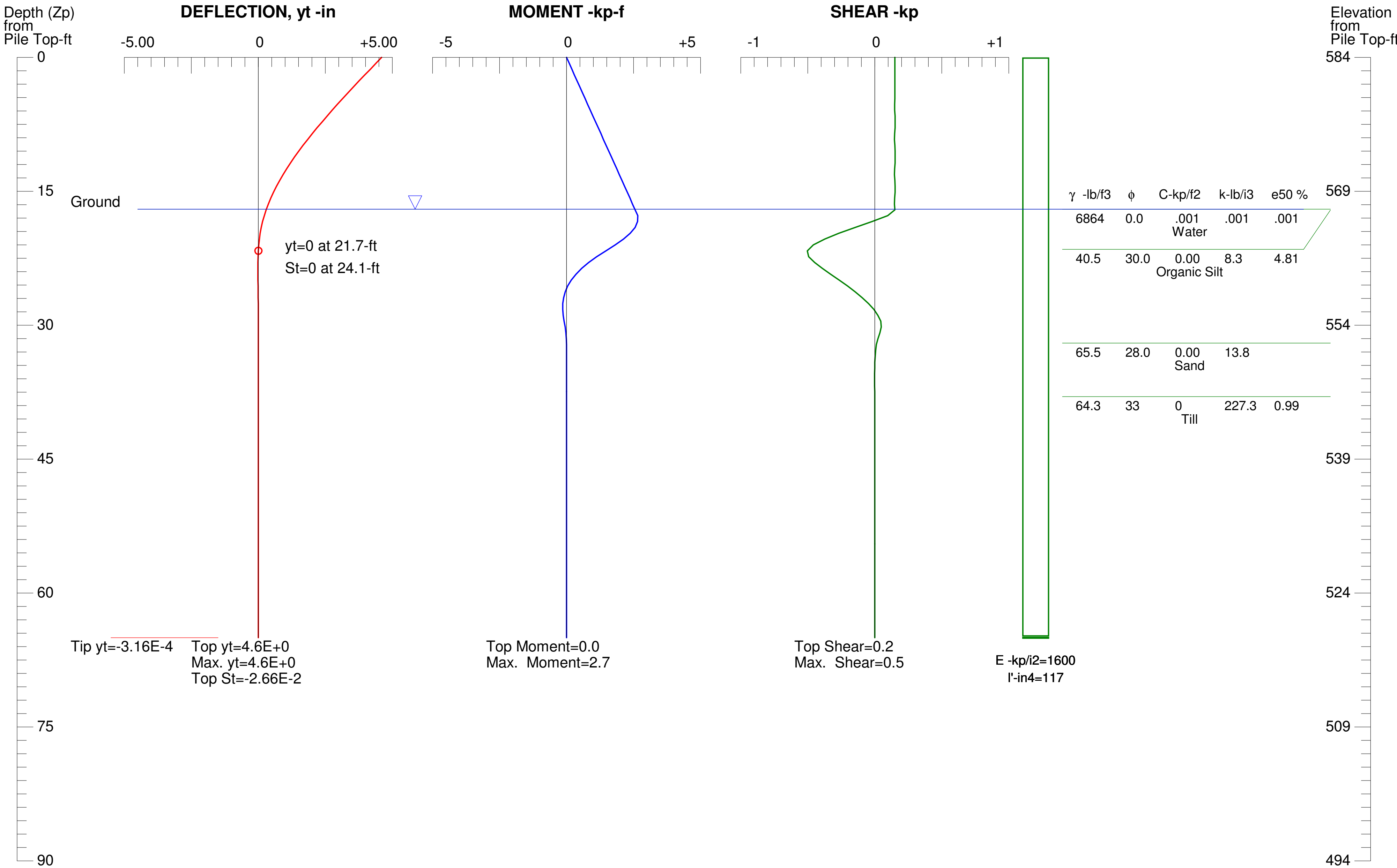
Barr Engineering Company

Kinnickinnic River Stability Analysis
Sec. 16, 70' pile - 7", undrained, NLW

Figure 12

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



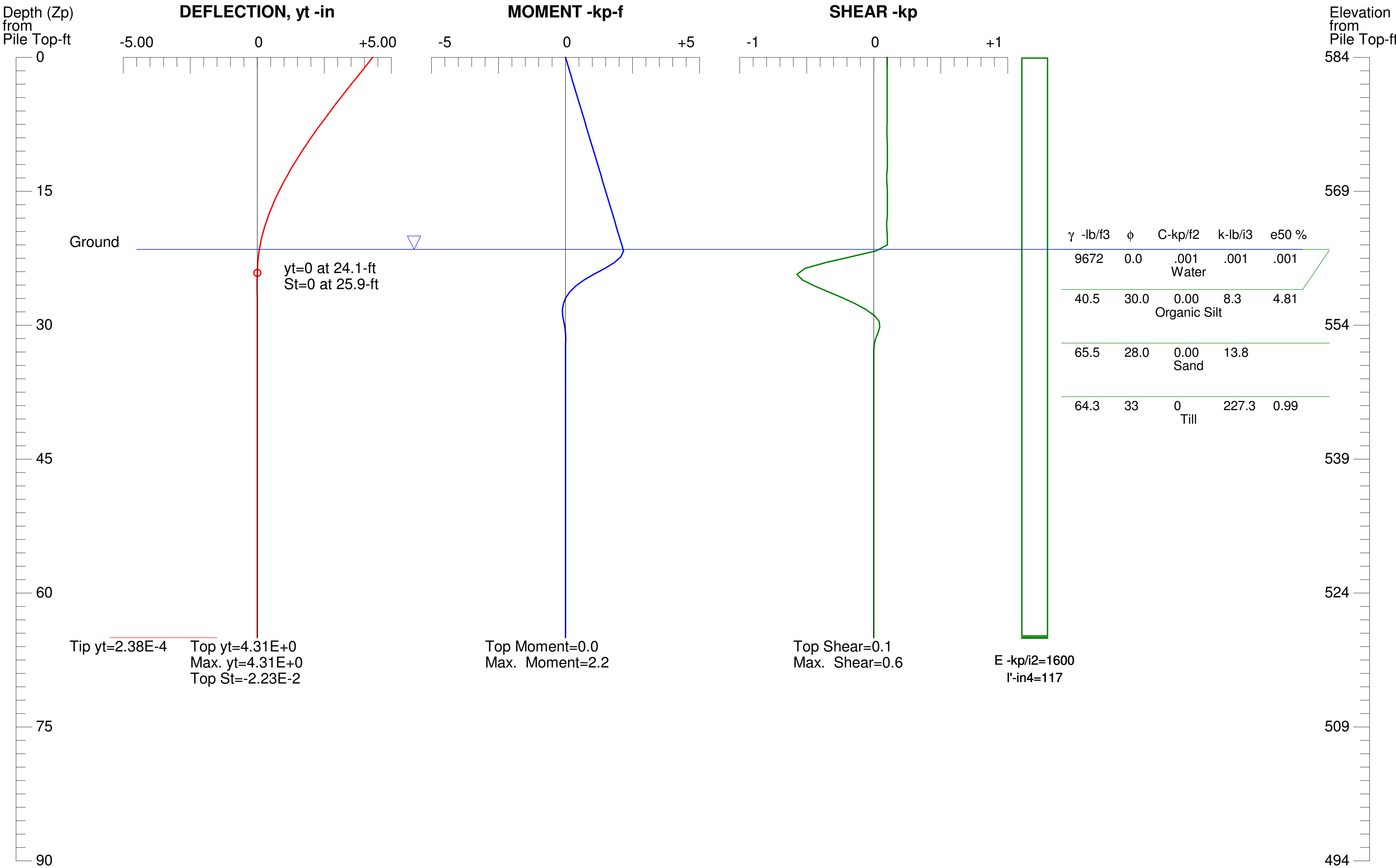
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 7" - 6 deg, initial, NLW

Figure 13

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



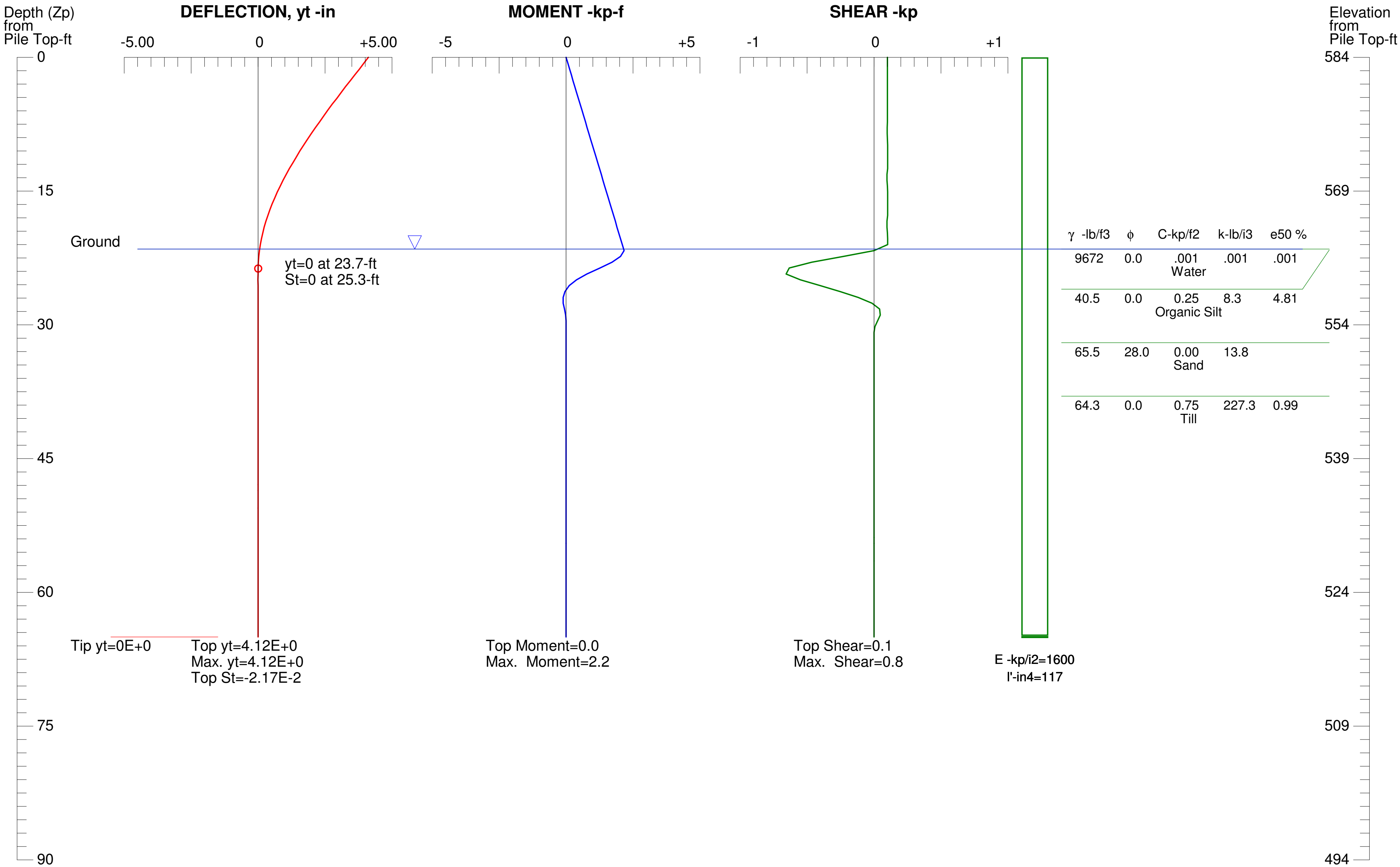
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 7" - 6 deg, drained, NLW

Figure 14

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



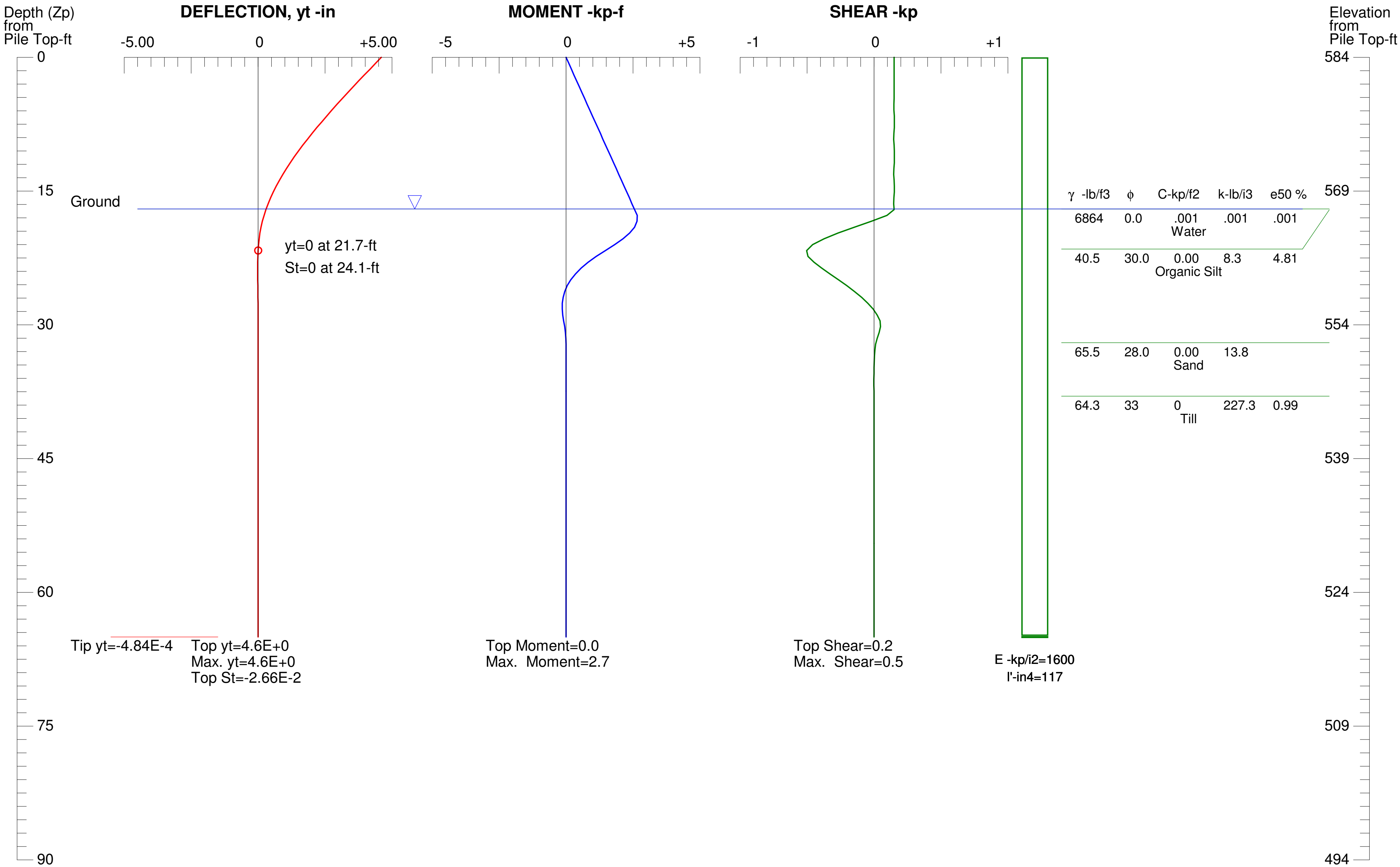
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 7" - 6 deg, undrained, NLW

Figure 15

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



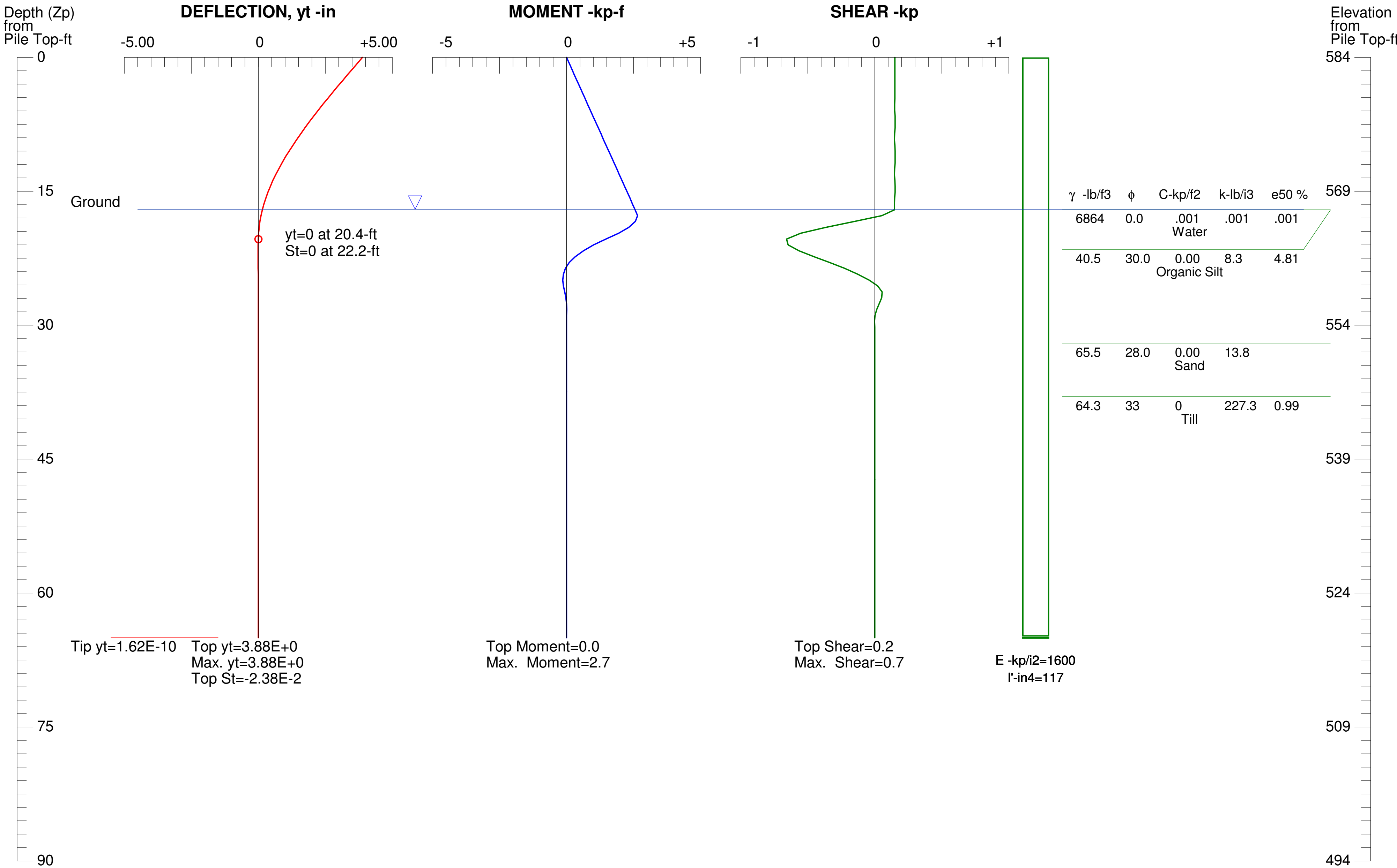
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 7" - 12 deg, initial, NLW

Figure 16

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



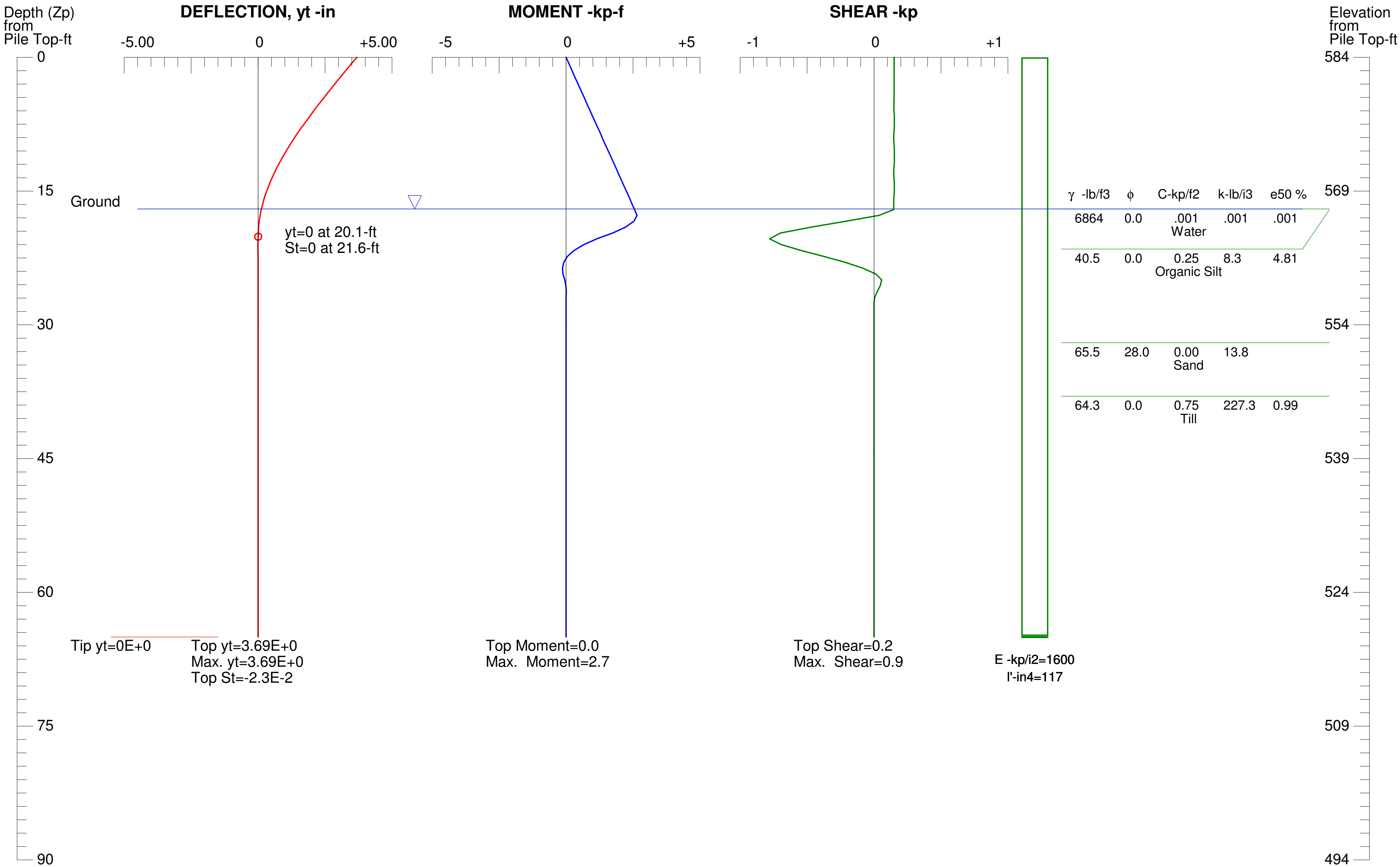
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 7" 12 deg, drained, NLW

Figure 17

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



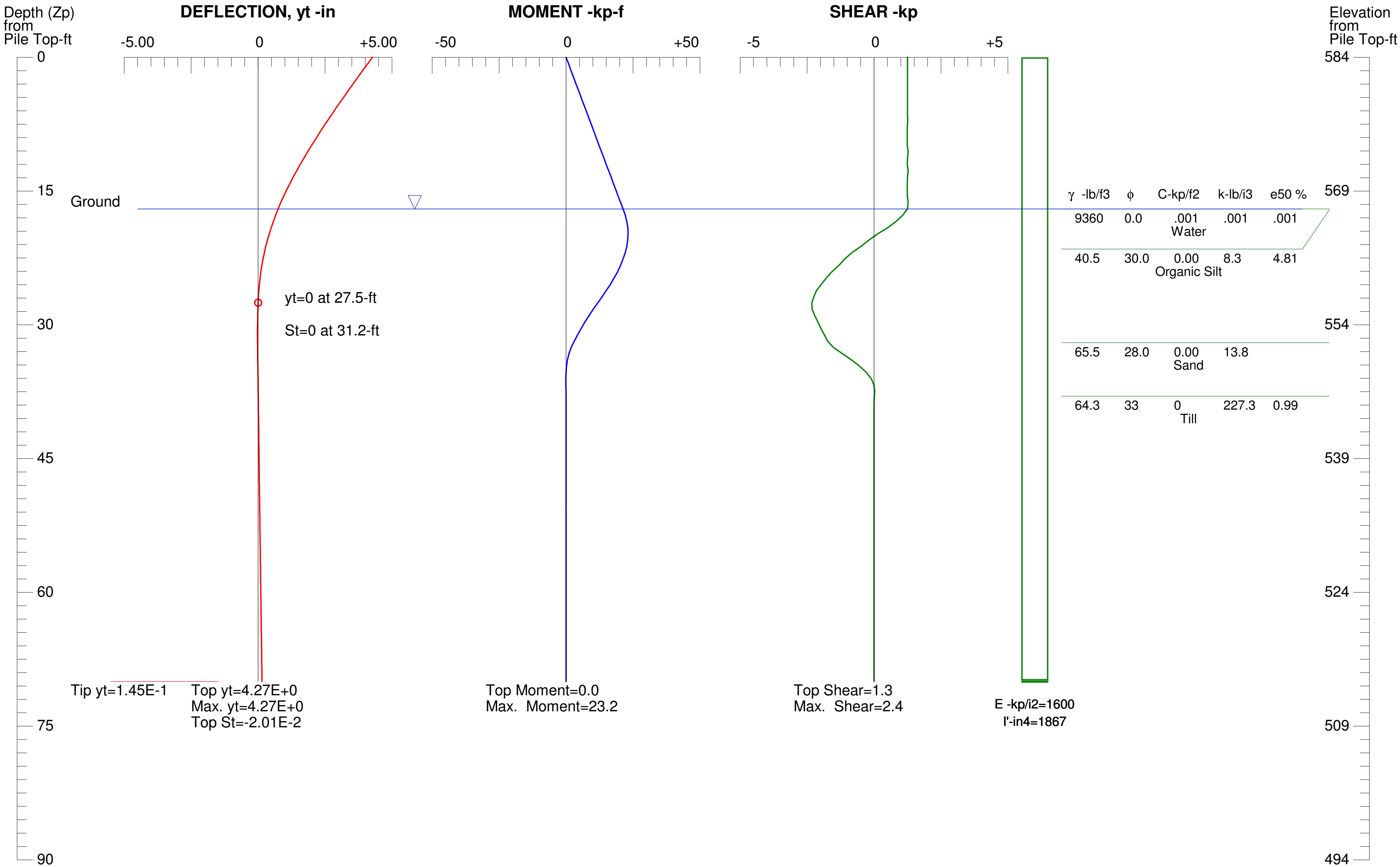
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 7" - 12 deg, undrained, NLW

Figure 18

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1

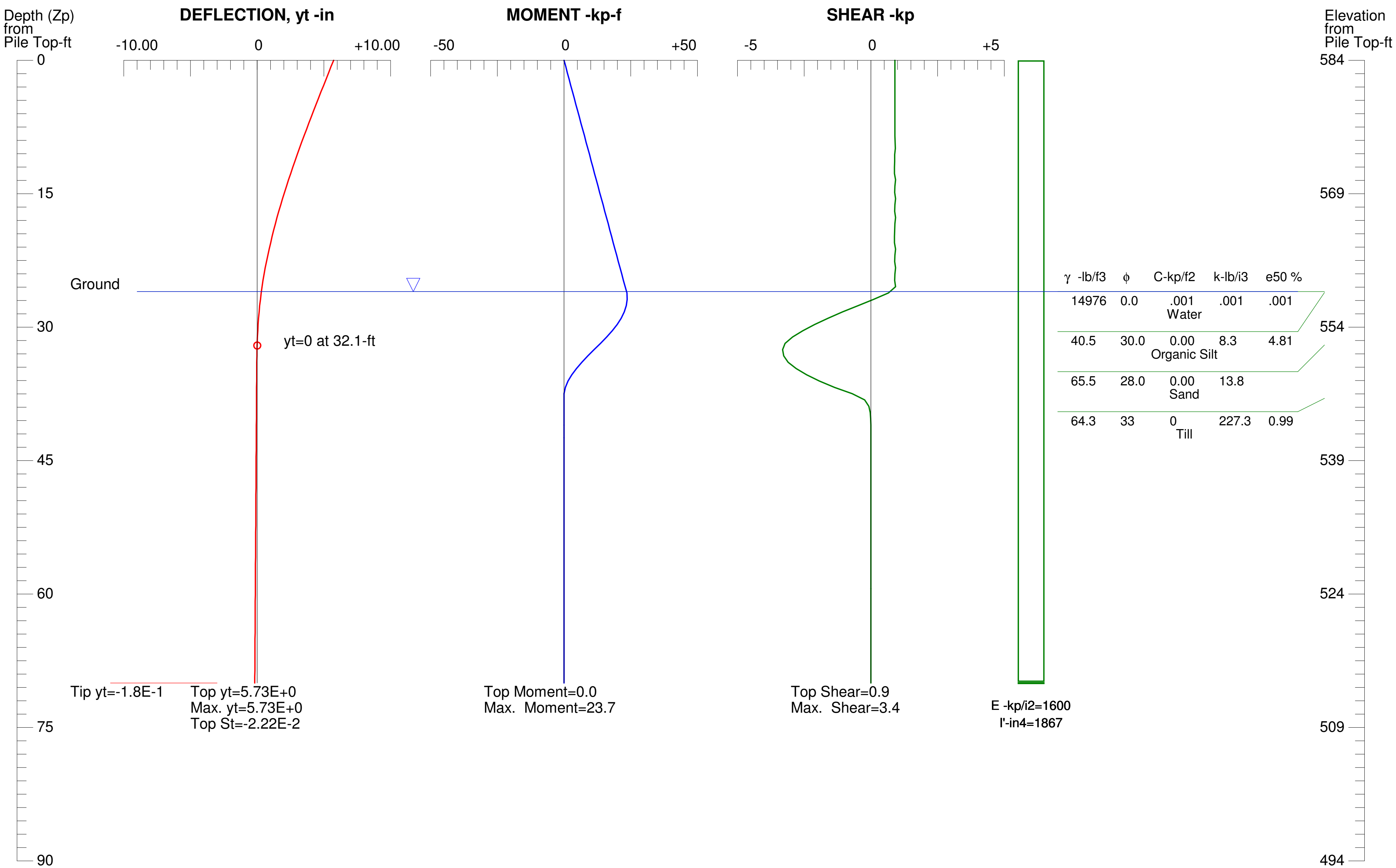


Barr Engineering Company **Kinnickinnic River Stability Analysis**
Sec. 16, 70' pile - 14", initial, NHWM

Figure 19

ALL-PILE Version 6   CivilTech Software   www.civiltech.com   Licensed to

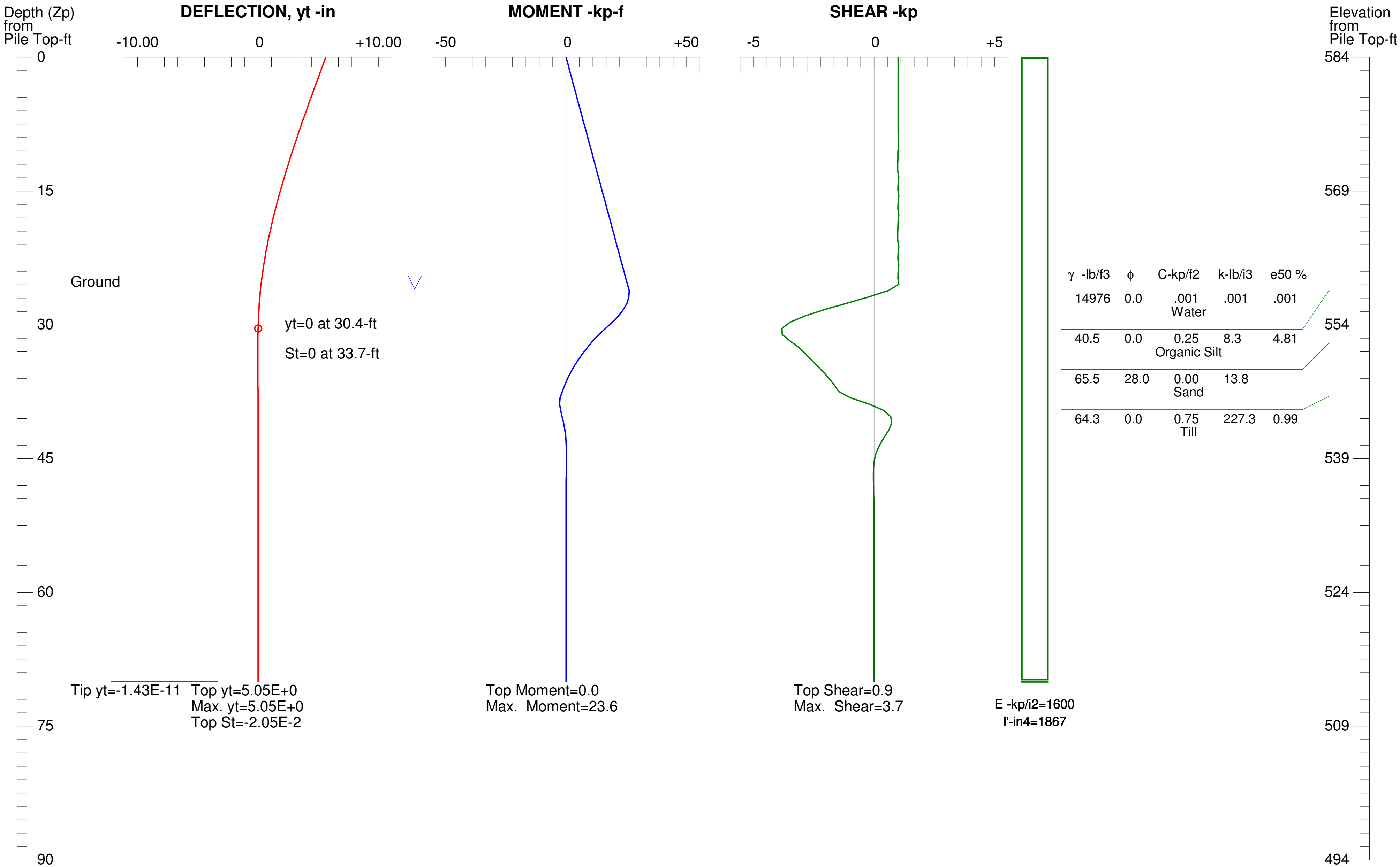
PILE DEFLECTION & FORCE vs DEPTH
Single Pile, Khead=2, Kbc=1



Barr Engineering Company   **Kinnickinnic River Stability Analysis**
Sec. 16, 70' pile - 14", drained, NHWM

Figure 20

PILE DEFLECTION & FORCE vs DEPTH
Single Pile, Khead=2, Kbc=1

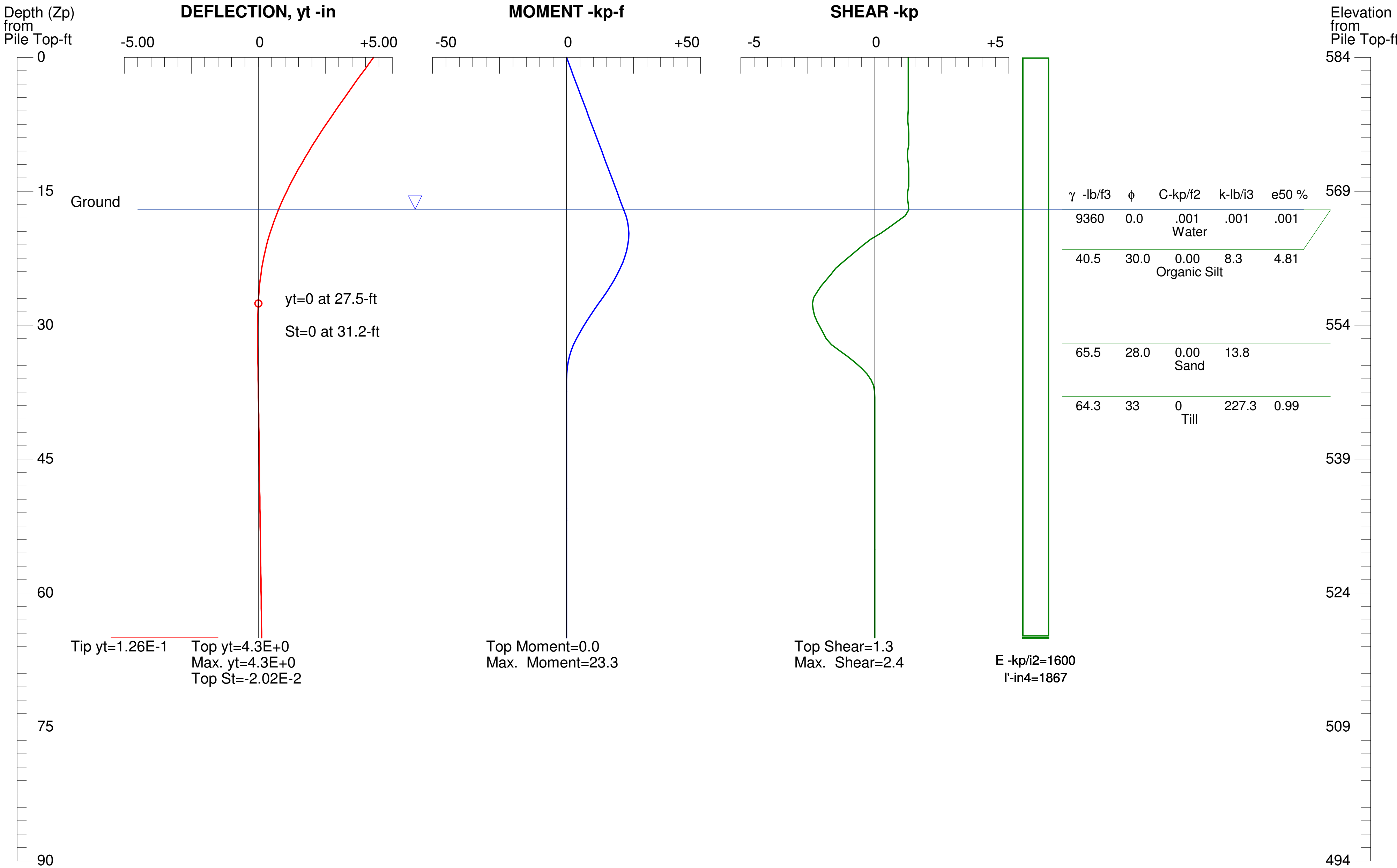


Barr Engineering Company Kinnickinnic River Stability Analysis
Sec. 16, 70' pile - 14", undrained, NHWM

Figure 21

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



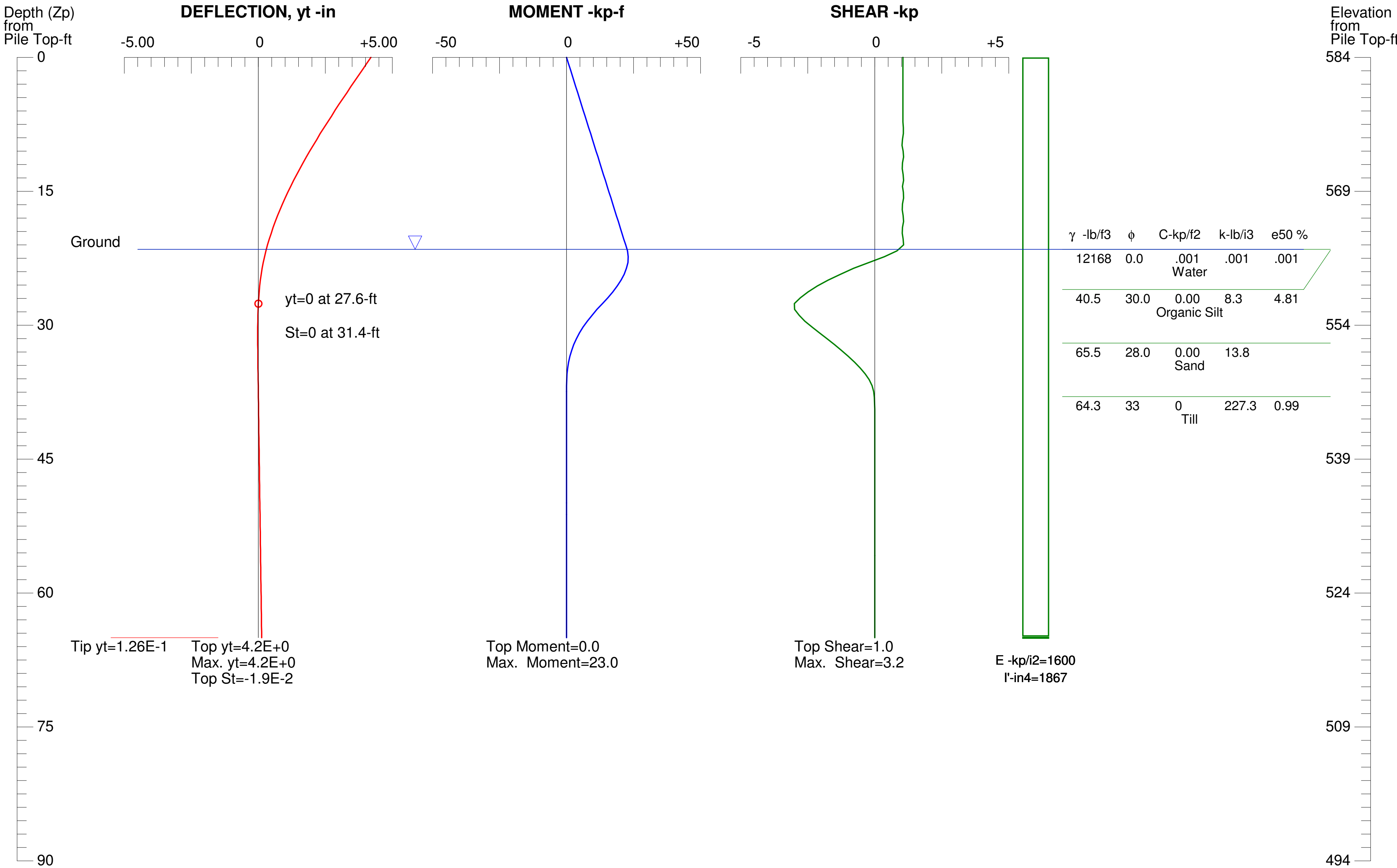
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 14" - 6 deg, initial, NHWM

Figure 22

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



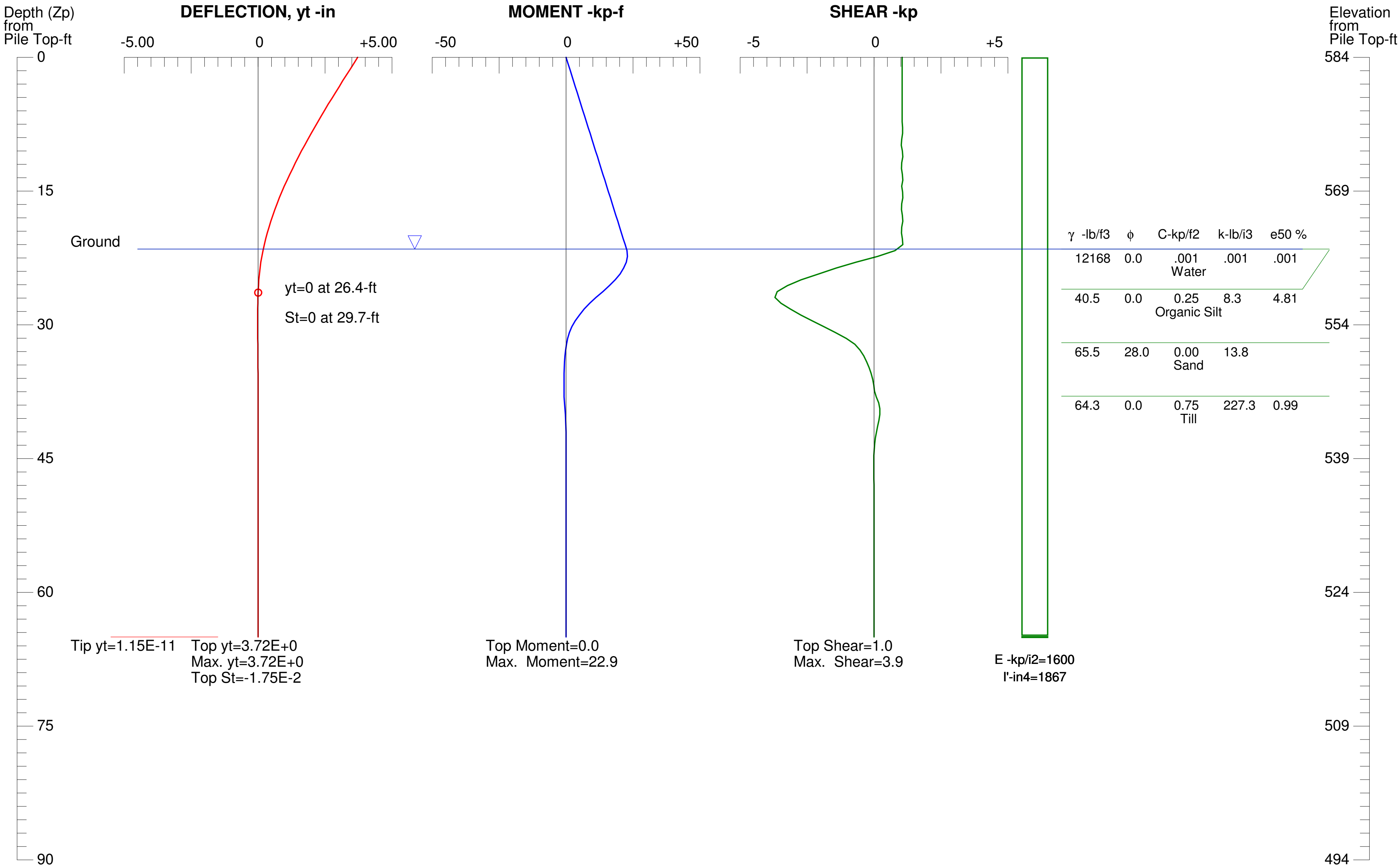
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 14" - 6 deg, drained, NHWM

Figure 23

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



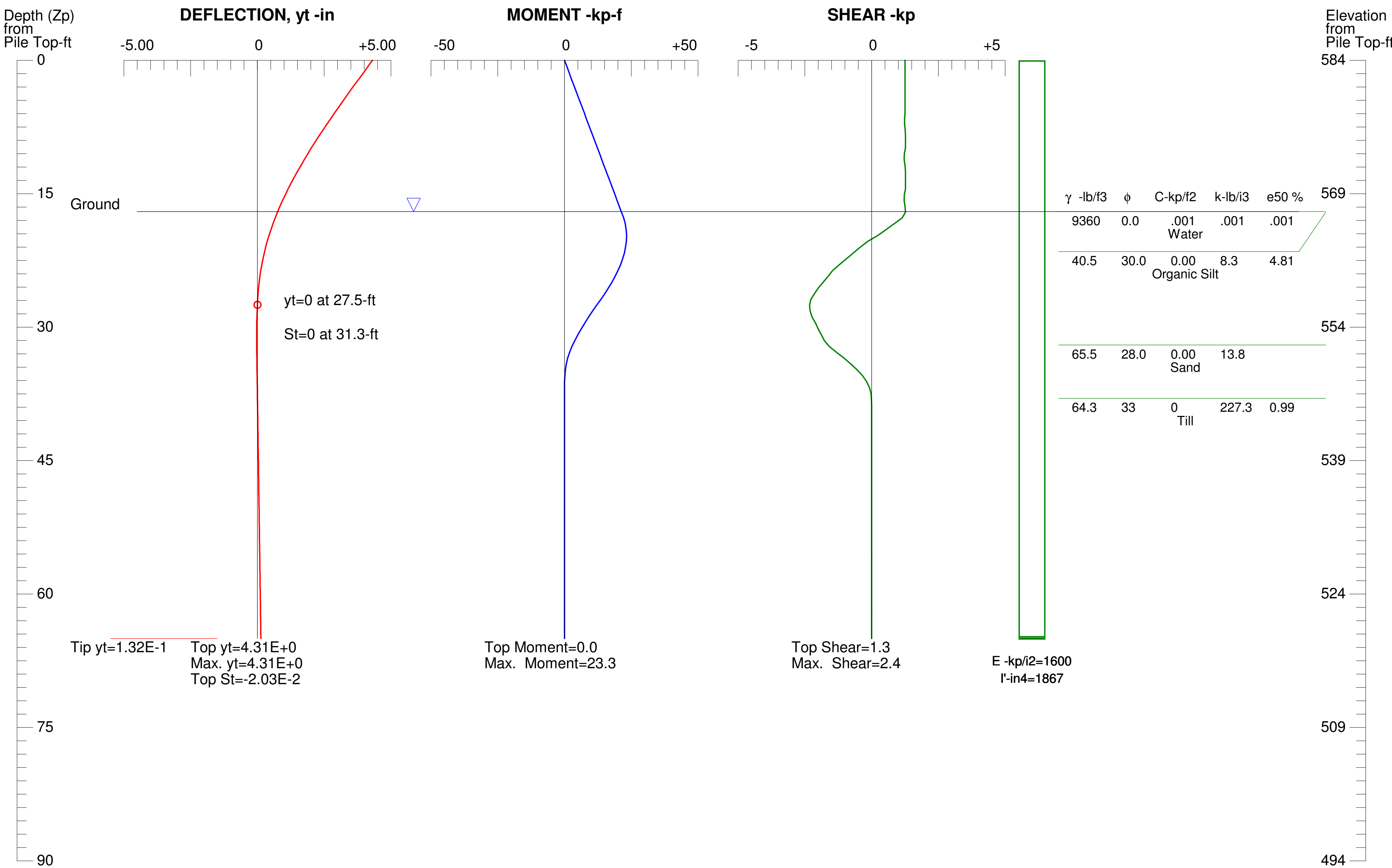
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 14" - 6 deg, undrained, NHWM

Figure 24

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



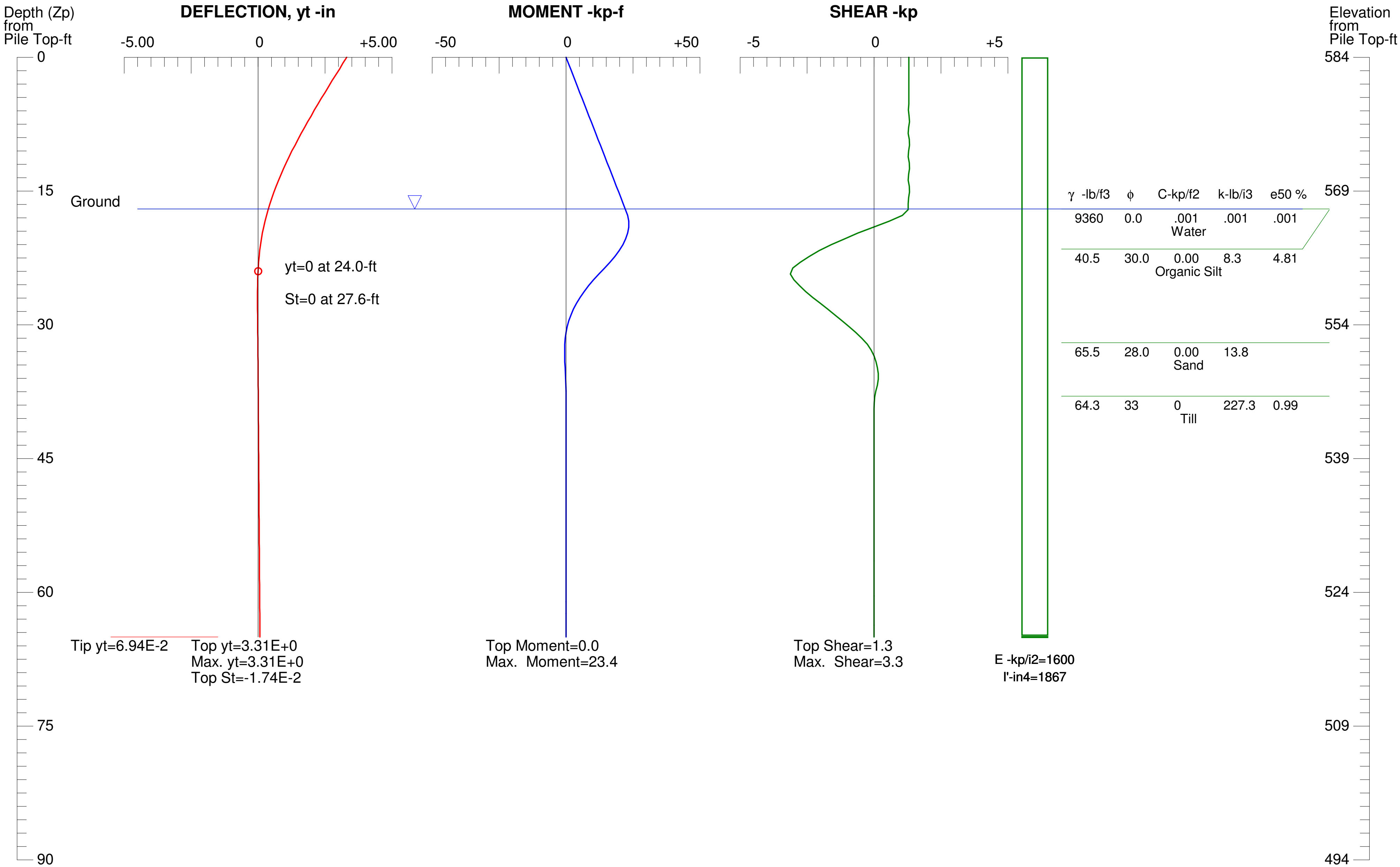
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 14" - 12 deg, initial, NHWM

Figure 25

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



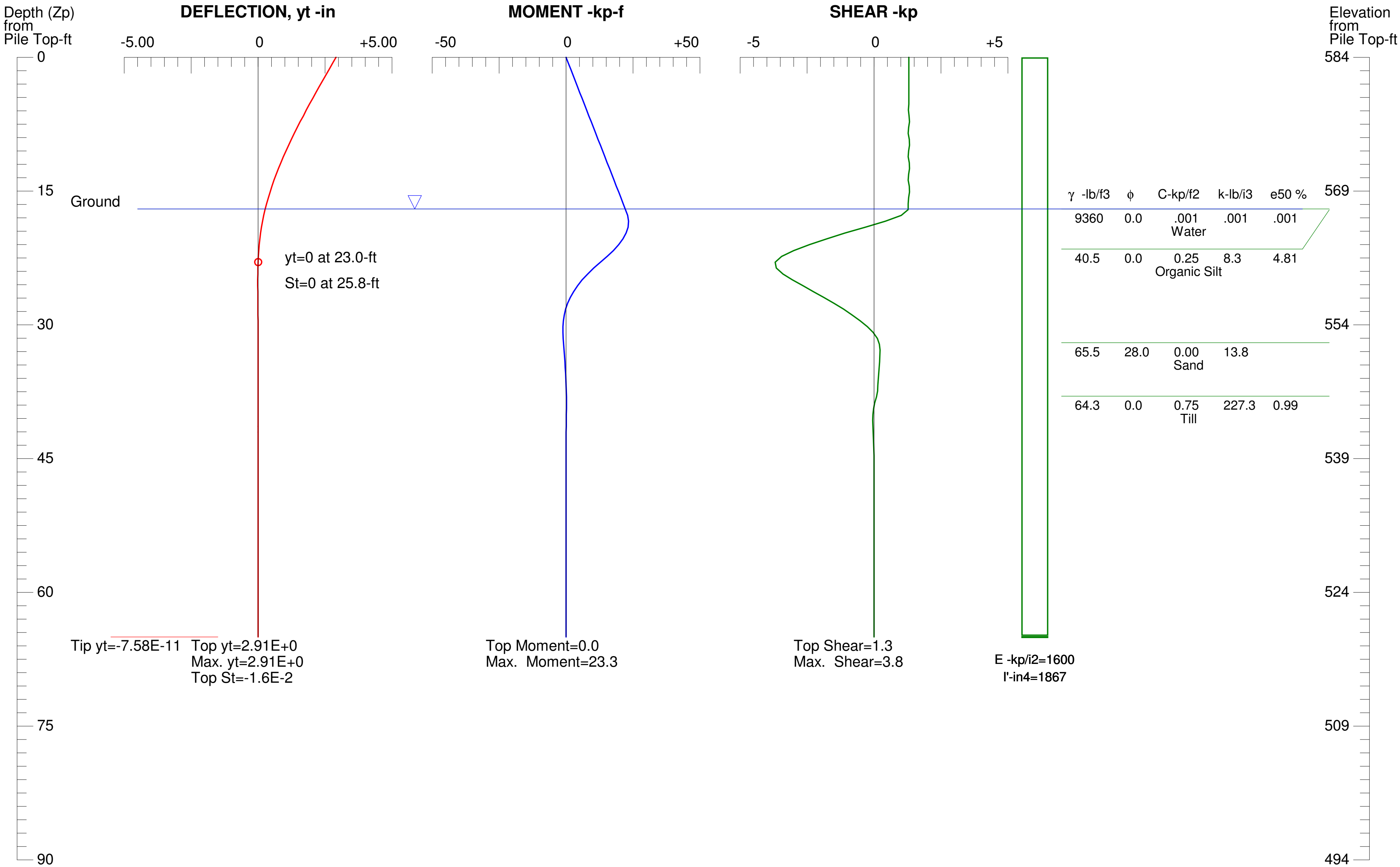
Barr Engineering Company Kinnickinnic River Stability Analysis

Sec. 16, 65' pile - 14" 12 deg, drained, NHWM

Figure 26

PILE DEFLECTION & FORCE vs DEPTH

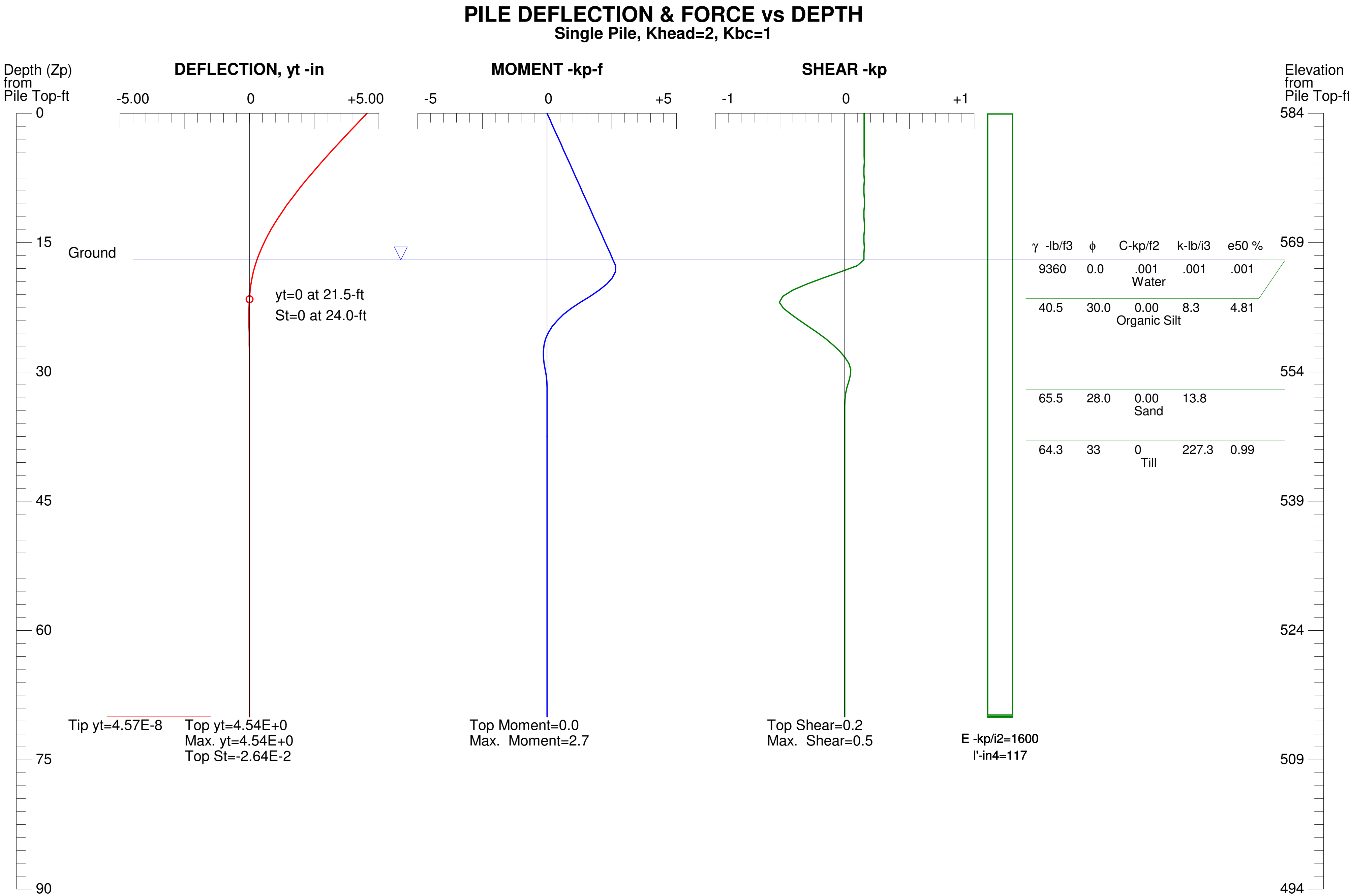
Single Pile, Khead=2, Kbc=1



Barr Engineering Company Kinnickinnic River Stability Analysis

Sec. 16, 65' pile - 14" - 12 deg, undrained, NHWM

Figure 27

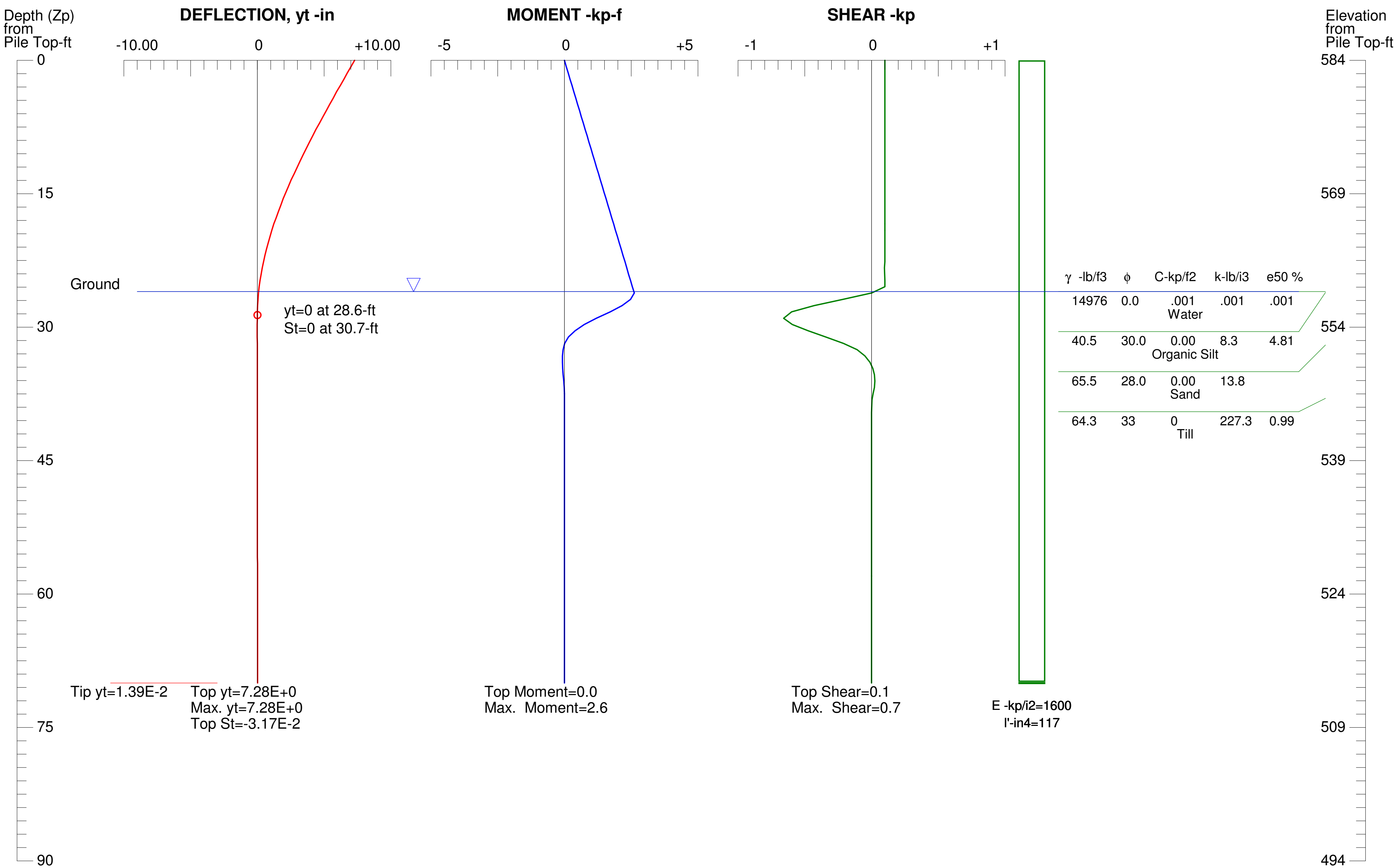


Barr Engineering Company **Kinnickinnic River Stability Analysis**
Sec. 16, 70' pile - 7", initial, NHWM

Figure 28

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



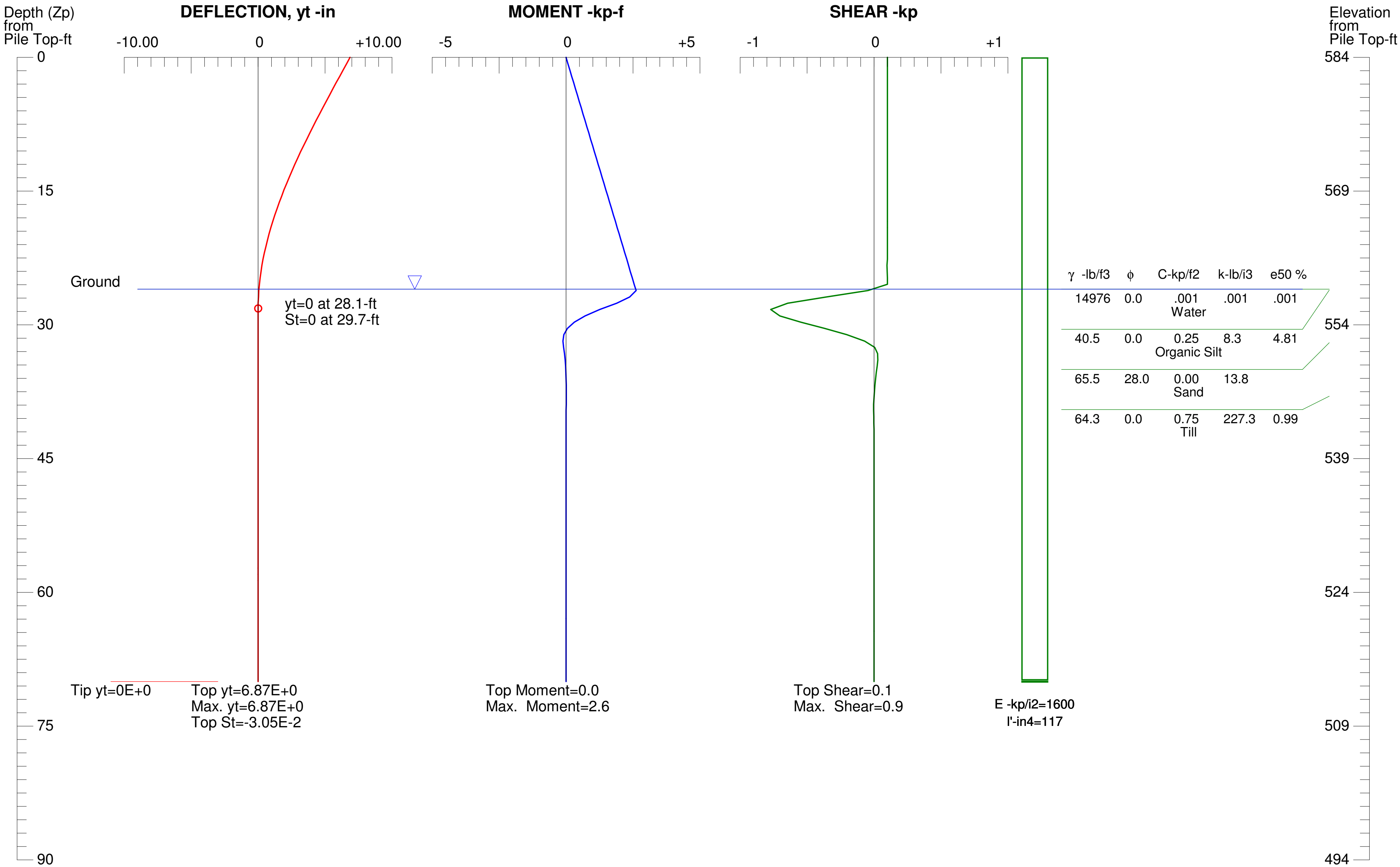
Barr Engineering Company

Kinnickinnic River Stability Analysis
Sec. 16, 70' pile - 7", drained, NHWM

Figure 29

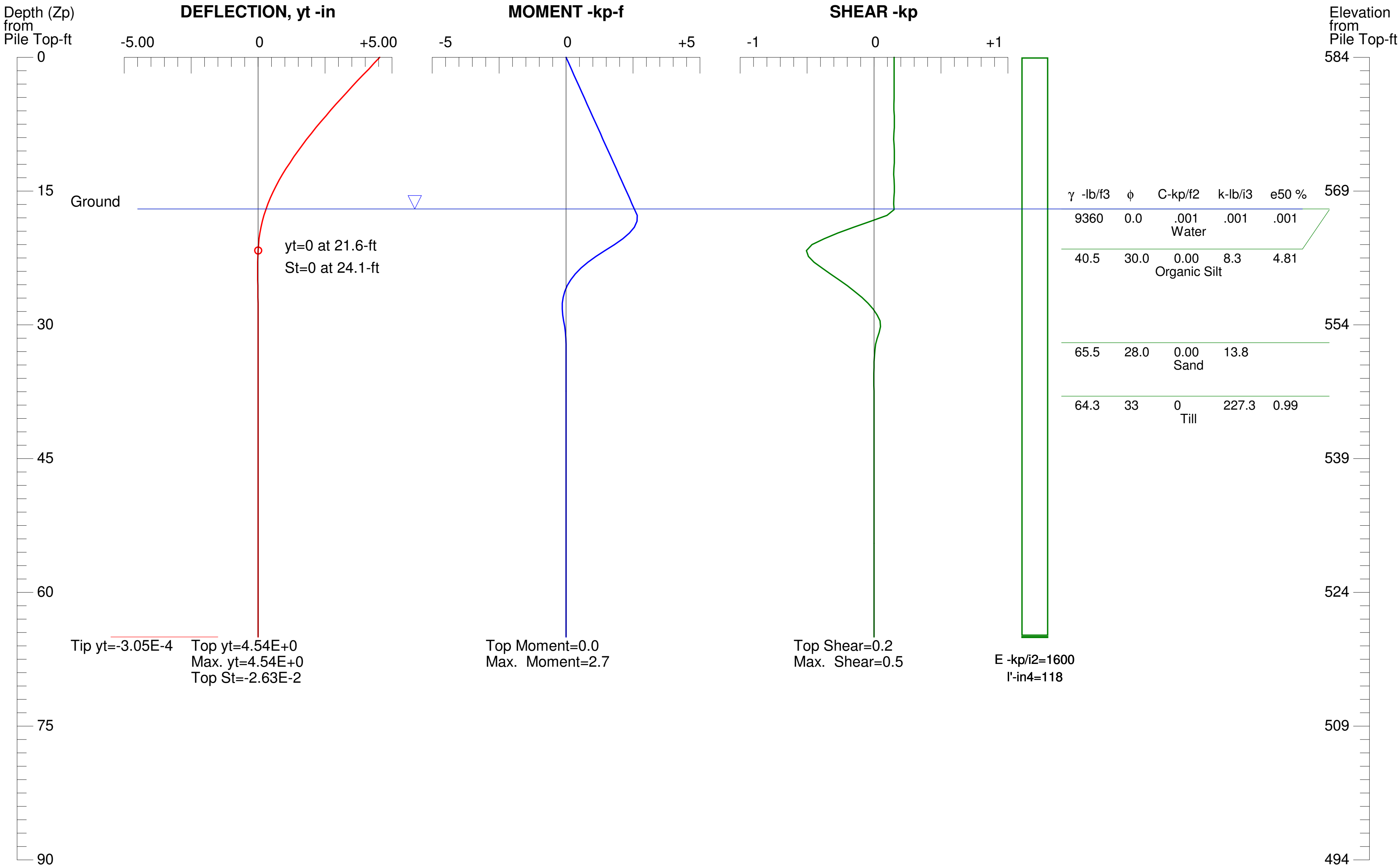
PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



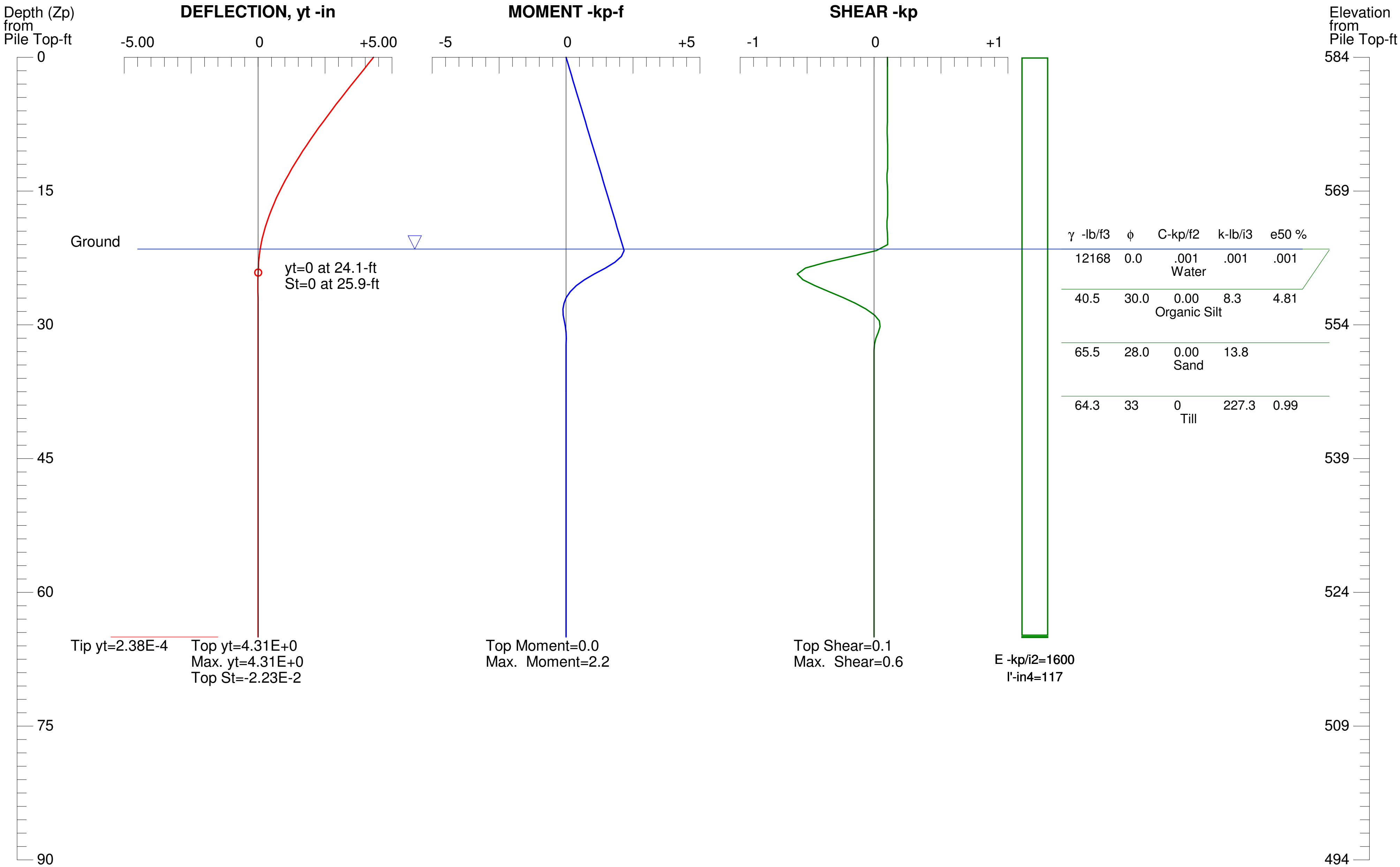
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 7" - 6 deg, initial, NHWM

Figure 31

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



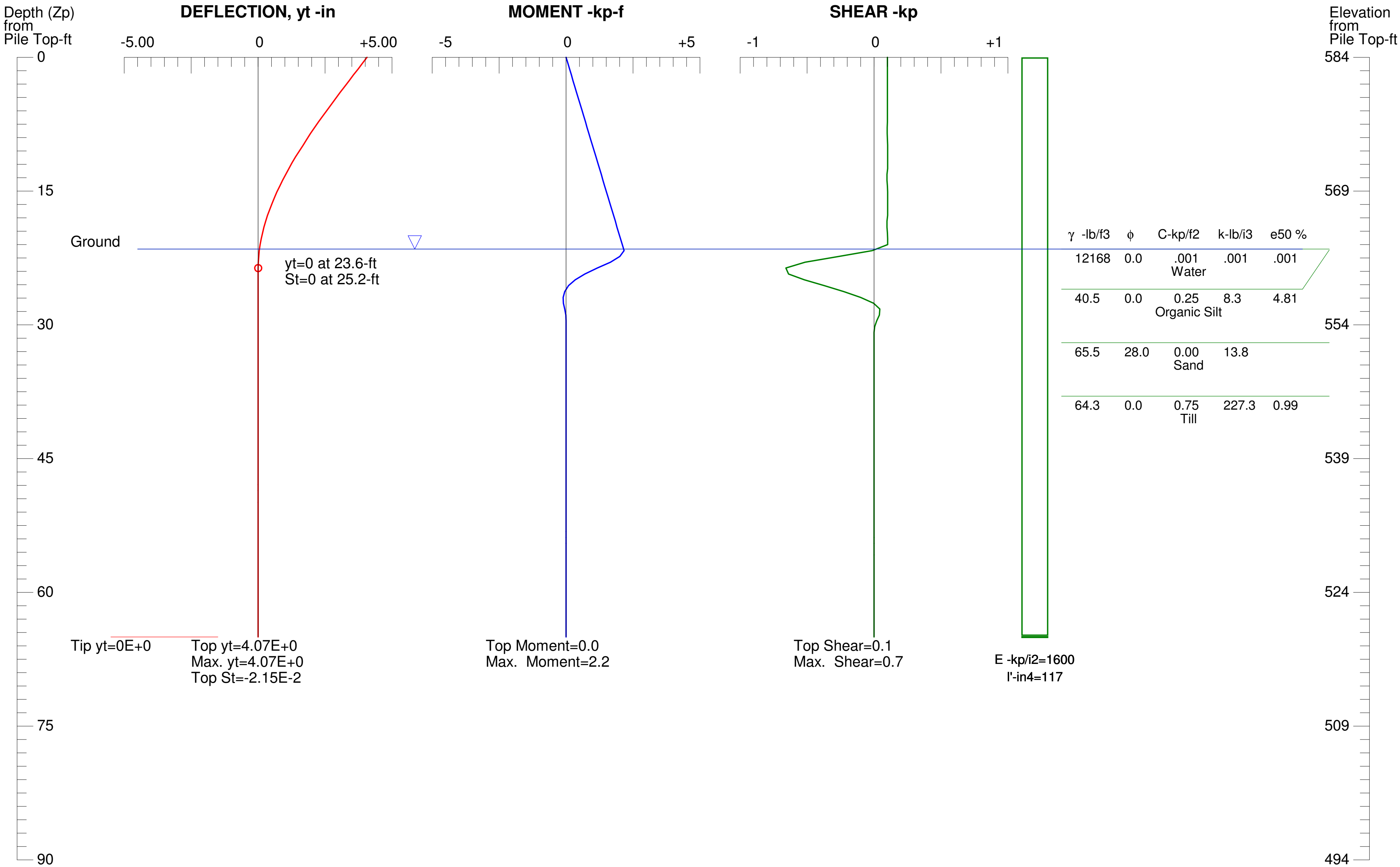
Barr Engineering Company Kinnickinnic River Stability Analysis

Sec. 16, 65' pile - 7" - 6 deg, drained, NHWM

Figure 32

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



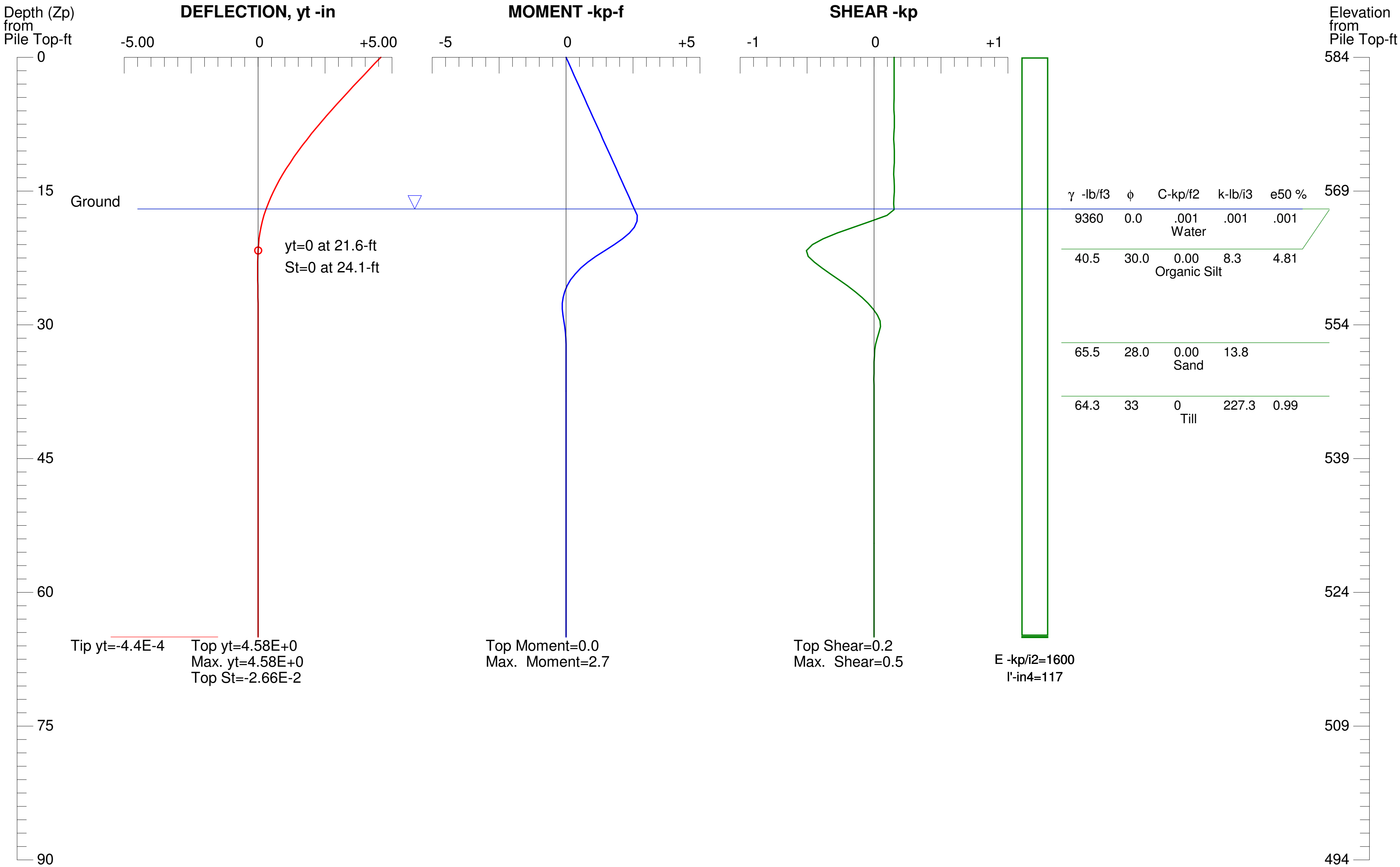
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 7" - 6 deg, undrained, NHWM

Figure 33

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



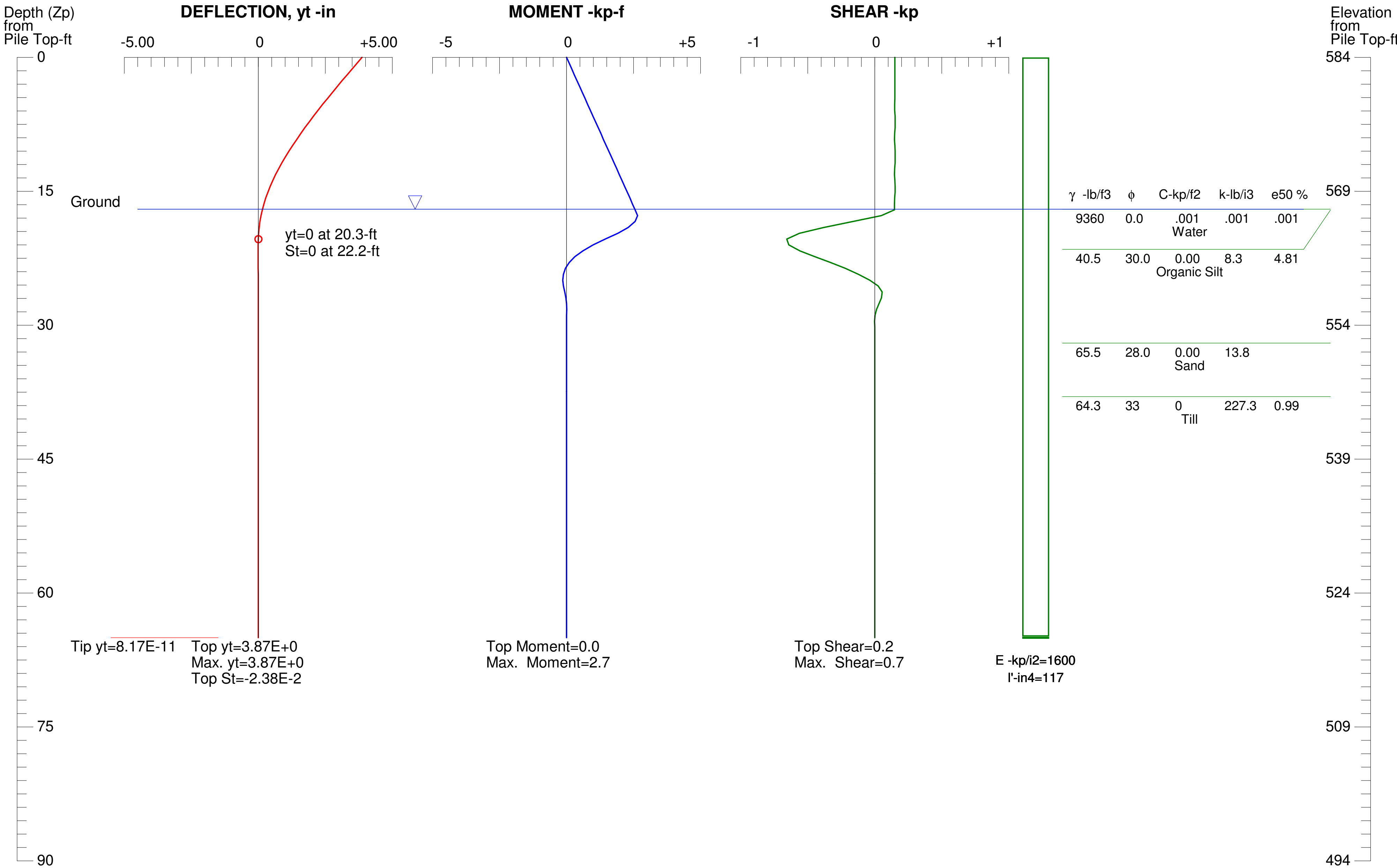
Barr Engineering Company Kinnickinnic River Stability Analysis

Sec. 16, 65' pile - 7" - 12 deg, initial, NHWM

Figure 34

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1



BARR

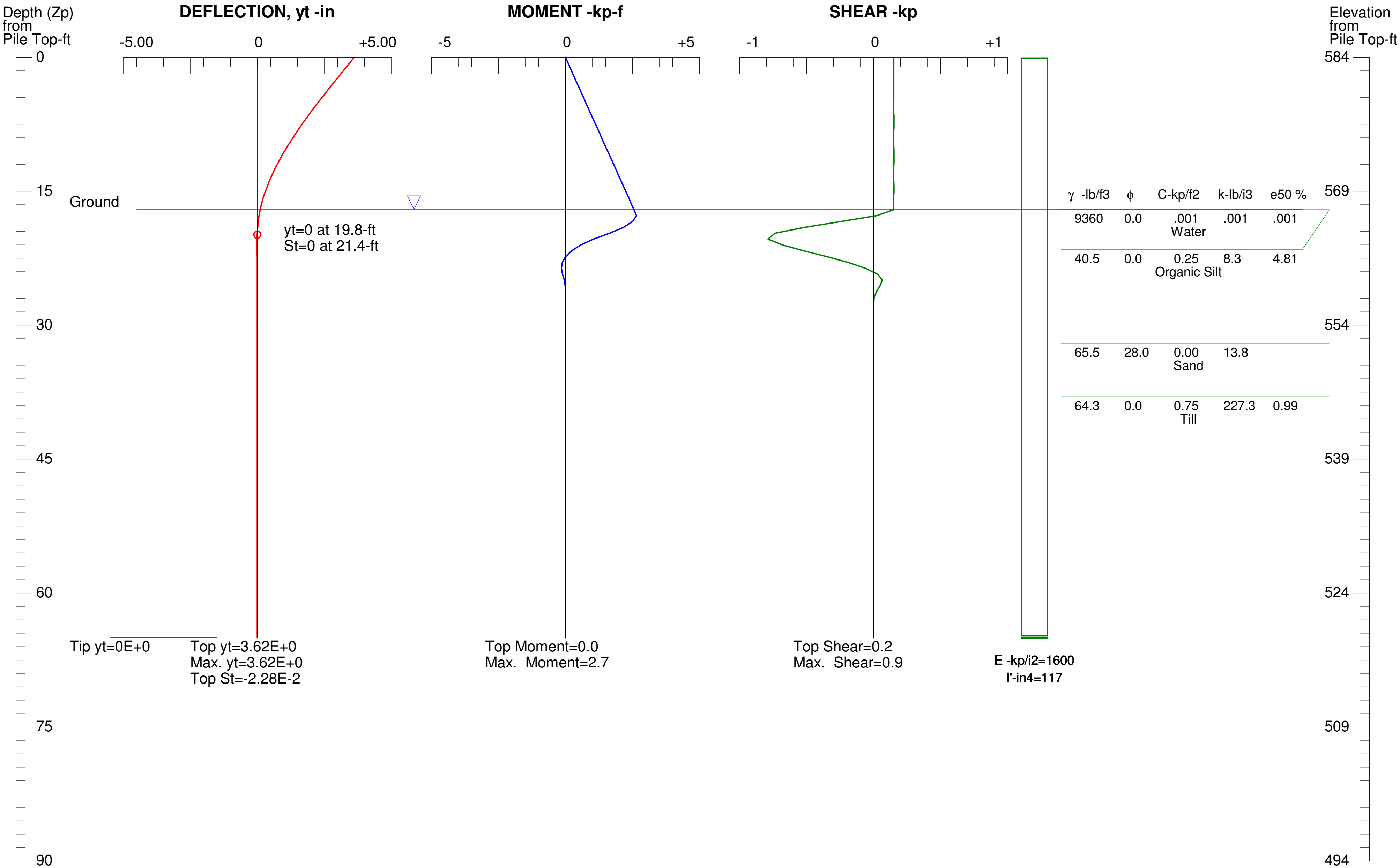
Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 7" 12 deg, drained, NHWM

Figure 35

PILE DEFLECTION & FORCE vs DEPTH

Single Pile, Khead=2, Kbc=1

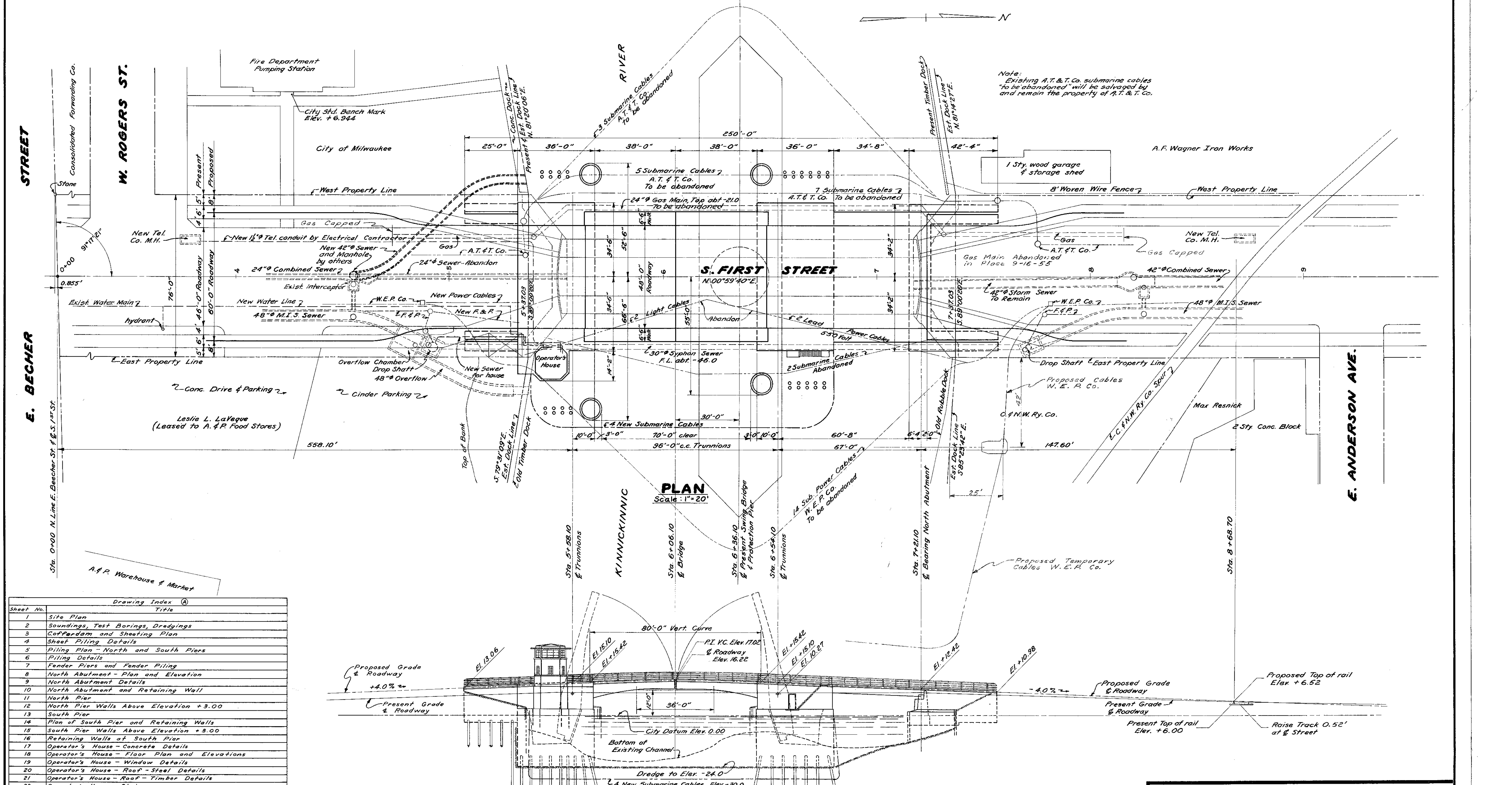


Barr Engineering Company **Kinnickinnic River Stability Analysis**

Sec. 16, 65' pile - 7" - 12 deg, undrained, NHWM

Figure 36

Appendix H – Bridge Abutment Record Drawings



Drawing Index (A)	
Sheet No.	Title
1	Site Plan
2	Soundings, Test Borings, Dredgings
3	Cofferdam and Sheeting Plan
4	Sheet Piling Details
5	Piling Plan – North and South Piers
6	Piling Details
7	Fender Piers and Fender Piling
8	North Abutment – Plan and Elevation
9	North Abutment Details
10	North Abutment and Retaining Wall
11	North Pier
12	North Pier Walls Above Elevation +3.00
13	South Pier
14	Plan of South Pier and Retaining Walls
15	South Pier Walls Above Elevation +3.00
16	Retaining Walls at South Pier
17	Operator's House – Concrete Details
18	Operator's House – Floor Plan and Elevations
19	Operator's House – Window Details
20	Operator's House – Roof – Steel Details
21	Operator's House – Roof – Timber Details
22	Operator's House – Stairways
23	Operator's House – Signal Ball
24	Operator's House – Heating Layout
25	Operator's House – Plumbing Layout
26	General Plan
27	Steel Framing Plan – South Leaf
28	Steel Framing Plan – North Leaf
29	Section Through Roadway
30	Main Girders
31	Floor Beams – FB1, FB2 and FB3
32	Floor Beam FB4
33	Rear Break at Sidewalk
34	Rear Break in Roadway
35	Loading Girders
36	Truss at Bent No. 1
37	Truss at Bent No. 2
38	Bents No. 3 and No. 4
39	Counterweight Box
40	Handrailing
41	Stairway

Drawing Index (Continued)	
Sheet No.	Title
42	Machinery Housings
43	Operating Machinery Layout
44	Operating Machinery Details
45	Operating Machinery Details
46	Centerlock Machinery Layout
47	Centerlock Castings
48	Bridge Wiring Plan
49	Submarine Cable Details
50	Limit Switches
51	Bronze Name Plate

DEPARTMENT OF PUBLIC WORKS
BUREAU OF BRIDGES AND PUBLIC BUILDINGS
CITY OF MILWAUKEE

REVISIONS		
MARK	DATE	BY
A	11-26-55	E.W.P.
B		
C		
D		
E		
F		
G		
H		
I		
J		
K		
L		
M		

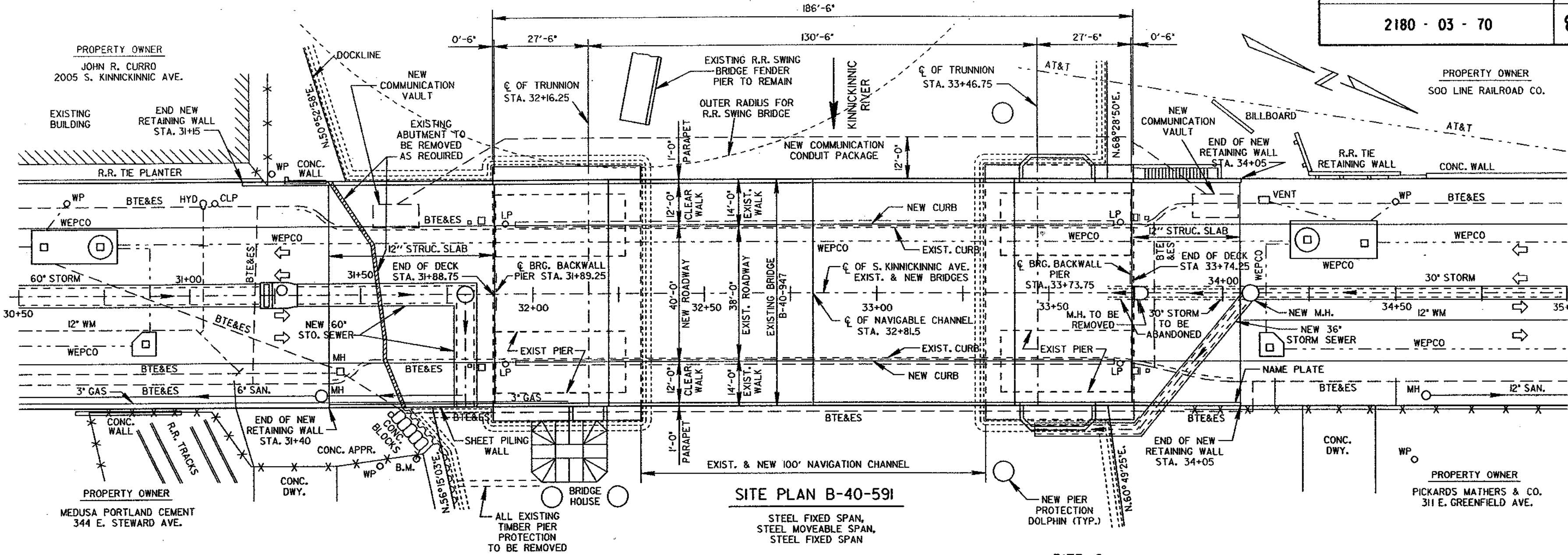
SOUTH FIRST STREET BASCULE BRIDGE
OVER KINNICKINNIC RIVER

SITE PLAN

DESIGNED BY: T.E.S. & J.J.M. TRACED BY: R.M.J. DATE: 8-5-55
DRAWN BY: T.E.S. CHECKED BY: R.H.C. DATE: 8-16-55
APPROVED:— SCALE: 1"=20'
Norris G. Batalden DATE: 8-22-55 SHEET NUMBER 1
DESIGNER IN CHARGE
George C. Ashton DATE: 8-23-55 SET OF 51 SHEETS
SUPT. OF BRIDGES AND PUBLIC BUILDINGS
Walter M. Swietlik DATE: 8-25-55 JOB NO. 521-027
COMMISSIONER OF PUBLIC WORKS

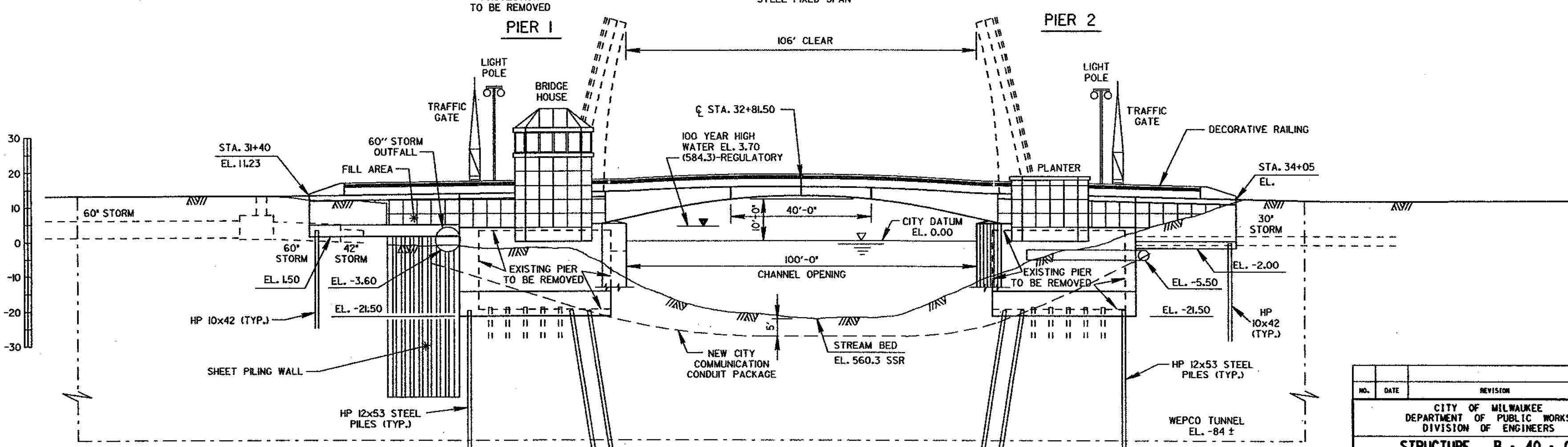
201

STATE PROJECT NUMBER	SHEET NO.
2180 - 03 - 70	8.1



SITE PLAN B-40-591

STEEL FIXED SPAN,
STEEL MOVEABLE SPAN,
STEEL FIXED SPAN



EAST ELEVATION

SCALE: 1" = 15'-0"

NOTE: CITY OF MILWAUKEE
DATUM 1929 ADJUSTMENT
0.00 = EL. 580.60

BENCH MARK: E/S OF S. KINNICKINNIC AVE.
STA. 31+65, 48 FT. RIGHT OF C/L
ARMY CORP OF ENG. SURVEY ON
BRASS PLUG EL. 10.03

NO.	DATE	REVISION	BY

CITY OF MILWAUKEE
DEPARTMENT OF PUBLIC WORKS
DIVISION OF ENGINEERS

STRUCTURE B - 40 - 0591

DESIGNED BY	J.T.A.	DRAWN BY	K.S.	CHECKED BY		DATE	1/95

SITE PLAN

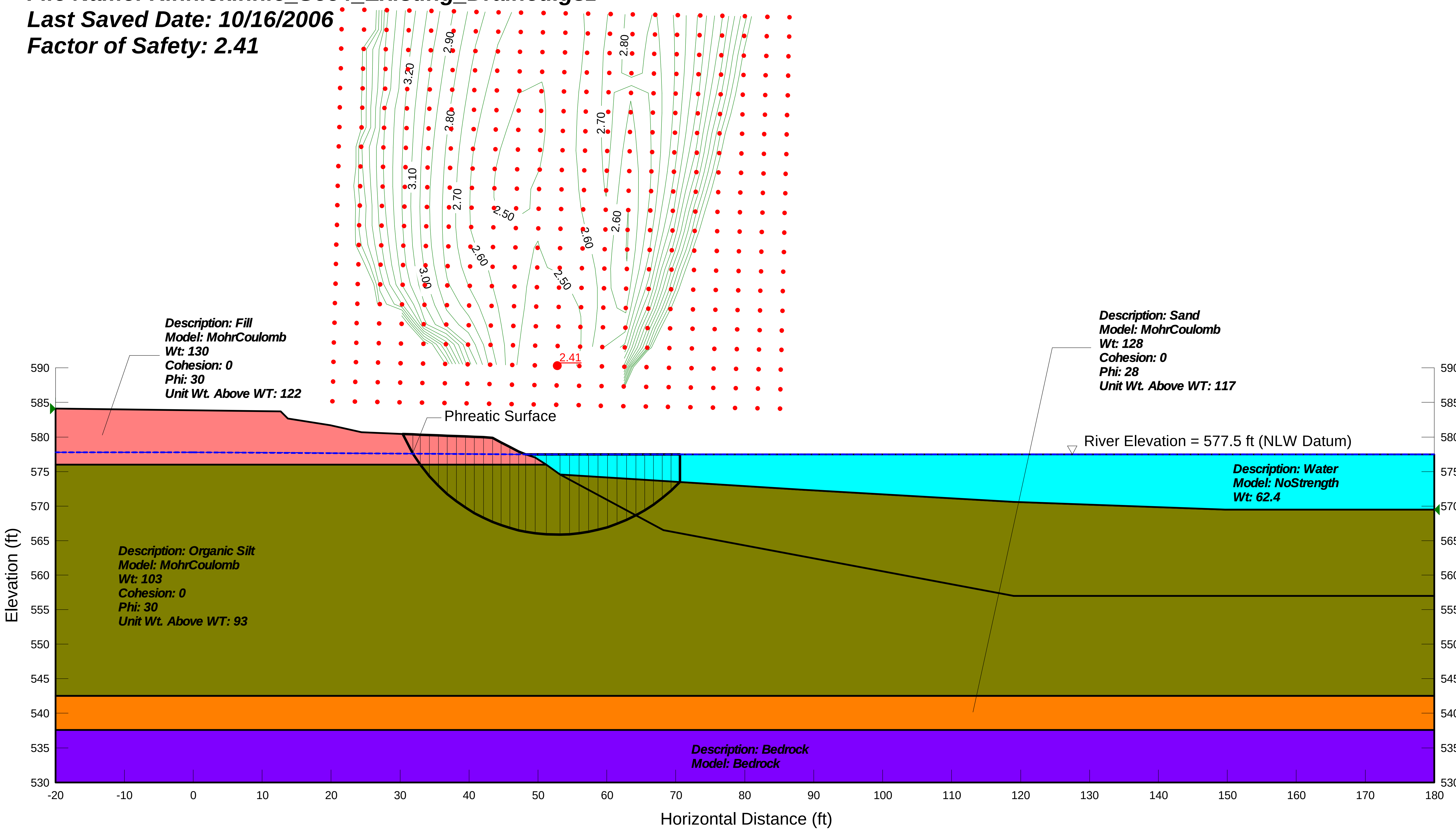
SHEET 2 OF 143

X

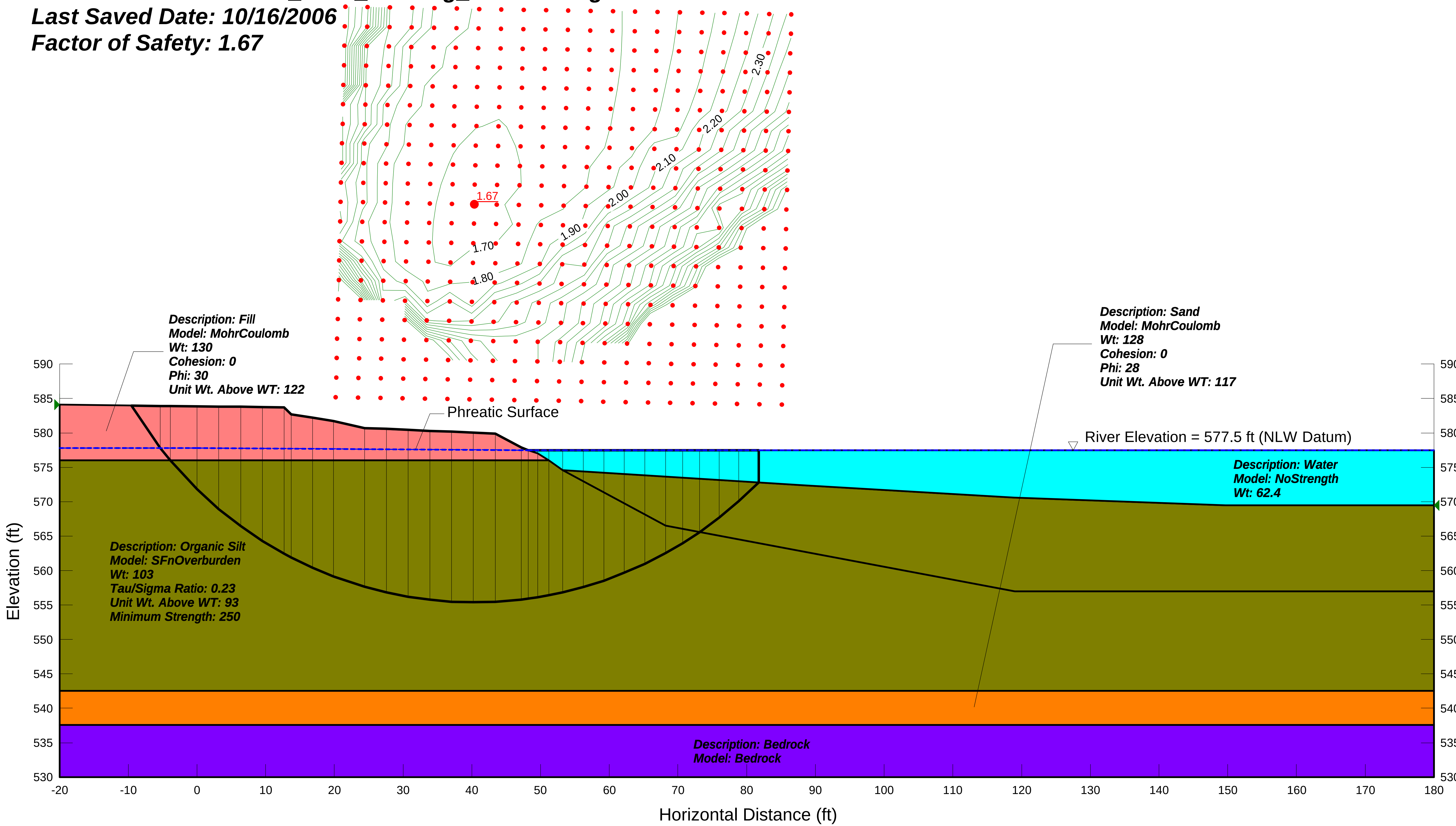
site.dgn 1/16/96

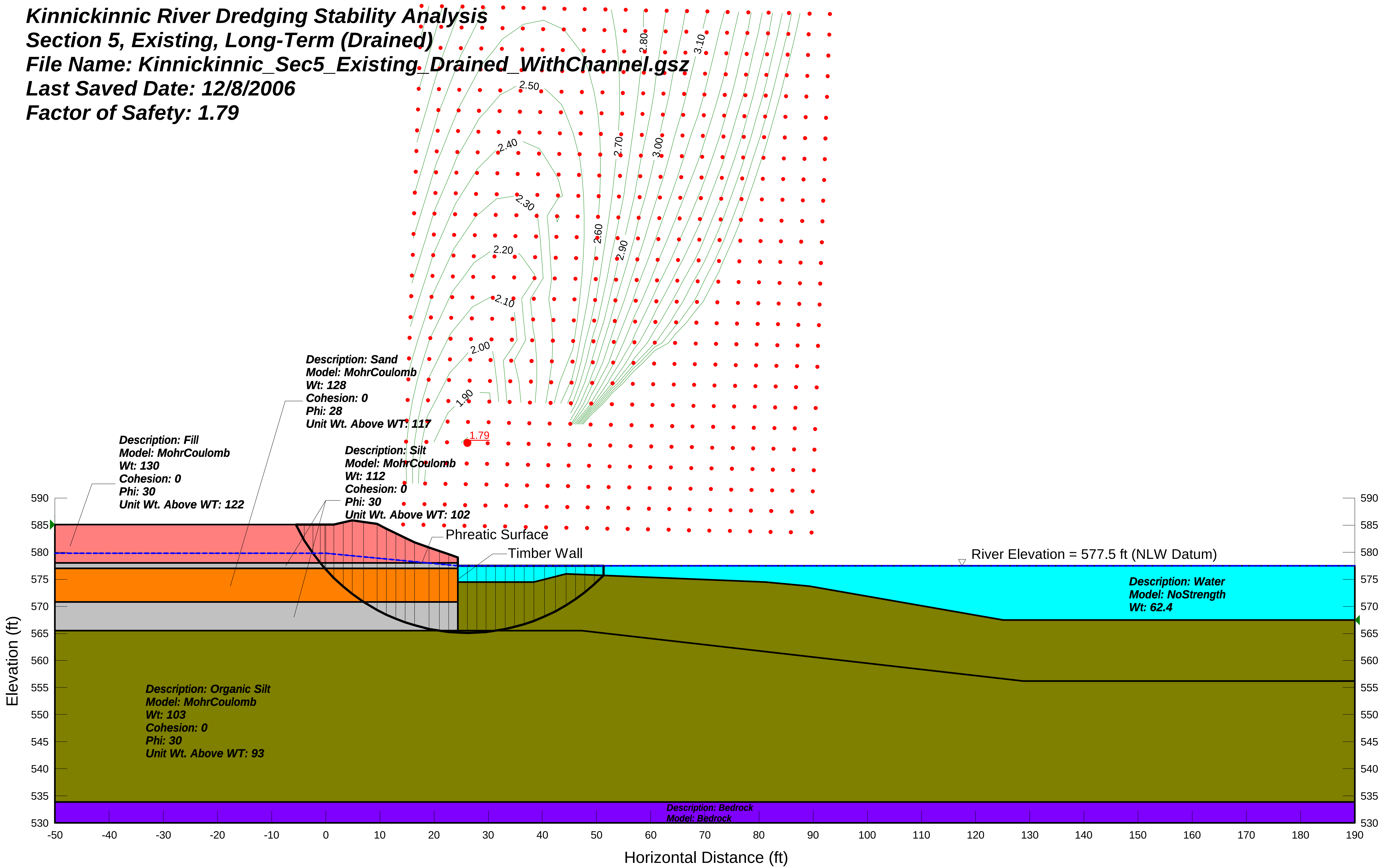
Appendix I – Unprotected Riverbank Calculations

Kinnickinnic River Dredging Stability Analysis
Section 4, Existing, Long-Term (Drained)
File Name: Kinnickinnic_Sec4_Existing_Drained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 2.41

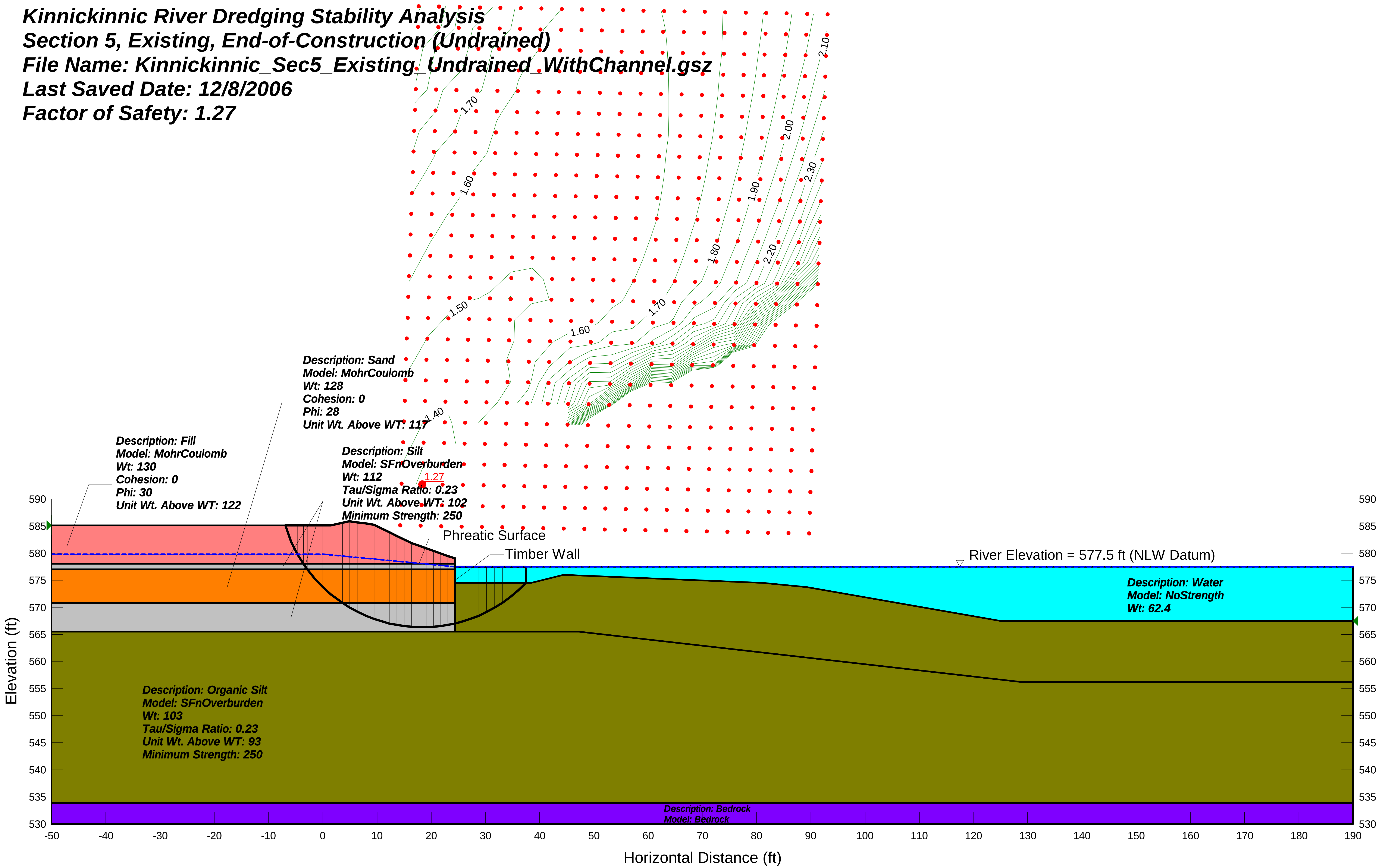


Kinnickinnic River Dredging Stability Analysis
Section 4, Existing, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec4_Existing_Undrained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 1.67

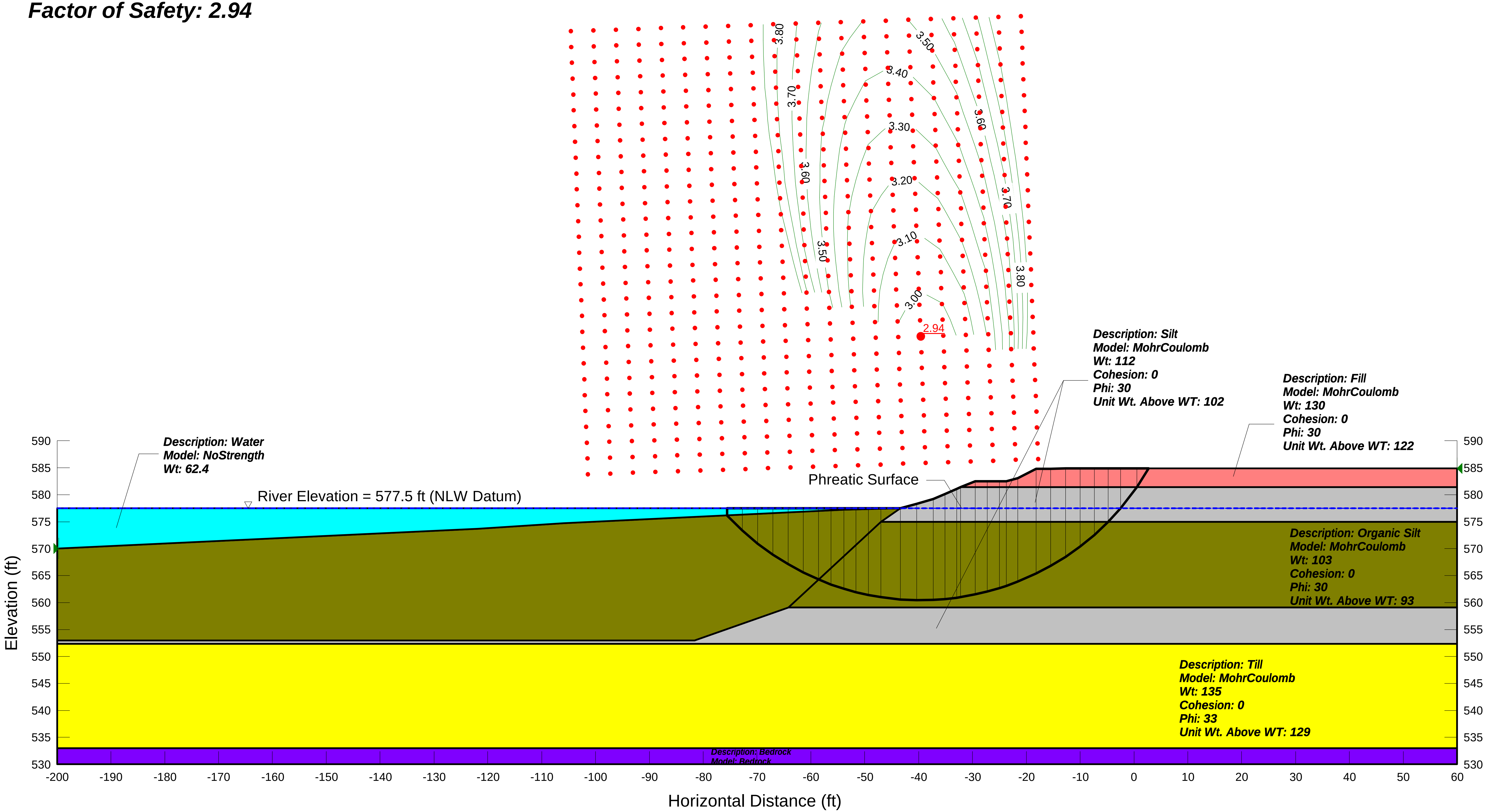




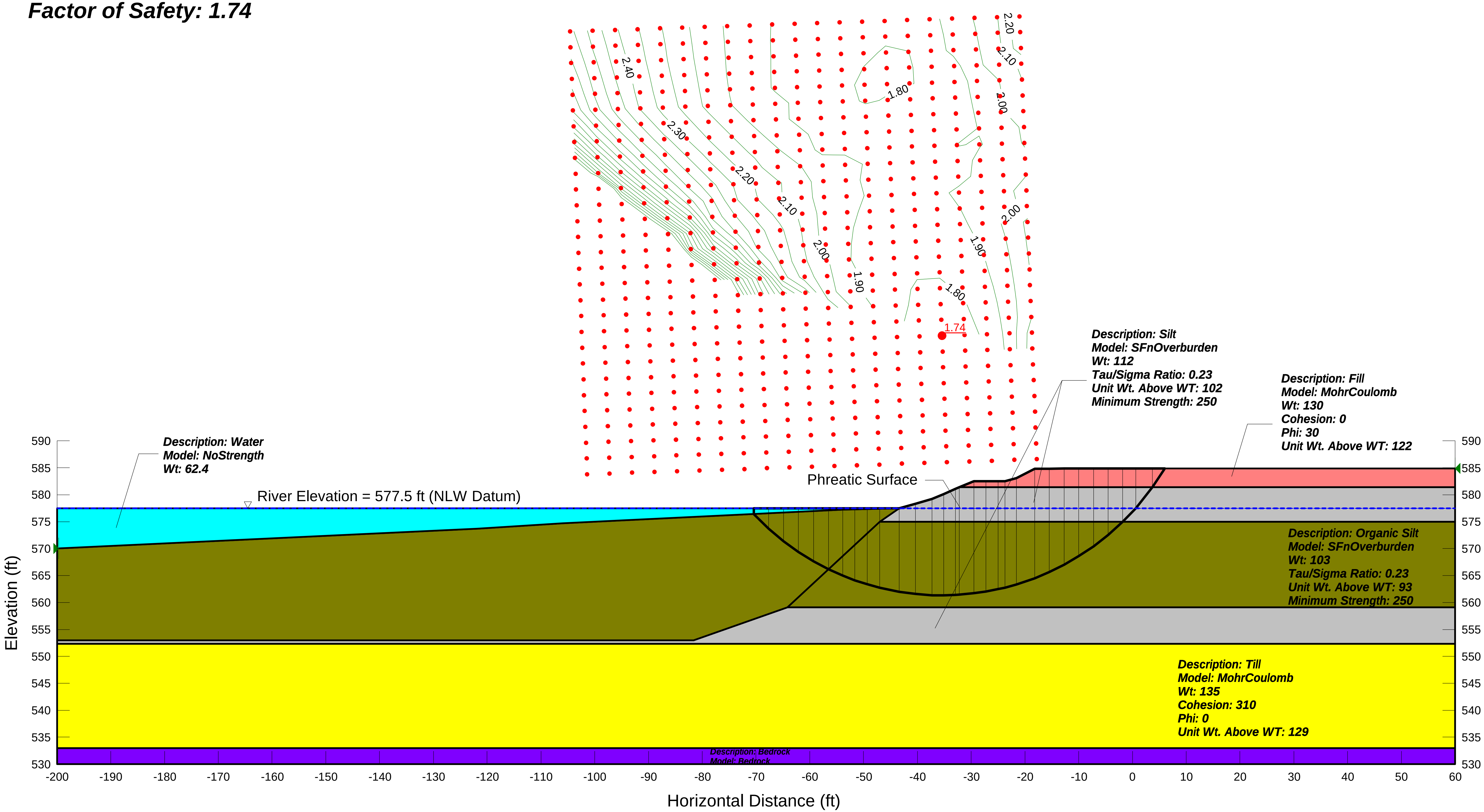
Kinnickinnic River Dredging Stability Analysis
Section 5, Existing, Long-Term (Drained)
File Name: Kinnickinnic_Sec5_Existing_Drained_WithChannel.gsz
Last Saved Date: 12/8/2006
Factor of Safety: 1.79
2.80
3.10
2.50
2.70
3.00
2.40
2.30
2.60
2.90
2.20
2.10
2.00
1.90
1.79
Description: Sand
Model: MohrCoulomb
Wt: 128
Cohesion: 0
Phi: 28
Unit Wt. Above WT: 117
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Description: Silt
Model: MohrCoulomb
Wt: 112
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 102
Phreatic Surface
Timber Wall
River Elevation = 577.5 ft (NLW Datum)
Description: Water
Model: NoStrength
Wt: 62.4
Description: Organic Silt
Model: MohrCoulomb
Wt: 103
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 93
Description: Bedrock
Model: Bedrock
Elevation (ft)
Horizontal Distance (ft)
590
585
580
575
570
565
560
555
550
545
540
535
530
-50
-40
-30
-20
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190


Kinnickinnic River Dredging Stability Analysis
Section 5, Existing, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec5_Existing_Undrained_WithChannel.gsz
Last Saved Date: 12/8/2006
Factor of Safety: 1.27
1.70
1.60
1.50
1.40
1.60
1.70
1.80
1.90
2.00
2.10
2.20
2.30
1.27
Description: Sand
Model: MohrCoulomb
Wt: 128
Cohesion: 0
Phi: 28
Unit Wt. Above WT: 117
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Description: Silt
Model: SFnOverburden
Wt: 112
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 102
Minimum Strength: 250
Phreatic Surface
Timber Wall
River Elevation = 577.5 ft (NLW Datum)
Description: Water
Model: NoStrength
Wt: 62.4
Description: Organic Silt
Model: SFnOverburden
Wt: 103
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 93
Minimum Strength: 250
Description: Bedrock
Model: Bedrock
Elevation (ft)
590
585
580
575
570
565
560
555
550
545
540
535
530
-50
-40
-30
-20
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
Horizontal Distance (ft)

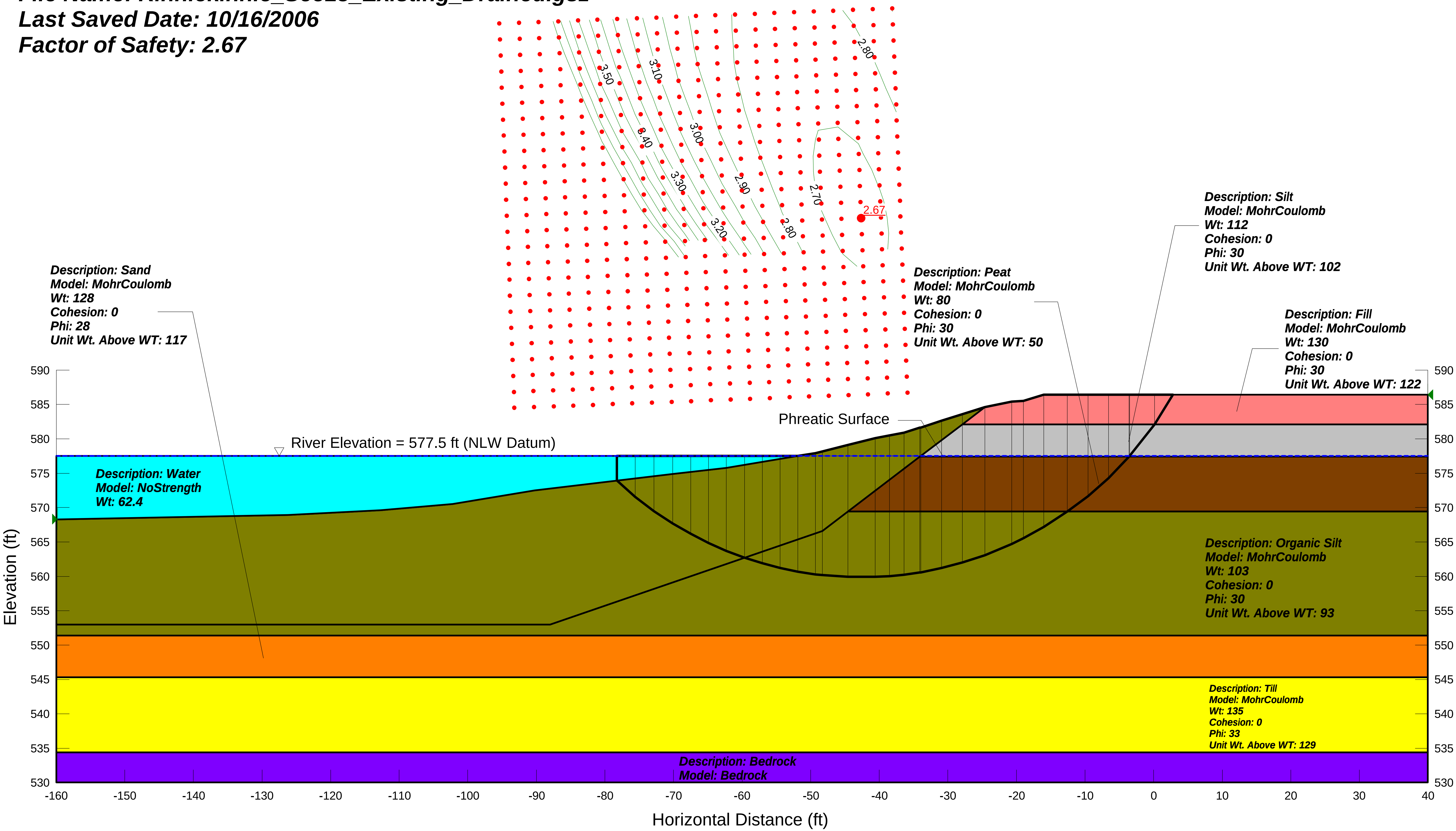
Kinnickinnic River Dredging Stability Analysis
Section 8, Existing, Long-Term (Drained)
File Name: Kinnickinnic_Sec8_Existing_Drained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 2.94



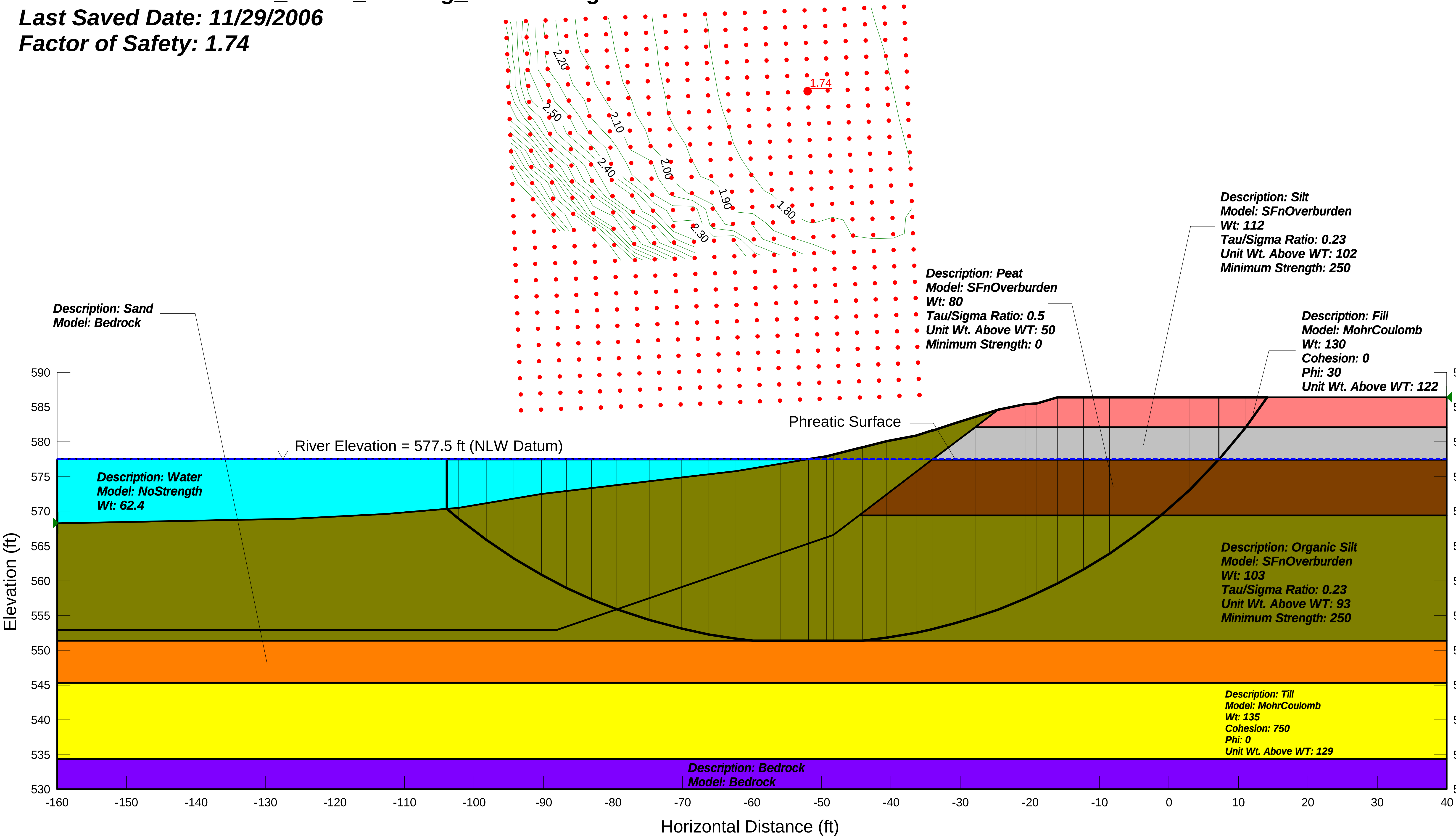
Kinnickinnic River Dredging Stability Analysis
Section 8, Existing, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec8_Existing_Undrained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 1.74



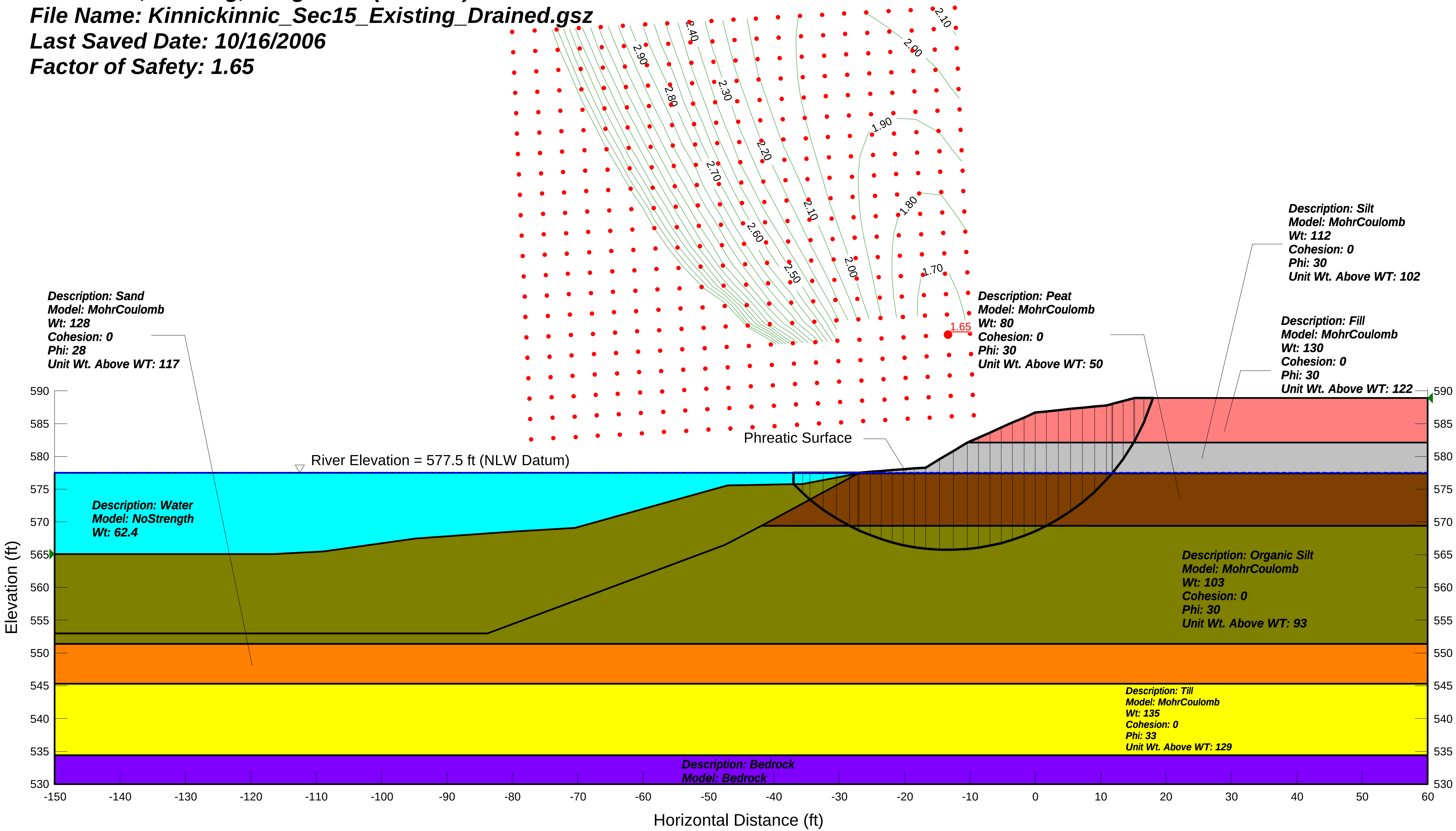
Kinnickinnic River Dredging Stability Analysis
Section 13, Existing, Long-Term (Drained)
File Name: Kinnickinnic_Sec13_Existing_Drained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 2.67



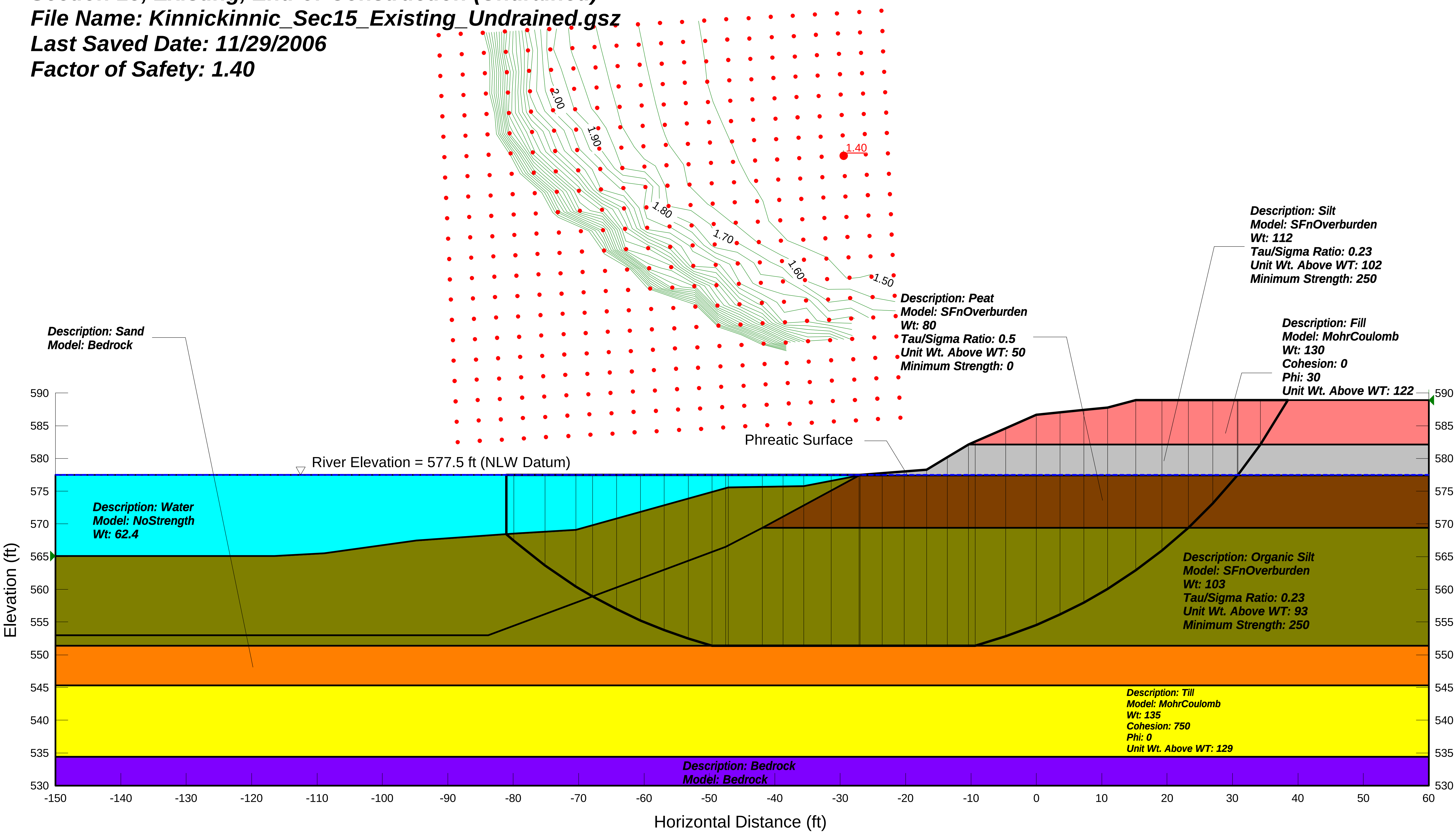
Kinnickinnic River Dredging Stability Analysis
Section 13, Existing, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec13_Existing_Undrained.gsz
Last Saved Date: 11/29/2006
Factor of Safety: 1.74



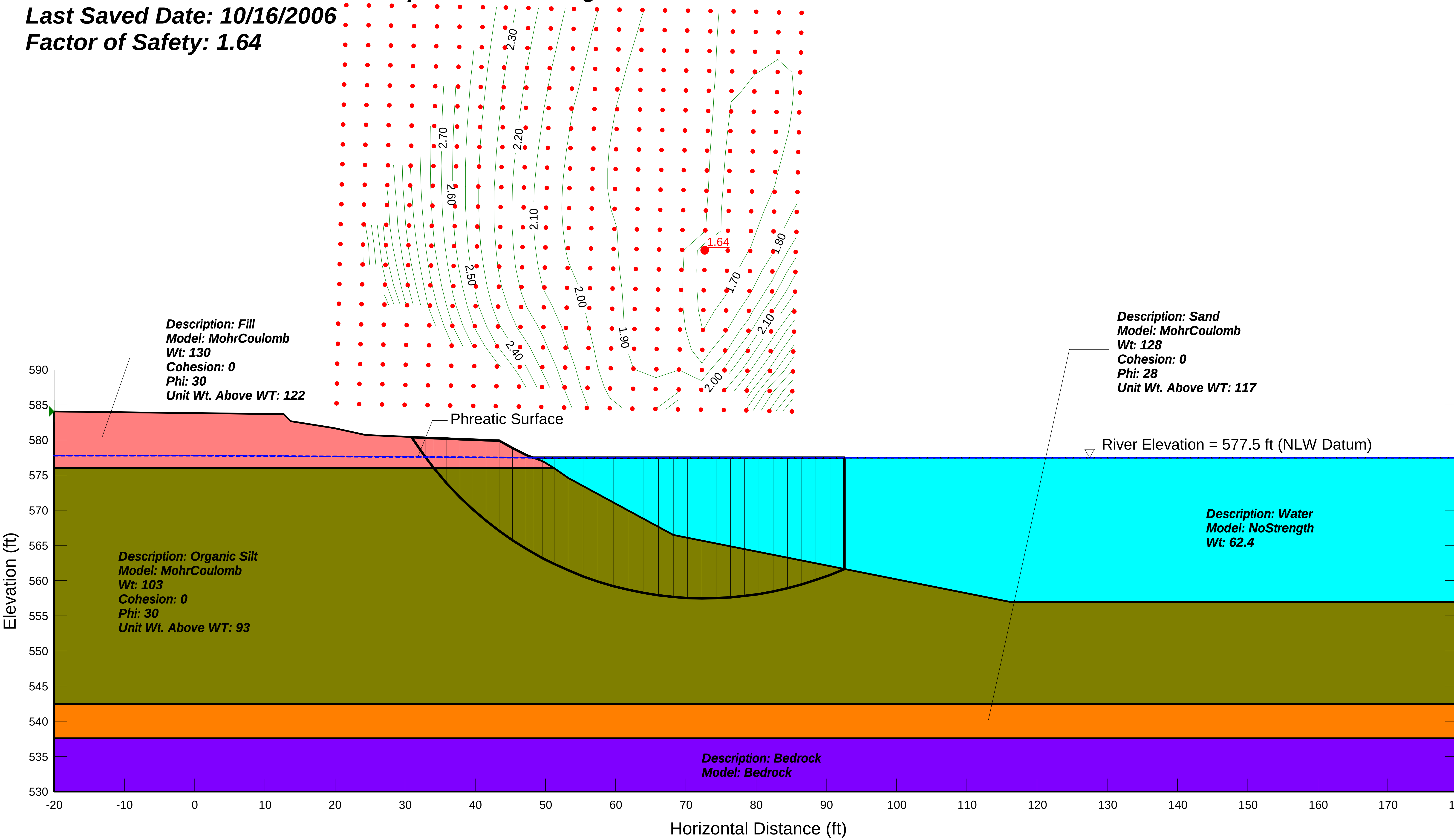
Kinnickinnic River Dredging Stability Analysis
Section 15, Existing, Long-Term (Drained)
File Name: Kinnickinnic_Sec15_Existing_Drained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 1.65

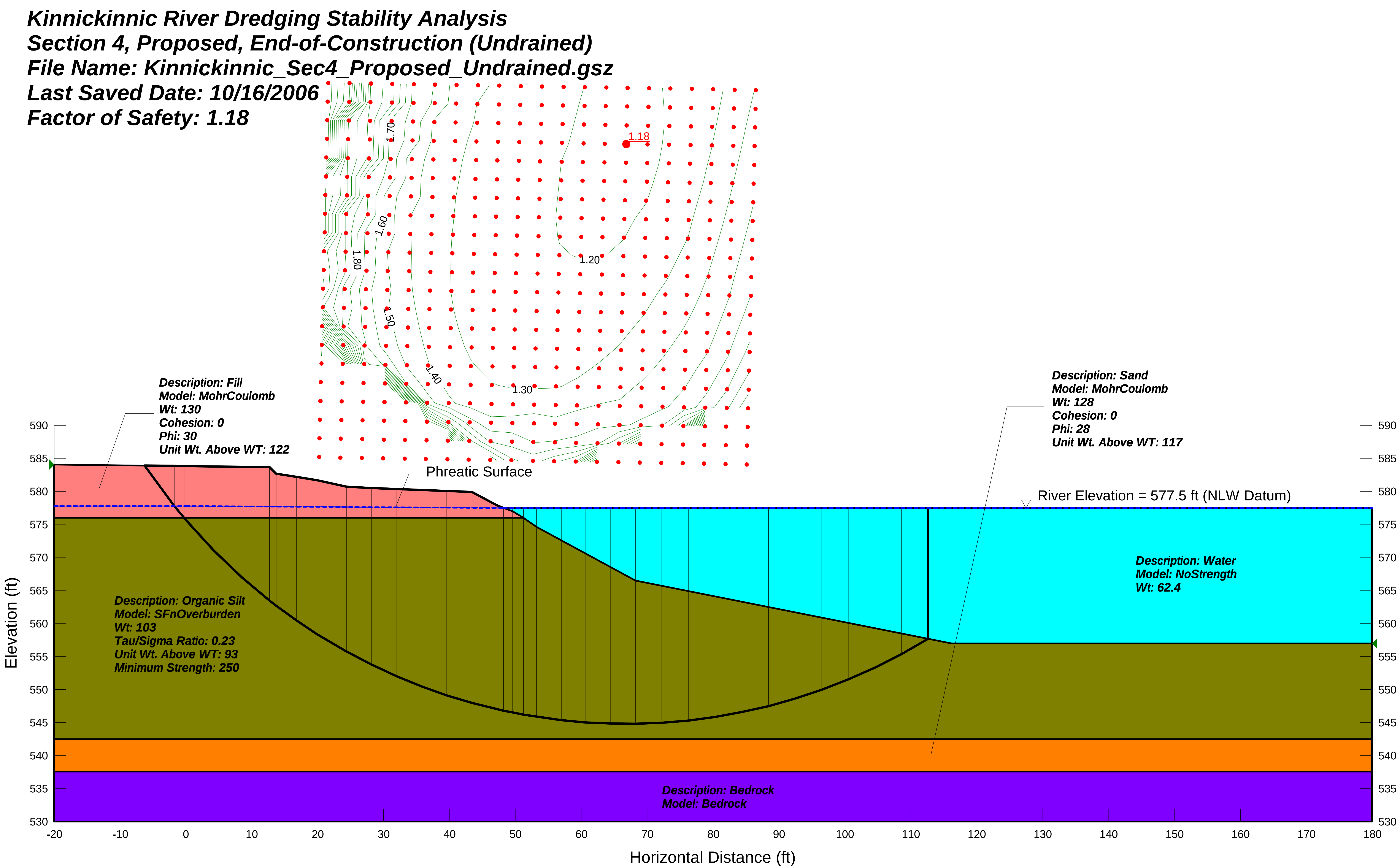


Kinnickinnic River Dredging Stability Analysis
Section 15, Existing, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec15_Existing_Undrained.gsz
Last Saved Date: 11/29/2006
Factor of Safety: 1.40



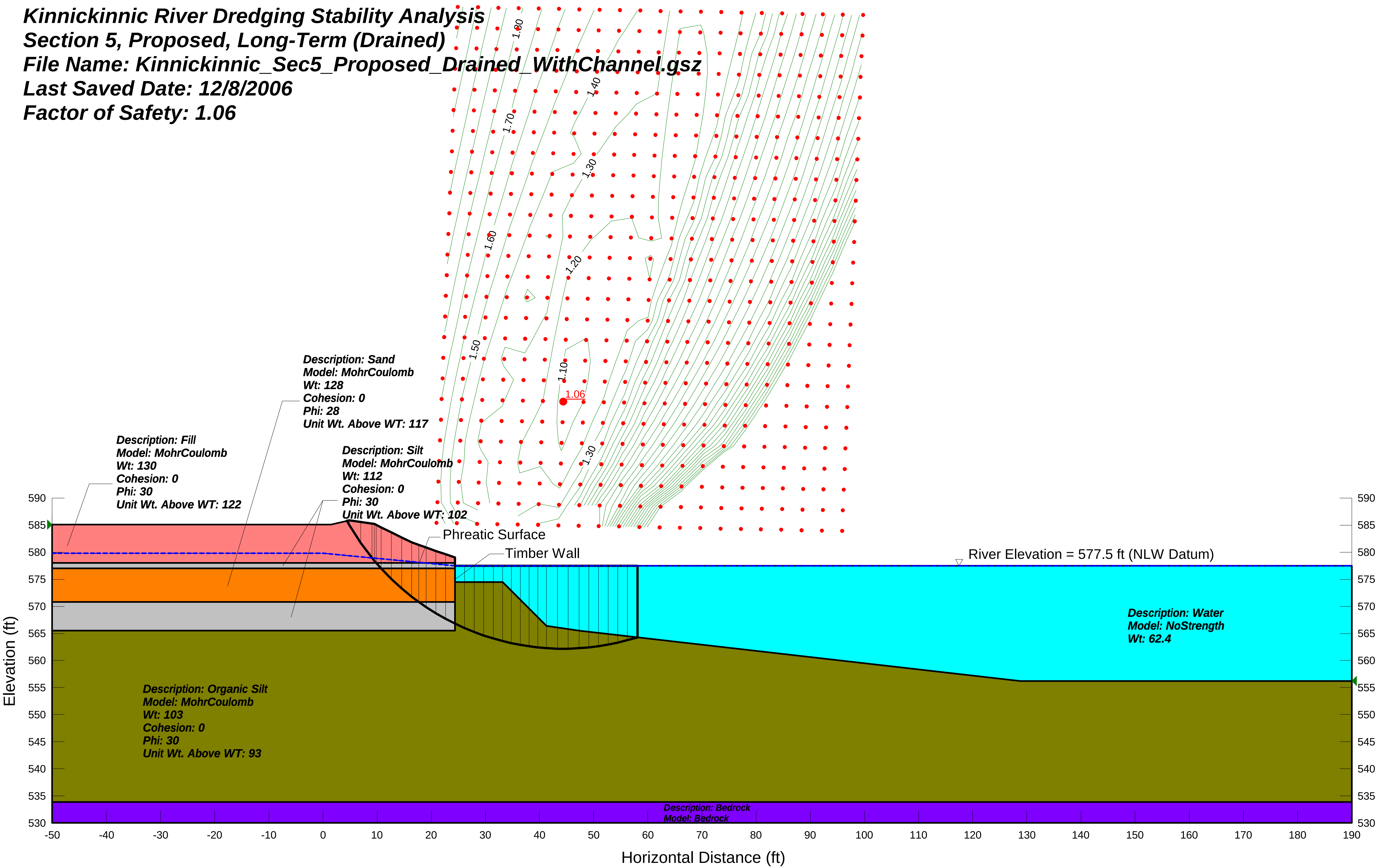
Kinnickinnic River Dredging Stability Analysis
Section 4, Proposed, Long-Term (Drained)
File Name: Kinnickinnic_Sec4_Proposed_Drained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 1.64



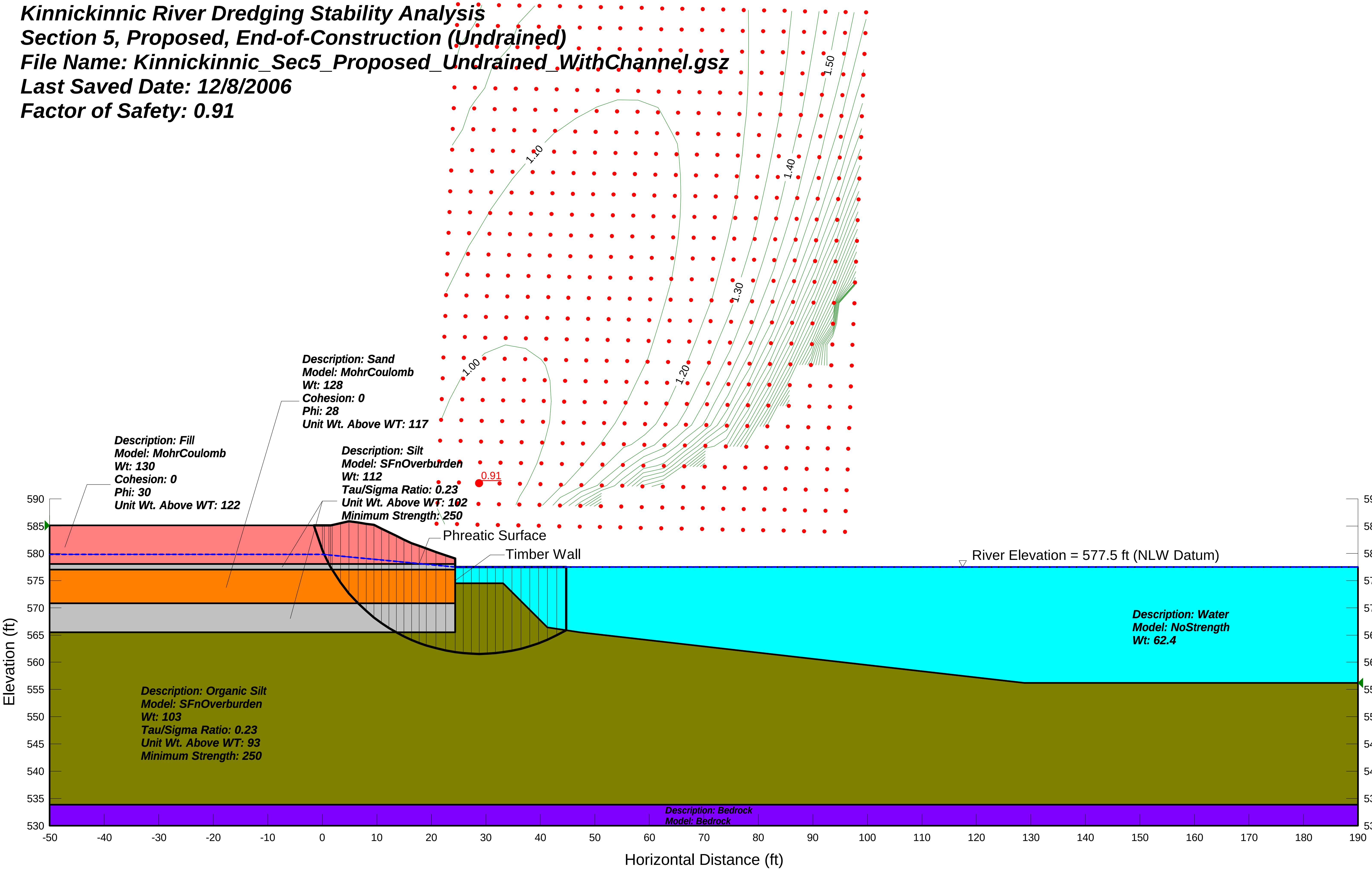


Kinnickinnic River Dredging Stability Analysis
Section 4, Proposed, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec4_Proposed_Undrained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 1.18
1.18
1.70
1.60
1.80
1.20
1.50
1.40
1.30
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Phreatic Surface
Description: Sand
Model: MohrCoulomb
Wt: 128
Cohesion: 0
Phi: 28
Unit Wt. Above WT: 117
River Elevation = 577.5 ft (NLW Datum)
Description: Water
Model: NoStrength
Wt: 62.4
Description: Organic Silt
Model: SFnOverburden
Wt: 103
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 93
Minimum Strength: 250
Description: Bedrock
Model: Bedrock
Elevation (ft)
590
585
580
575
570
565
560
555
550
545
540
535
530
-20
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
Horizontal Distance (ft)

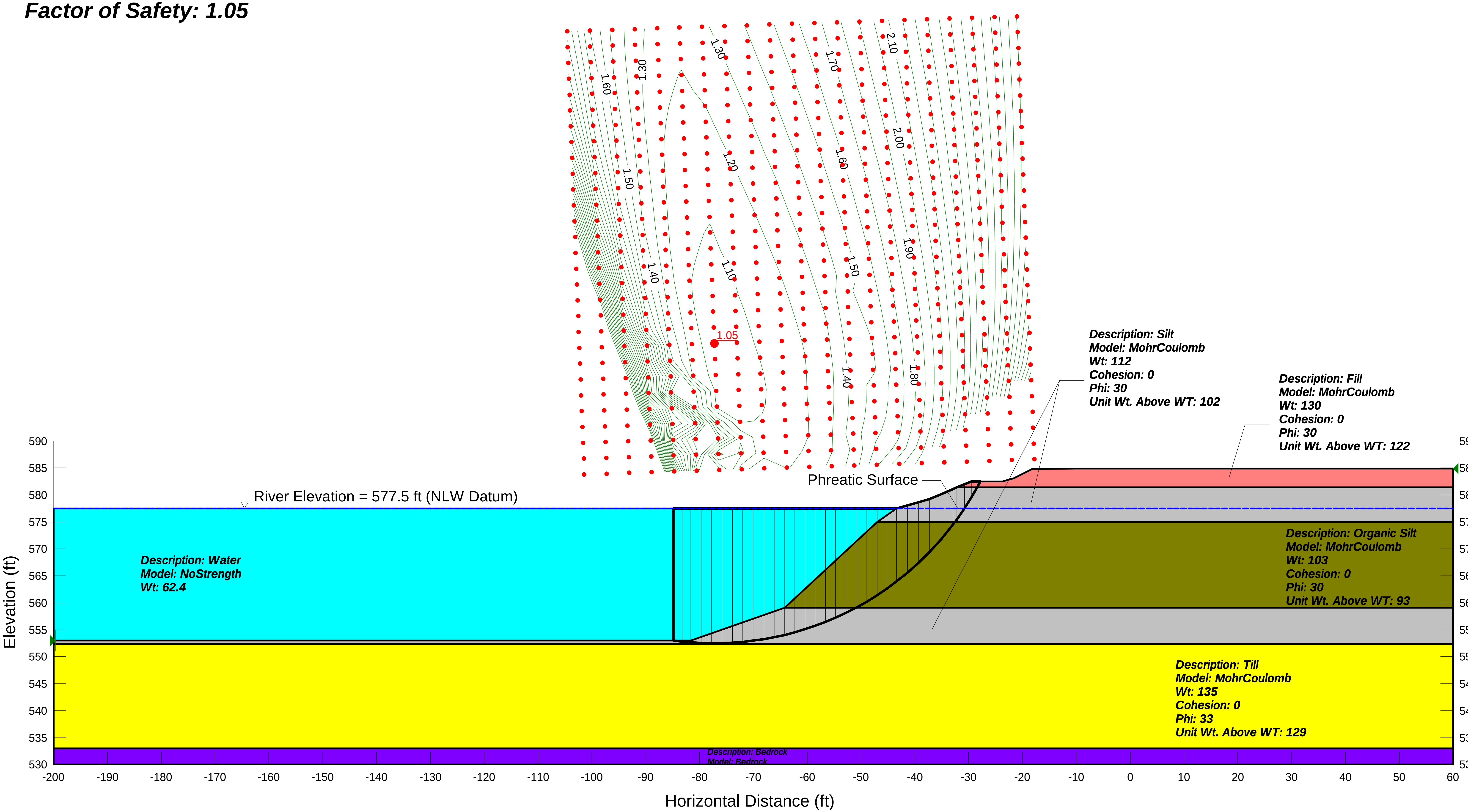
Kinnickinnic River Dredging Stability Analysis
Section 5, Proposed, Long-Term (Drained)
File Name: Kinnickinnic_Sec5_Proposed_Drained_WithChannel.gsz
Last Saved Date: 12/8/2006
Factor of Safety: 1.06



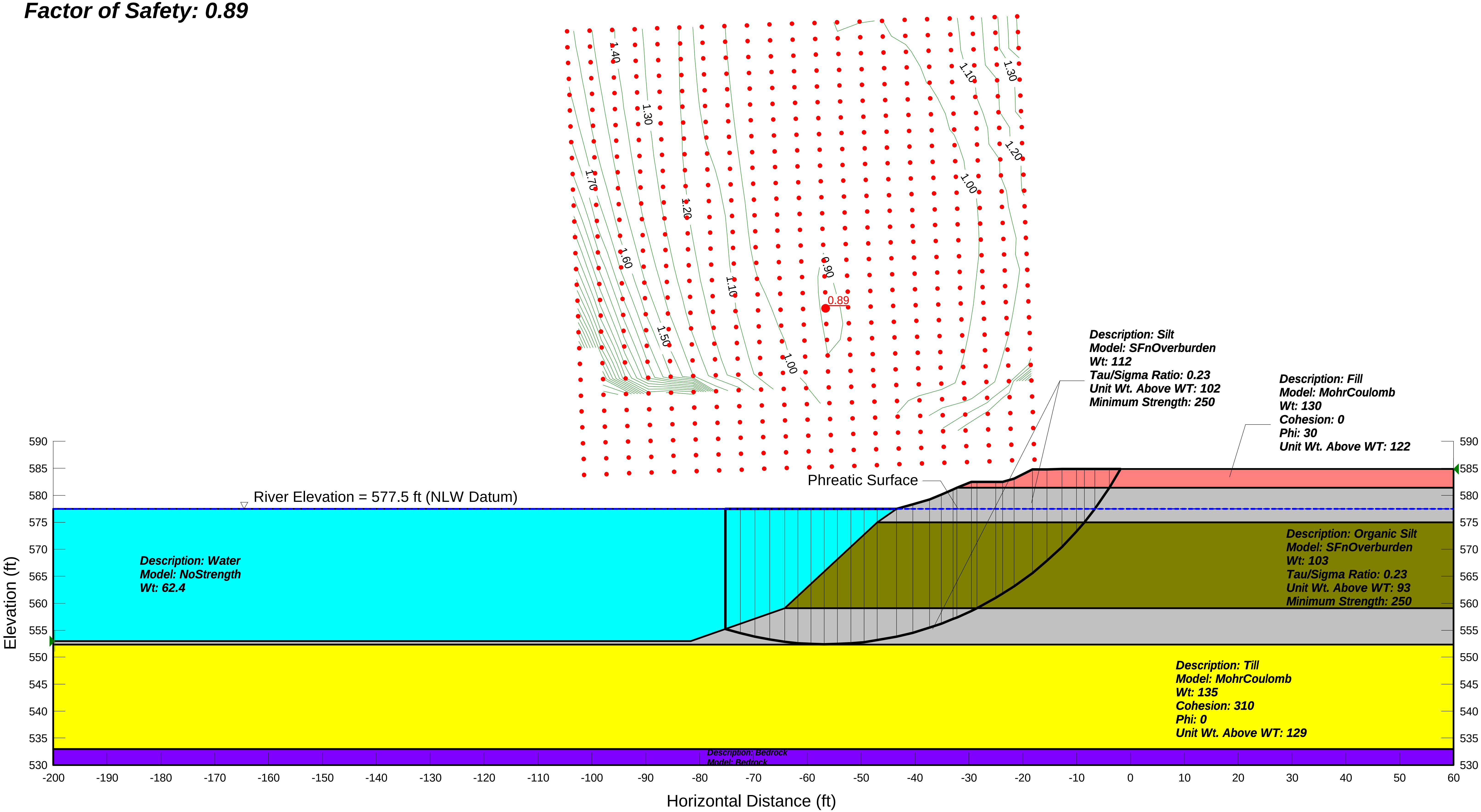
Kinnickinnic River Dredging Stability Analysis
Section 5, Proposed, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec5_Proposed_Undrained_WithChannel.gsz
Last Saved Date: 12/8/2006
Factor of Safety: 0.91



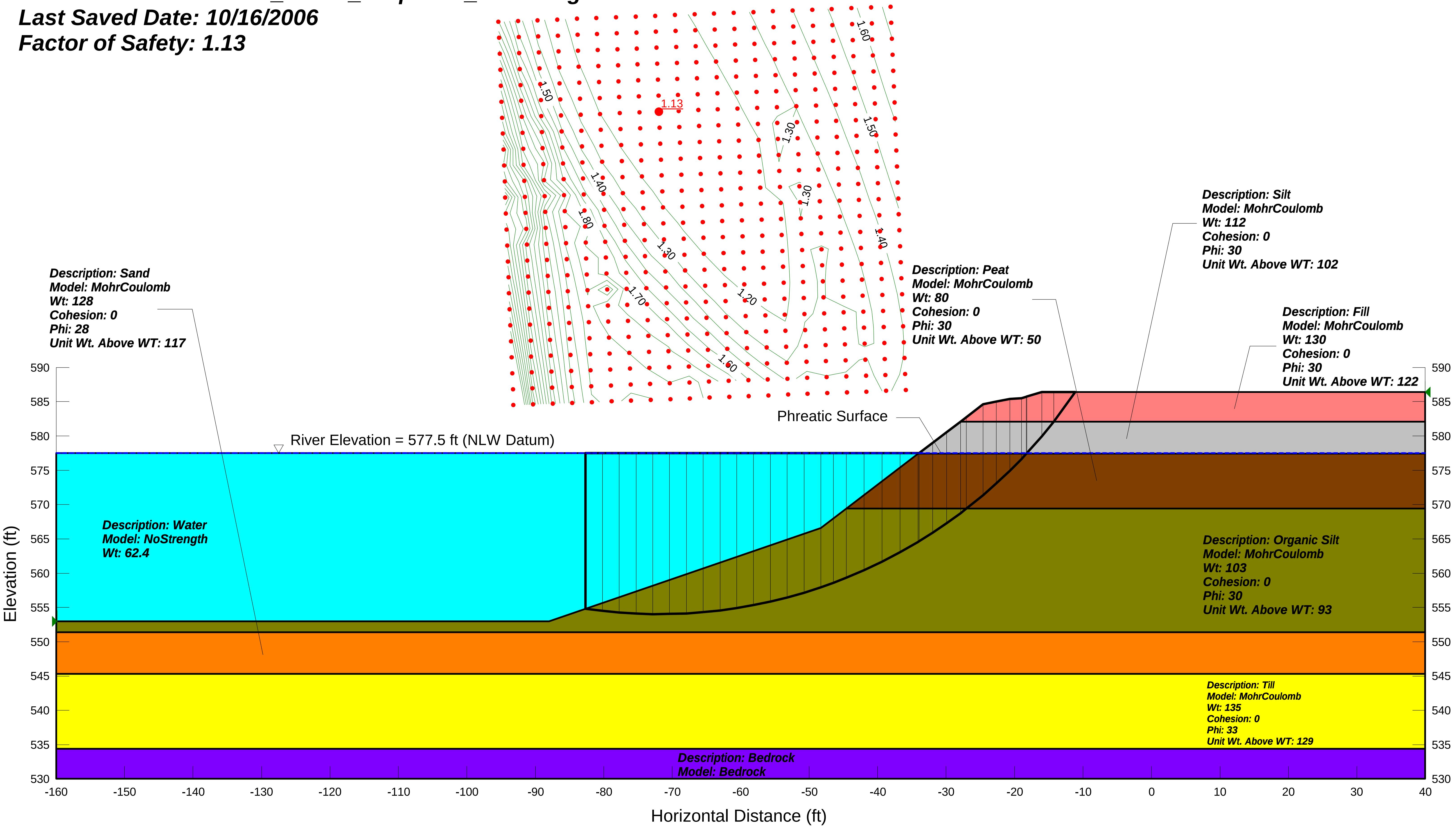
Kinnickinnic River Dredging Stability Analysis
Section 8, Proposed, Long-Term (Drained)
File Name: Kinnickinnic_Sec8_Proposed_Drained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 1.05



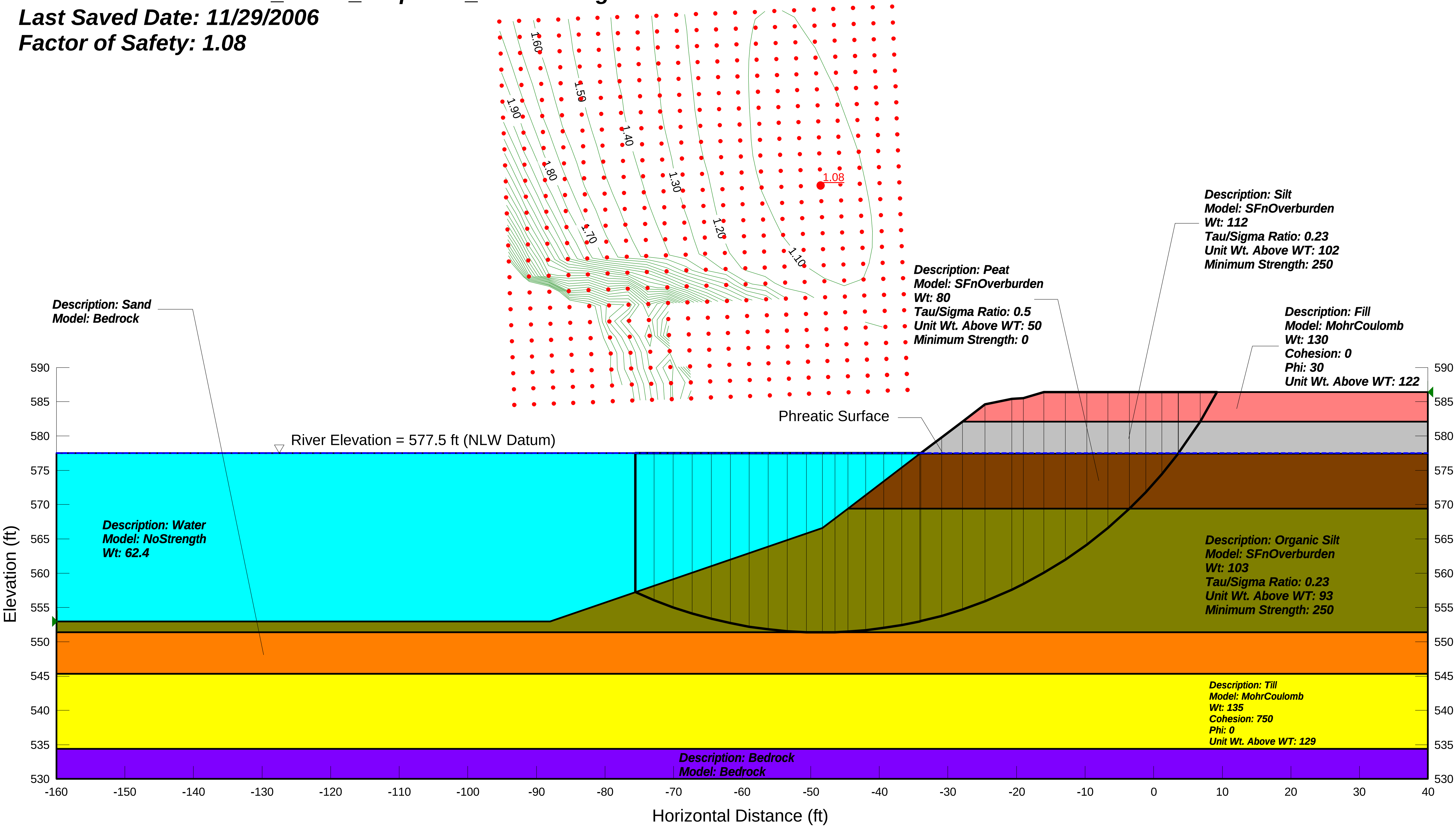
Kinnickinnic River Dredging Stability Analysis
Section 8, Proposed, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec8_Proposed_Undrained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 0.89



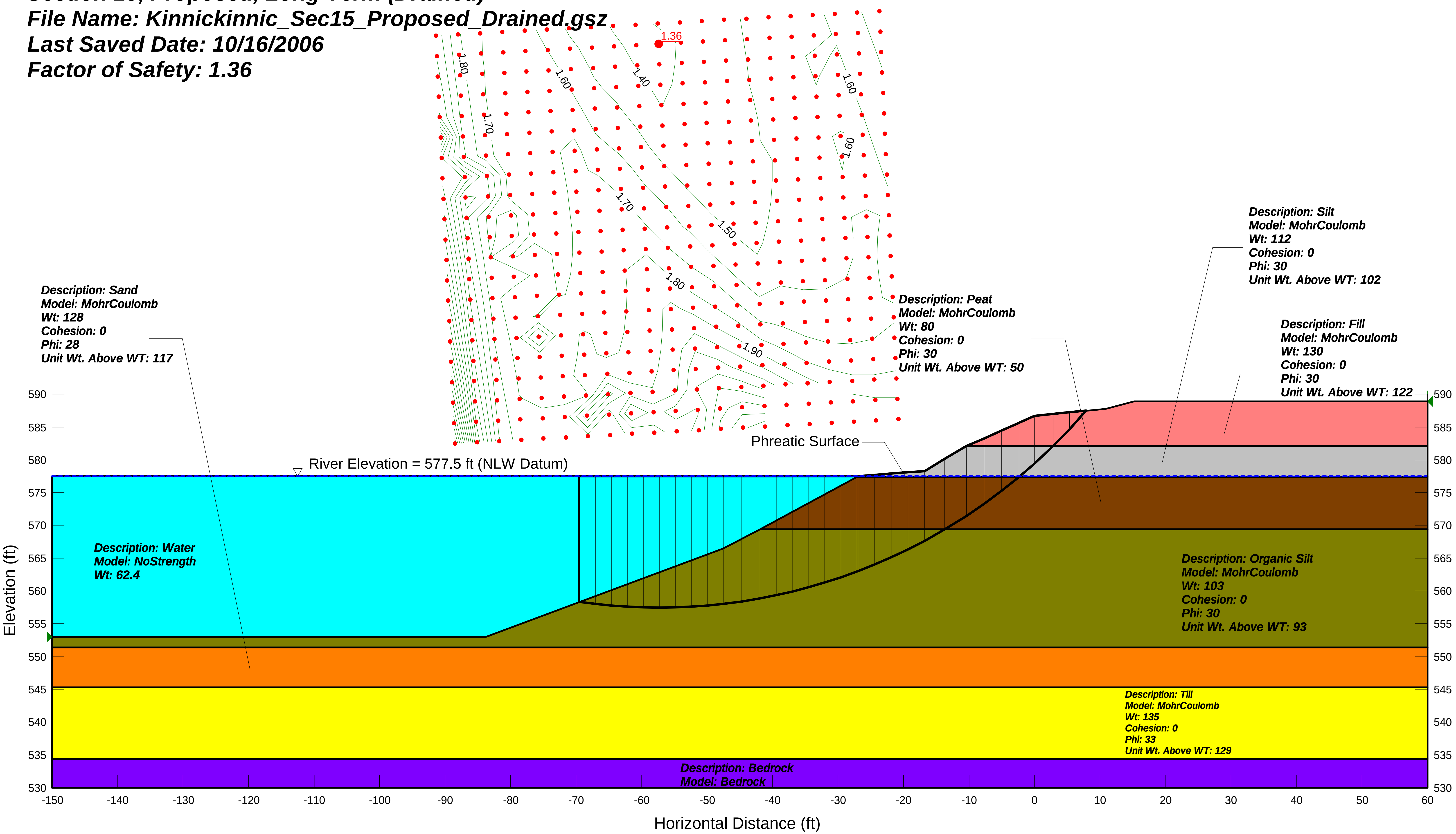
Kinnickinnic River Dredging Stability Analysis
Section 13, Proposed, Long-Term (Drained)
File Name: Kinnickinnic_Sec13_Proposed_Drained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 1.13

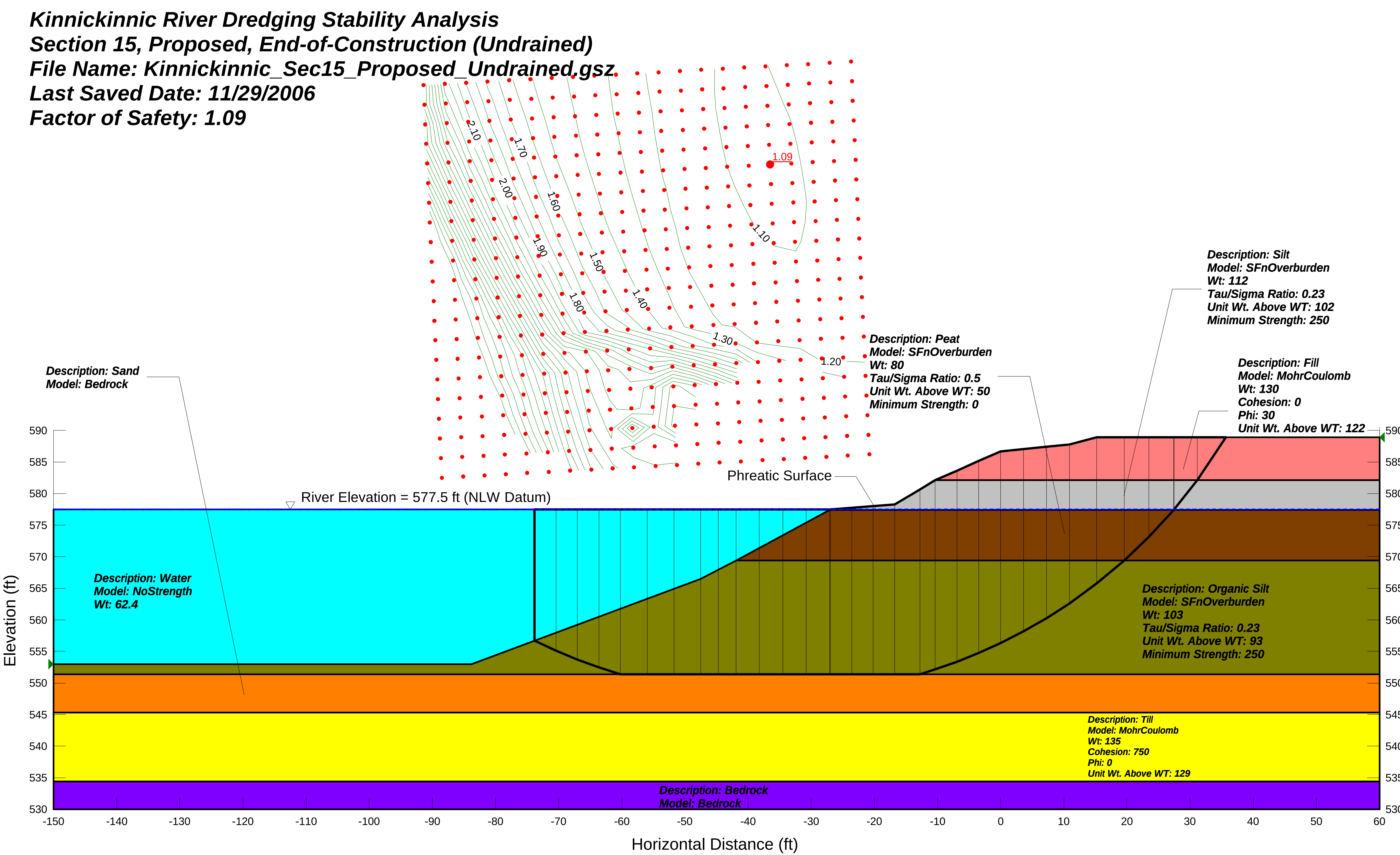


Kinnickinnic River Dredging Stability Analysis
Section 13, Proposed, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec13_Proposed_Undrained.gsz
Last Saved Date: 11/29/2006
Factor of Safety: 1.08

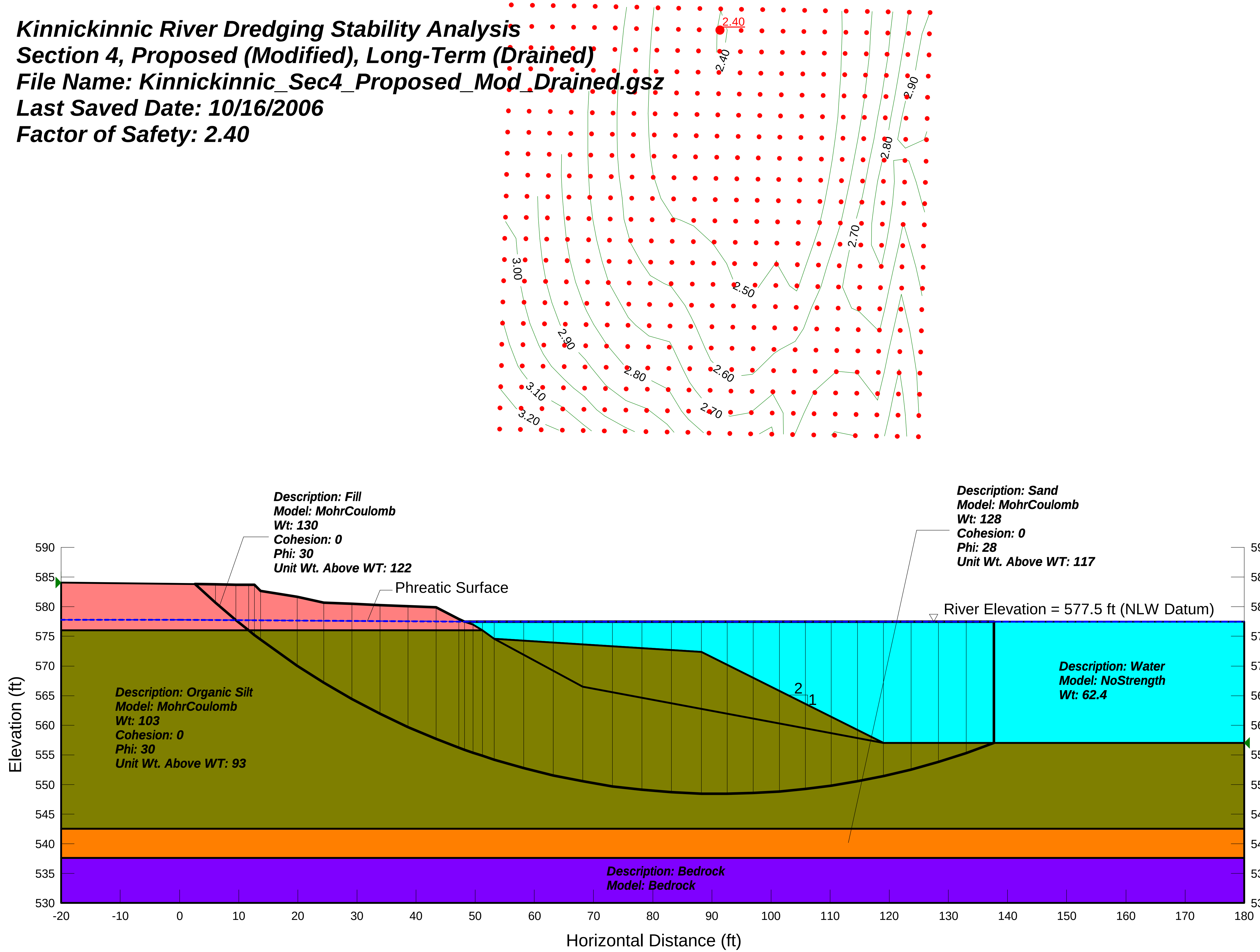


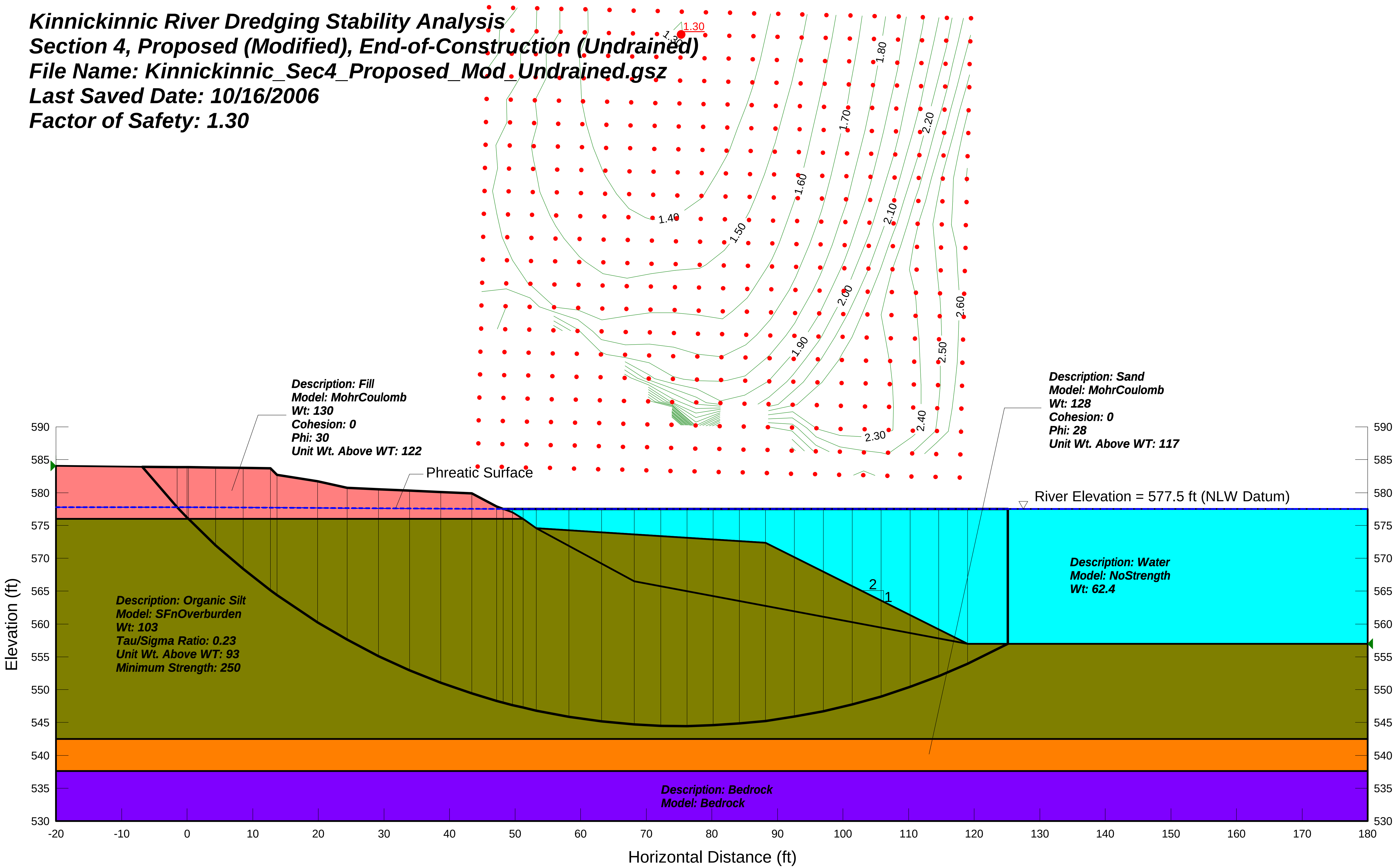
Kinnickinnic River Dredging Stability Analysis
Section 15, Proposed, Long-Term (Drained)
File Name: Kinnickinnic_Sec15_Proposed_Drained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 1.36

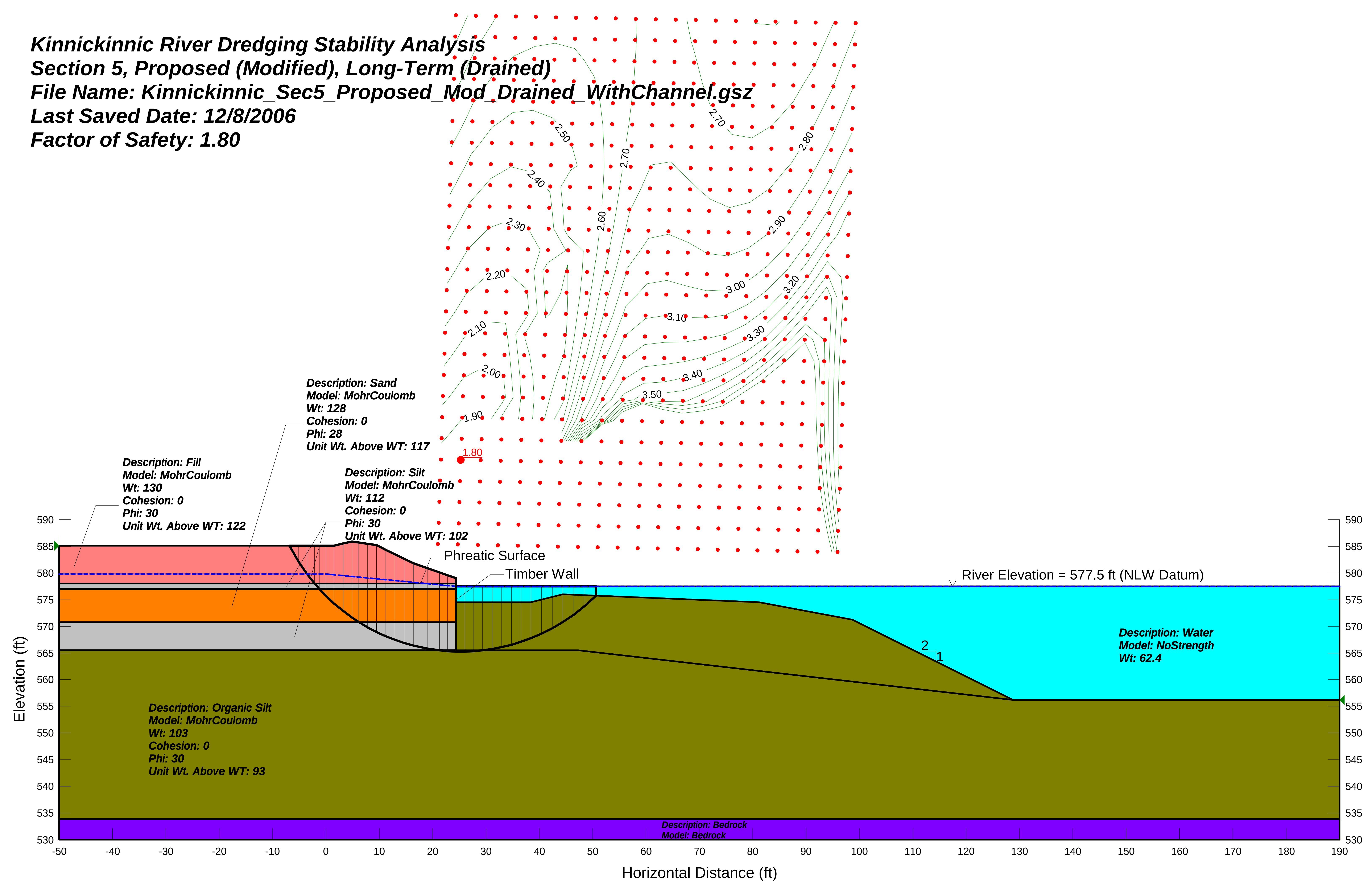



Kinnickinnic River Dredging Stability Analysis
Section 15, Proposed, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec15_Proposed_Undrained.gsz
Last Saved Date: 11/29/2006
Factor of Safety: 1.09
1.09
2.10
1.70
2.00
1.60
1.90
1.50
1.80
1.40
1.30
1.20
1.10
Description: Silt
Model: SFnOverburden
Wt: 112
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 102
Minimum Strength: 250
Description: Peat
Model: SFnOverburden
Wt: 80
Tau/Sigma Ratio: 0.5
Unit Wt. Above WT: 50
Minimum Strength: 0
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Description: Sand
Model: Bedrock
Phreatic Surface
River Elevation = 577.5 ft (NLW Datum)
Description: Water
Model: NoStrength
Wt: 62.4
Description: Organic Silt
Model: SFnOverburden
Wt: 103
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 93
Minimum Strength: 250
Description: Till
Model: MohrCoulomb
Wt: 135
Cohesion: 750
Phi: 0
Unit Wt. Above WT: 129
Description: Bedrock
Model: Bedrock
Elevation (ft)
590
585
580
575
570
565
560
555
550
545
540
535
530
-150
-140
-130
-120
-110
-100
-90
-80
-70
-60
-50
-40
-30
-20
-10
0
10
20
30
40
50
60
Horizontal Distance (ft)

Kinnickinnic River Dredging Stability Analysis
Section 4, Proposed (Modified), Long-Term (Drained)
File Name: Kinnickinnic_Sec4_Proposed_Mod_Drained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 2.40

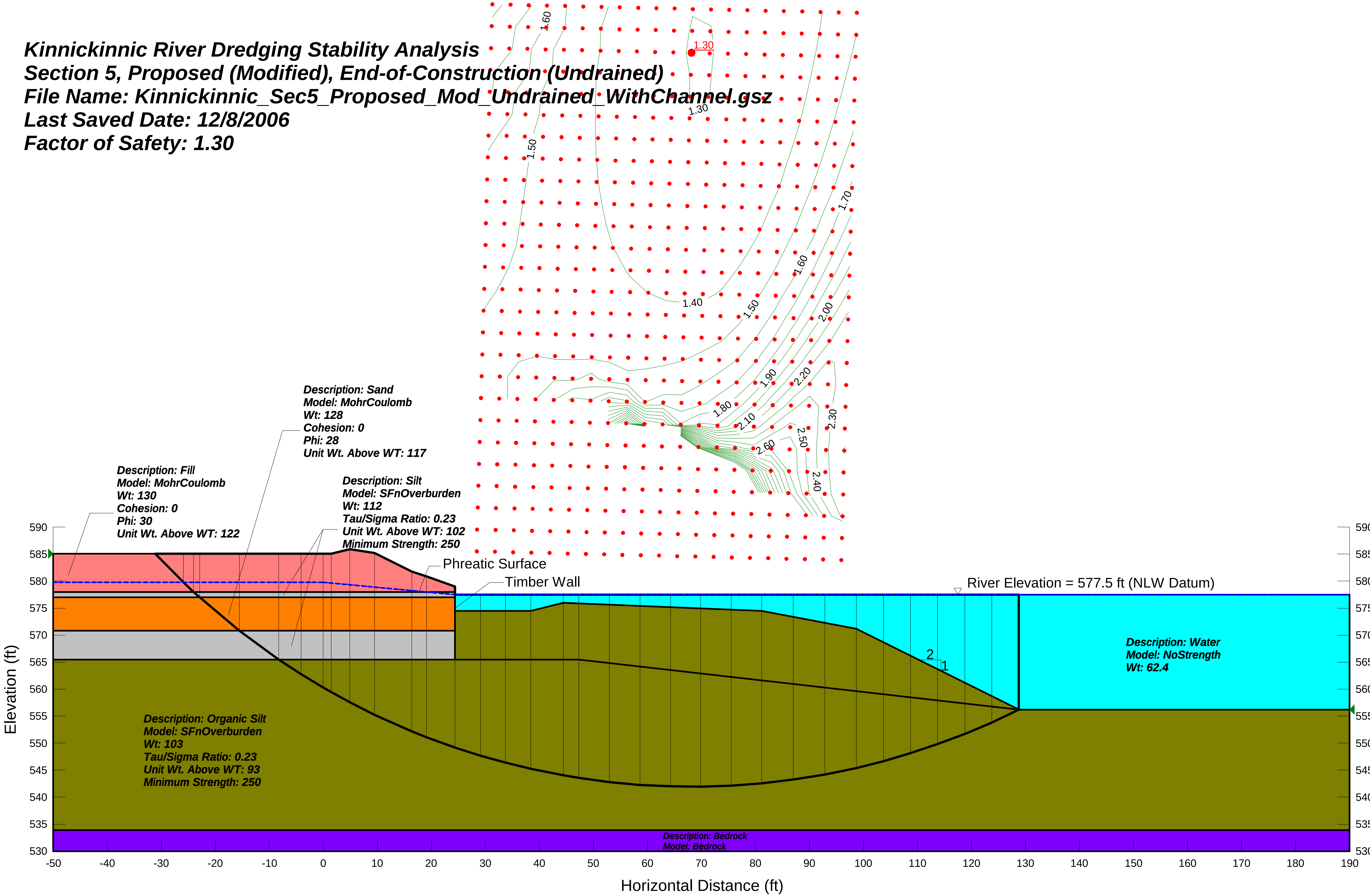



Kinnickinnic River Dredging Stability Analysis
Section 4, Proposed (Modified), End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec4_Proposed_Mod_Undrained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 1.30
1.30
1.40
1.50
1.60
1.70
1.80
1.90
2.00
2.10
2.20
2.30
2.40
2.50
2.60
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Phreatic Surface
Description: Sand
Model: MohrCoulomb
Wt: 128
Cohesion: 0
Phi: 28
Unit Wt. Above WT: 117
River Elevation = 577.5 ft (NLW Datum)
Description: Water
Model: NoStrength
Wt: 62.4
2
1
Description: Organic Silt
Model: SFnOverburden
Wt: 103
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 93
Minimum Strength: 250
Description: Bedrock
Model: Bedrock
Elevation (ft)
590
585
580
575
570
565
560
555
550
545
540
535
530
-20
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
Horizontal Distance (ft)

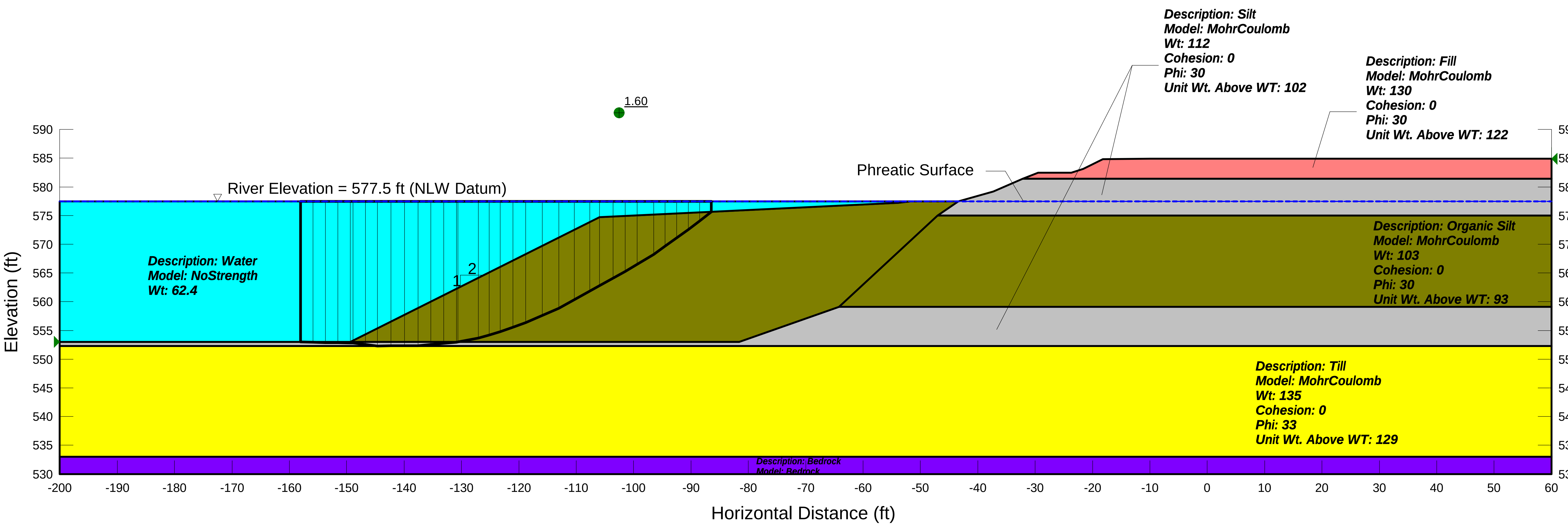


Kinnickinnic River Dredging Stability Analysis
Section 5, Proposed (Modified), Long-Term (Drained)
File Name: Kinnickinnic_Sec5_Proposed_Mod_Drained_WithChannel.gsz
Last Saved Date: 12/8/2006
Factor of Safety: 1.80
Description: Sand
Model: MohrCoulomb
Wt: 128
Cohesion: 0
Phi: 28
Unit Wt. Above WT: 117
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Description: Silt
Model: MohrCoulomb
Wt: 112
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 102
Phreatic Surface
Timber Wall
River Elevation = 577.5 ft (NLW Datum)
Description: Water
Model: NoStrength
Wt: 62.4
Description: Organic Silt
Model: MohrCoulomb
Wt: 103
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 93
Description: Bedrock
Model: Bedrock
1.80
1.90
2.00
2.10
2.20
2.30
2.40
2.50
2.60
2.70
2.80
2.90
3.00
3.10
3.20
3.30
3.40
3.50
2
1
Elevation (ft)
Horizontal Distance (ft)

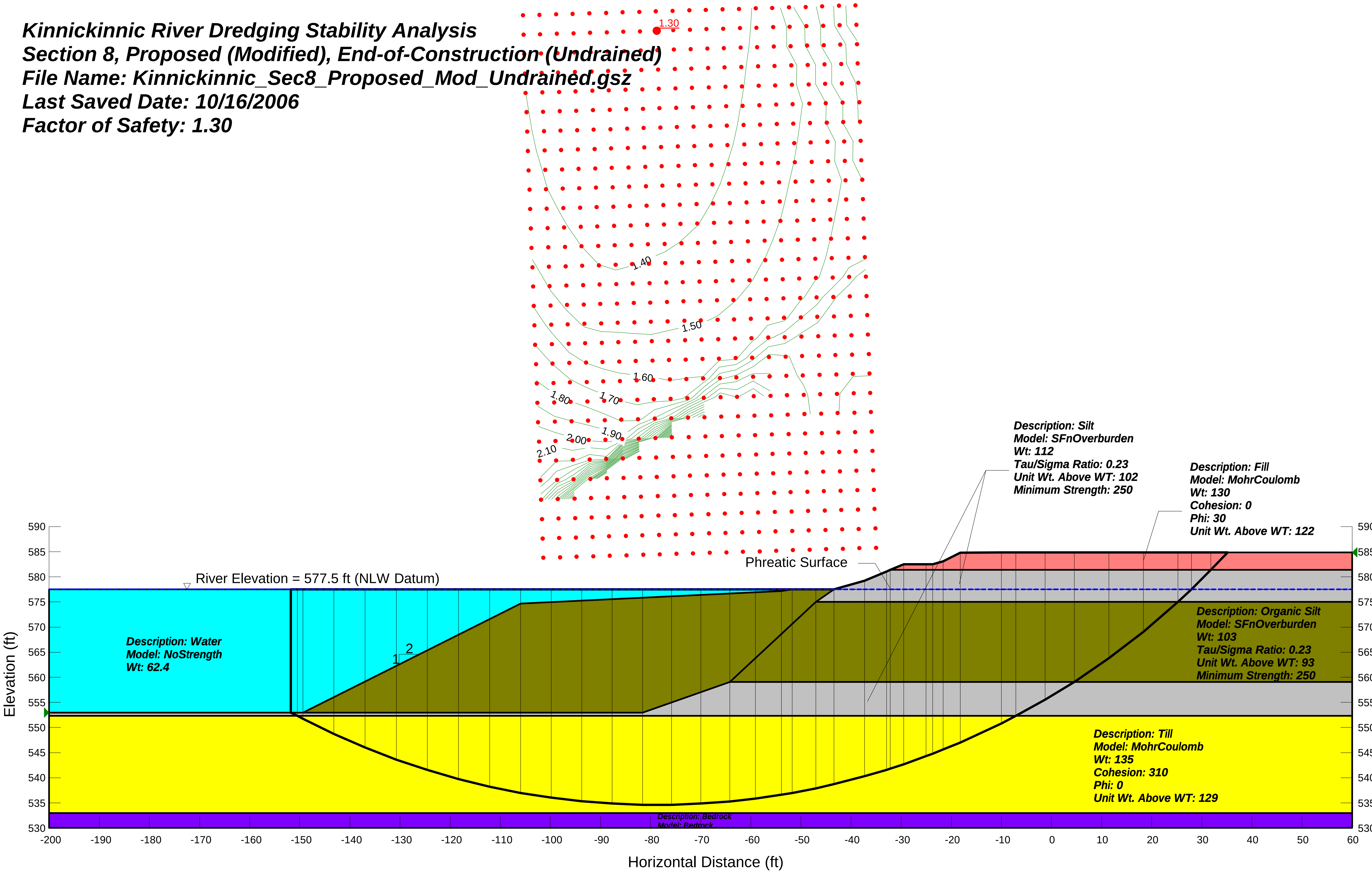
Kinnickinnic River Dredging Stability Analysis
Section 5, Proposed (Modified), End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec5_Proposed_Mod_Undrained_WithChannel.gsz
Last Saved Date: 12/8/2006
Factor of Safety: 1.30

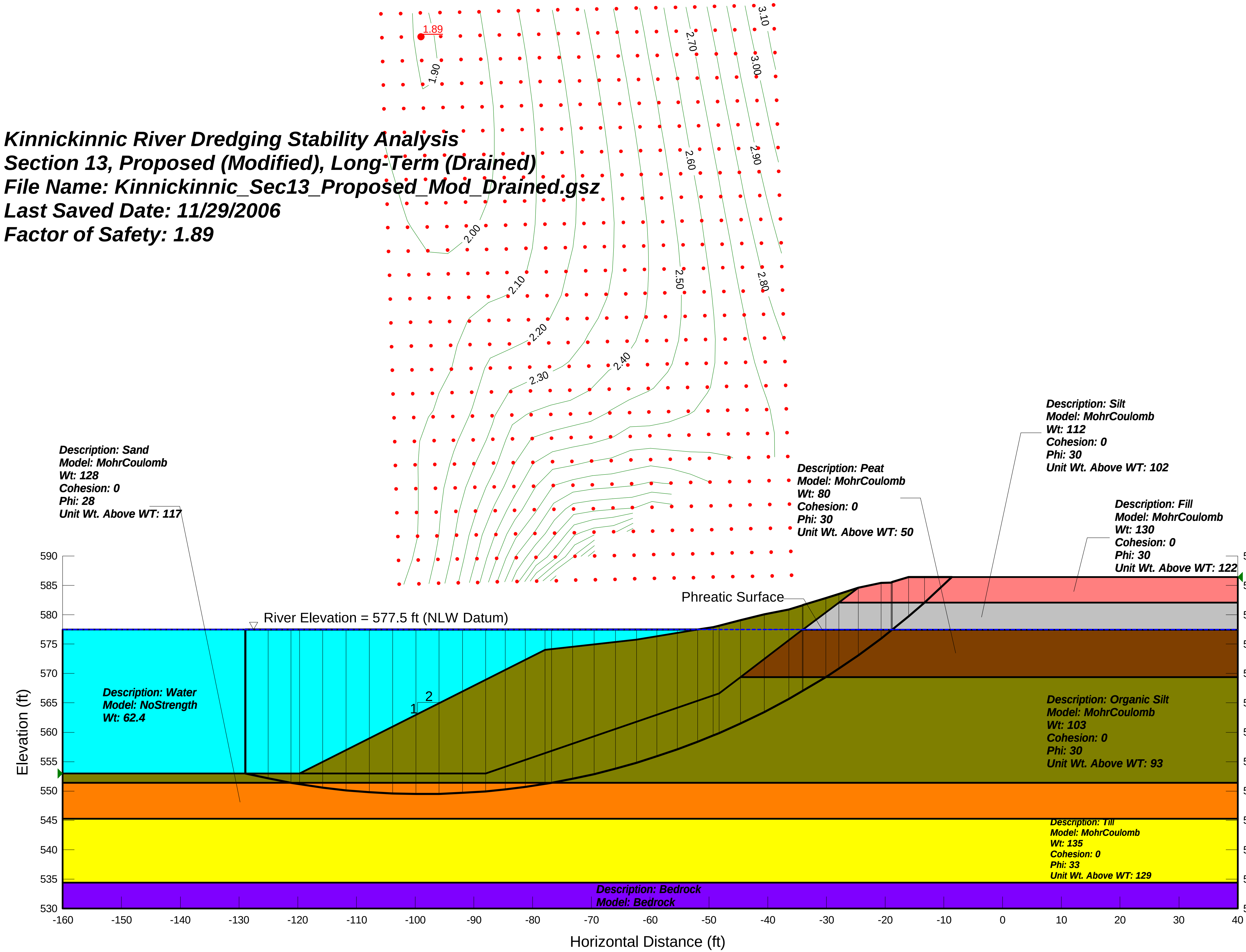


Kinnickinnic River Dredging Stability Analysis
Section 8, Proposed (Modified), Long-Term (Drained)
File Name: Kinnickinnic_Sec8_Proposed_Mod_Drained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 1.60

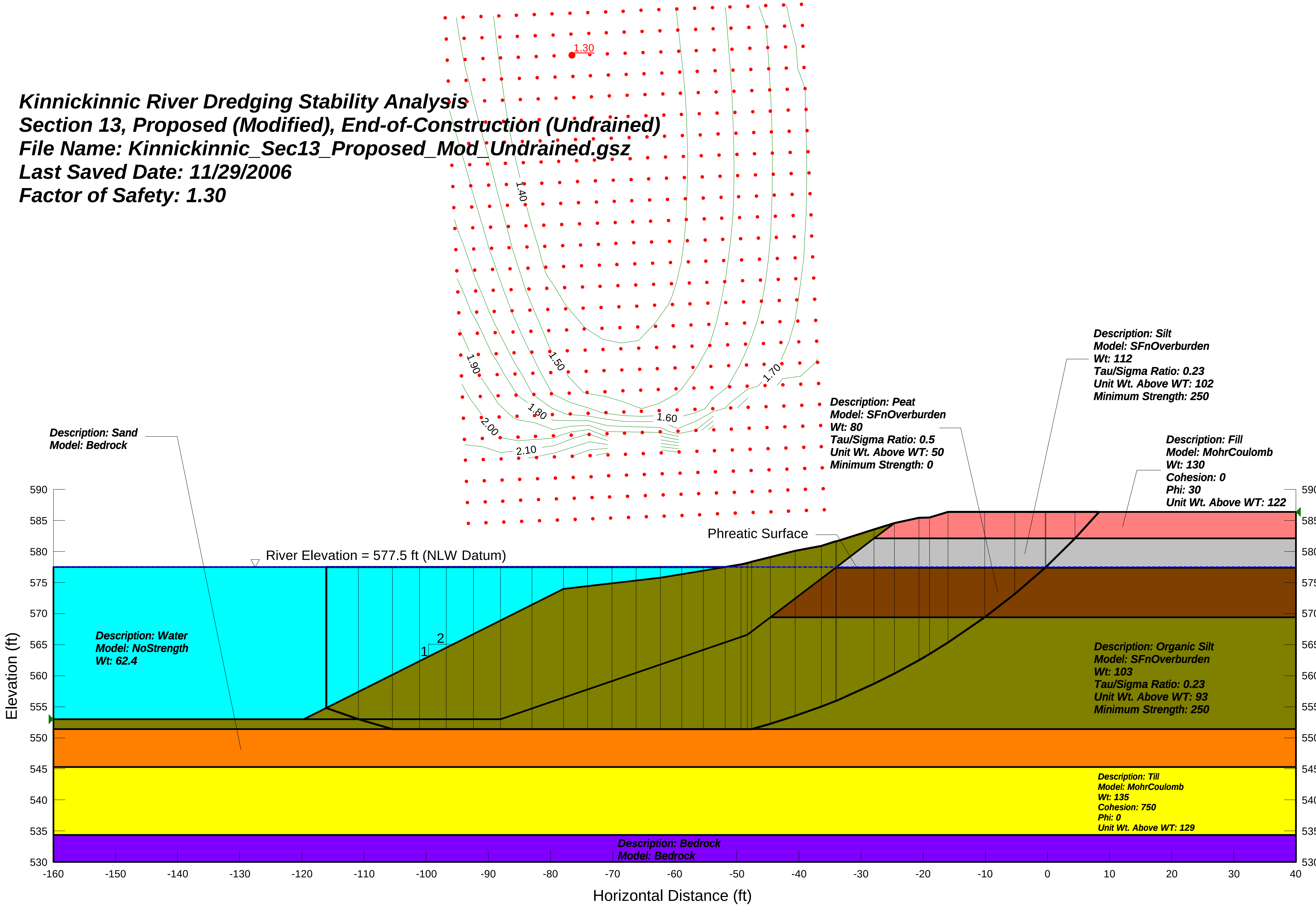


Kinnickinnic River Dredging Stability Analysis
Section 8, Proposed (Modified), End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec8_Proposed_Mod_Undrained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 1.30



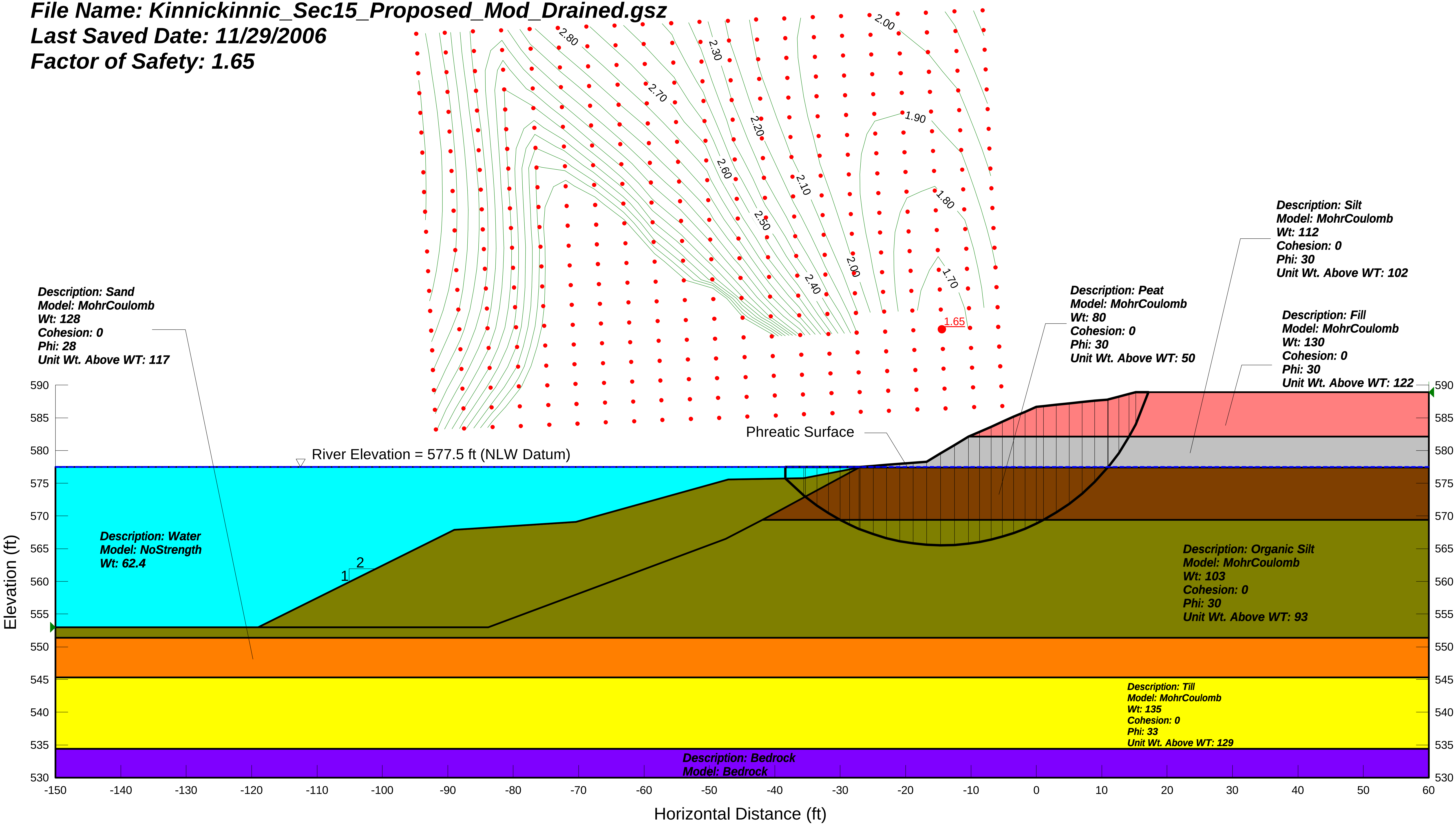


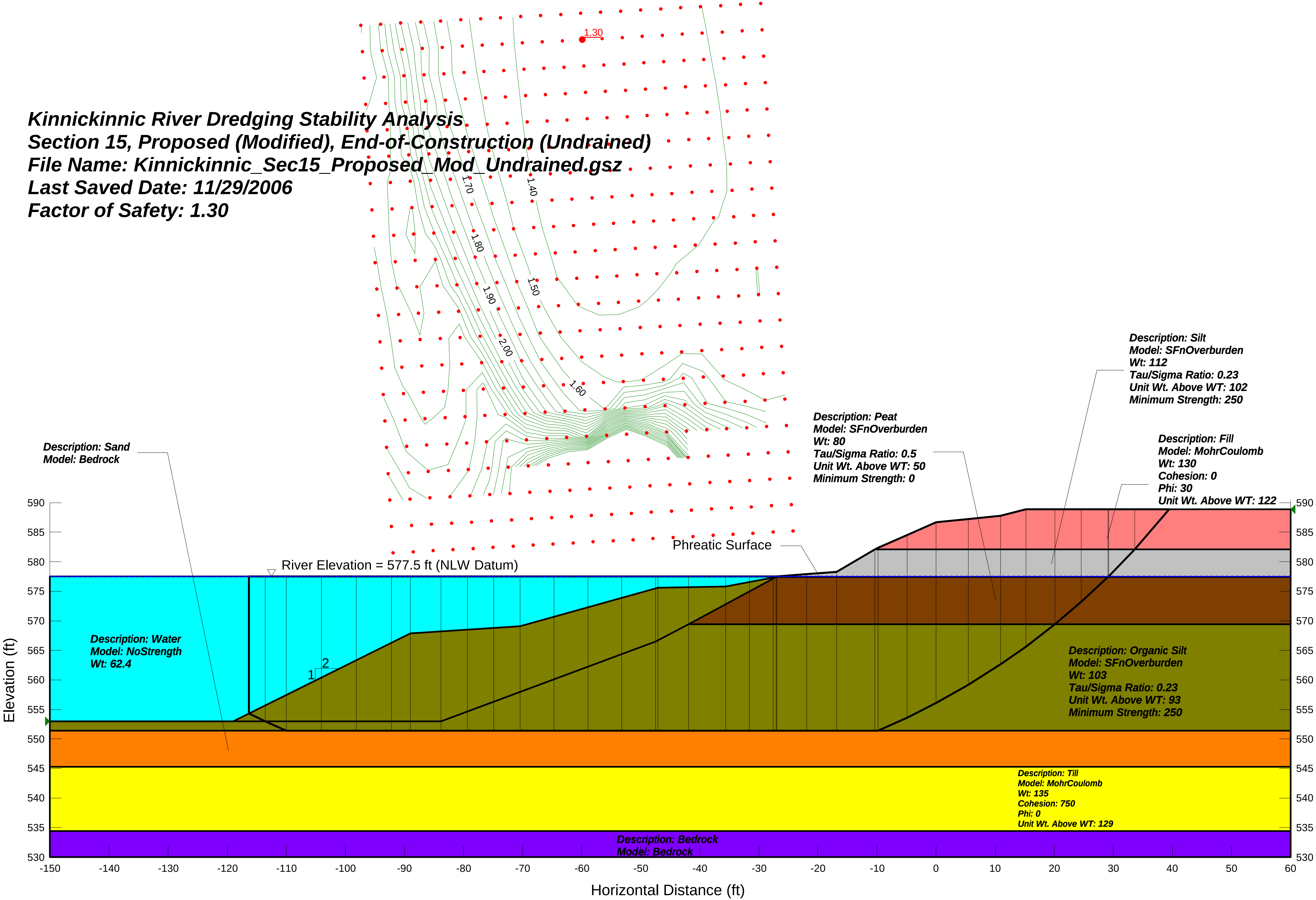
Kinnickinnic River Dredging Stability Analysis
Section 13, Proposed (Modified), Long-Term (Drained)
File Name: Kinnickinnic_Sec13_Proposed_Mod_Drained.gsz
Last Saved Date: 11/29/2006
Factor of Safety: 1.89
1.89
1.90
2.00
2.10
2.20
2.30
2.40
2.50
2.60
2.70
2.80
2.90
3.00
3.10
Description: Sand
Model: MohrCoulomb
Wt: 128
Cohesion: 0
Phi: 28
Unit Wt. Above WT: 117
Description: Peat
Model: MohrCoulomb
Wt: 80
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 50
Description: Silt
Model: MohrCoulomb
Wt: 112
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 102
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Phreatic Surface
River Elevation = 577.5 ft (NLW Datum)
Description: Water
Model: NoStrength
Wt: 62.4
2
1
Description: Organic Silt
Model: MohrCoulomb
Wt: 103
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 93
Description: Till
Model: MohrCoulomb
Wt: 135
Cohesion: 0
Phi: 33
Unit Wt. Above WT: 129
Description: Bedrock
Model: Bedrock
Elevation (ft)
Horizontal Distance (ft)



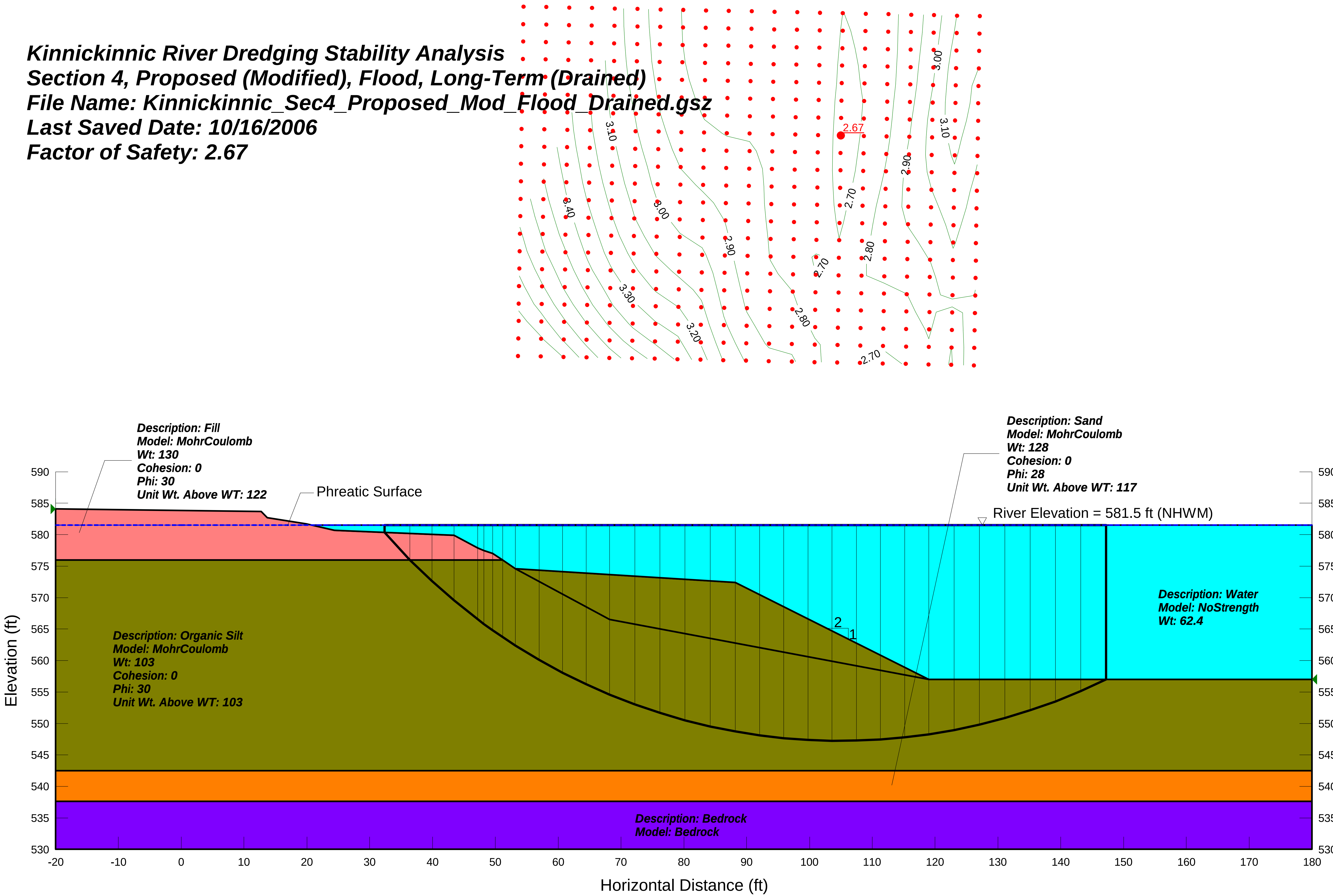
Kinnickinnic River Dredging Stability Analysis
Section 13, Proposed (Modified), End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec13_Proposed_Mod_Undrained.gsz
Last Saved Date: 11/29/2006
Factor of Safety: 1.30
1.30
1.40
1.50
1.60
1.70
1.80
1.90
2.00
2.10
Description: Sand
Model: Bedrock
Description: Peat
Model: SFnOverburden
Wt: 80
Tau/Sigma Ratio: 0.5
Unit Wt. Above WT: 50
Minimum Strength: 0
Description: Silt
Model: SFnOverburden
Wt: 112
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 102
Minimum Strength: 250
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Phreatic Surface
River Elevation = 577.5 ft (NLW Datum)
Description: Water
Model: NoStrength
Wt: 62.4
2
1
Description: Organic Silt
Model: SFnOverburden
Wt: 103
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 93
Minimum Strength: 250
Description: Till
Model: MohrCoulomb
Wt: 135
Cohesion: 750
Phi: 0
Unit Wt. Above WT: 129
Description: Bedrock
Model: Bedrock
Elevation (ft)
Horizontal Distance (ft)
590
585
580
575
570
565
560
555
550
545
540
535
530
-160
-150
-140
-130
-120
-110
-100
-90
-80
-70
-60
-50
-40
-30
-20
-10
0
10
20
30
40

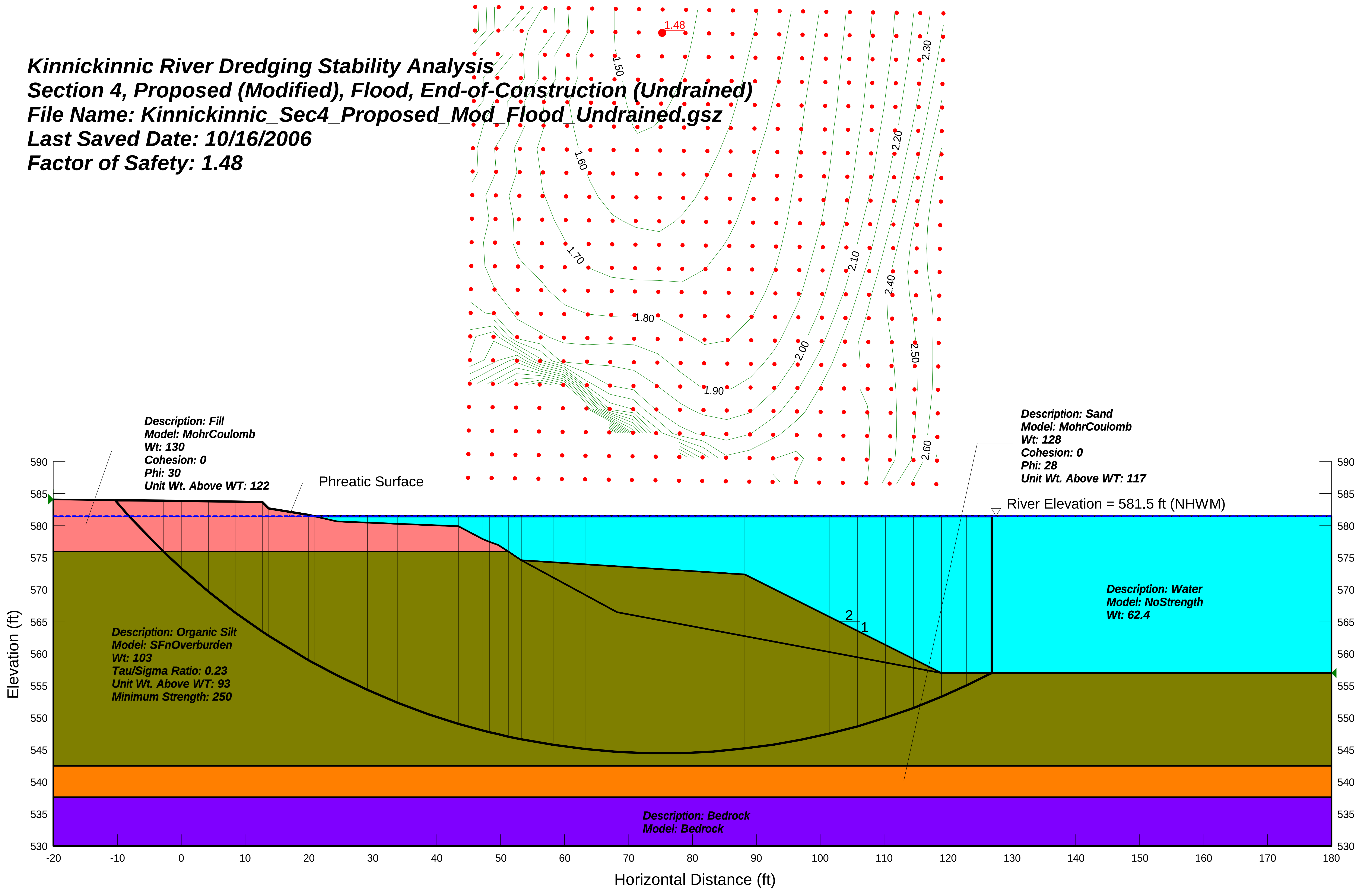
Kinnickinnic River Dredging Stability Analysis
Section 15, Proposed (Modified), Long-Term (Drained)
File Name: Kinnickinnic_Sec15_Proposed_Mod_Drained.gsz
Last Saved Date: 11/29/2006
Factor of Safety: 1.65



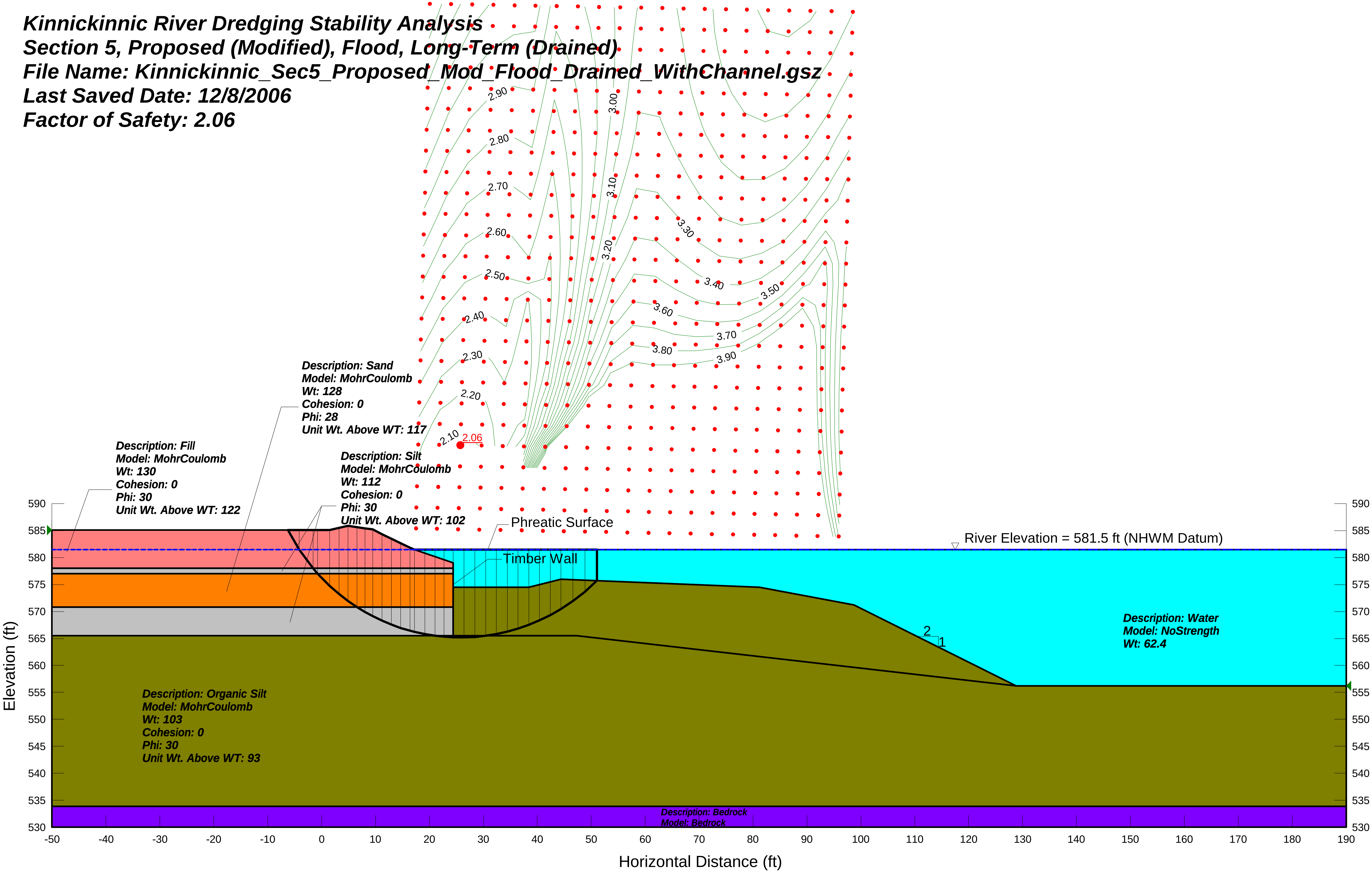

Kinnickinnic River Dredging Stability Analysis
Section 15, Proposed (Modified), End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec15_Proposed_Mod_Undrained.gsz
Last Saved Date: 11/29/2006
Factor of Safety: 1.30
1.30
1.40
1.50
1.60
1.70
1.80
1.90
2.00
Description: Silt
Model: SFnOverburden
Wt: 112
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 102
Minimum Strength: 250
Description: Peat
Model: SFnOverburden
Wt: 80
Tau/Sigma Ratio: 0.5
Unit Wt. Above WT: 50
Minimum Strength: 0
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Description: Sand
Model: Bedrock
Phreatic Surface
River Elevation = 577.5 ft (NLW Datum)
Description: Water
Model: NoStrength
Wt: 62.4
Description: Organic Silt
Model: SFnOverburden
Wt: 103
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 93
Minimum Strength: 250
Description: Till
Model: MohrCoulomb
Wt: 135
Cohesion: 750
Phi: 0
Unit Wt. Above WT: 129
Description: Bedrock
Model: Bedrock
Elevation (ft)
Horizontal Distance (ft)

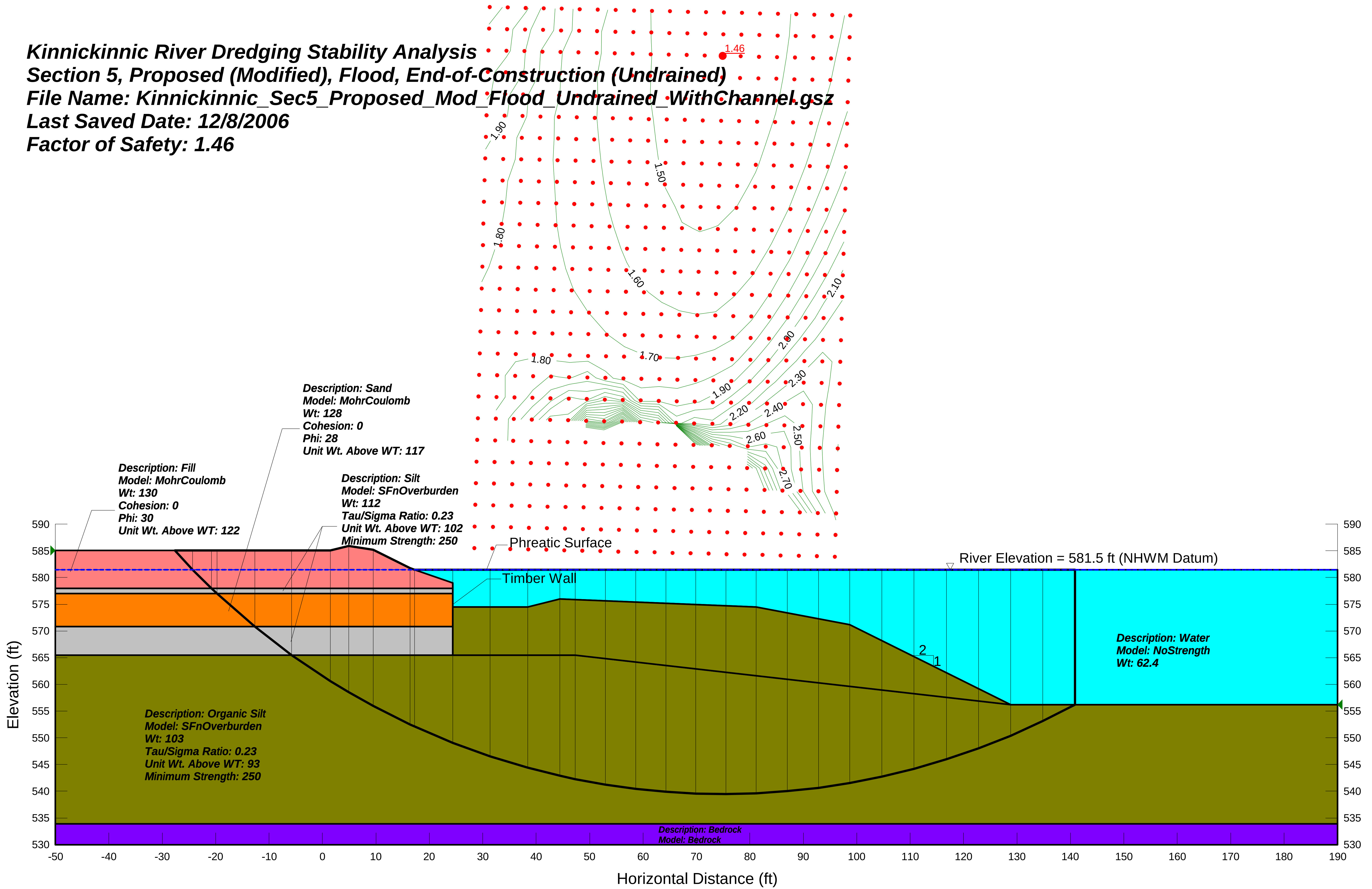
Kinnickinnic River Dredging Stability Analysis
Section 4, Proposed (Modified), Flood, Long-Term (Drained)
File Name: Kinnickinnic_Sec4_Proposed_Mod_Flood_Drained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 2.67



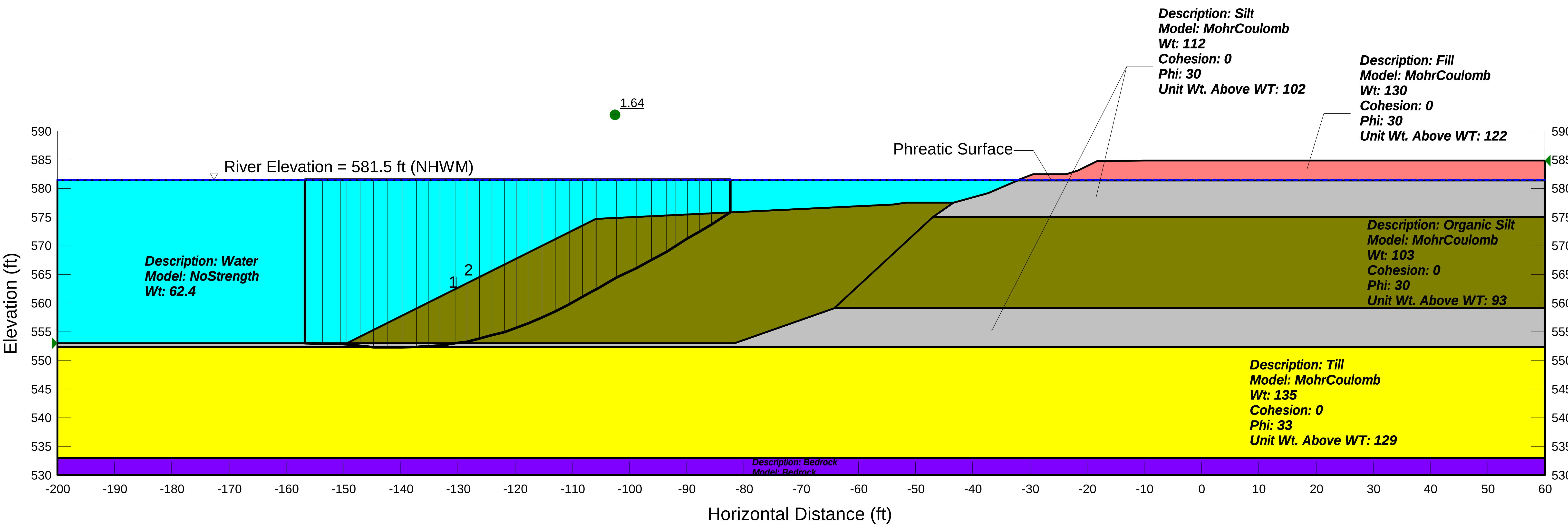


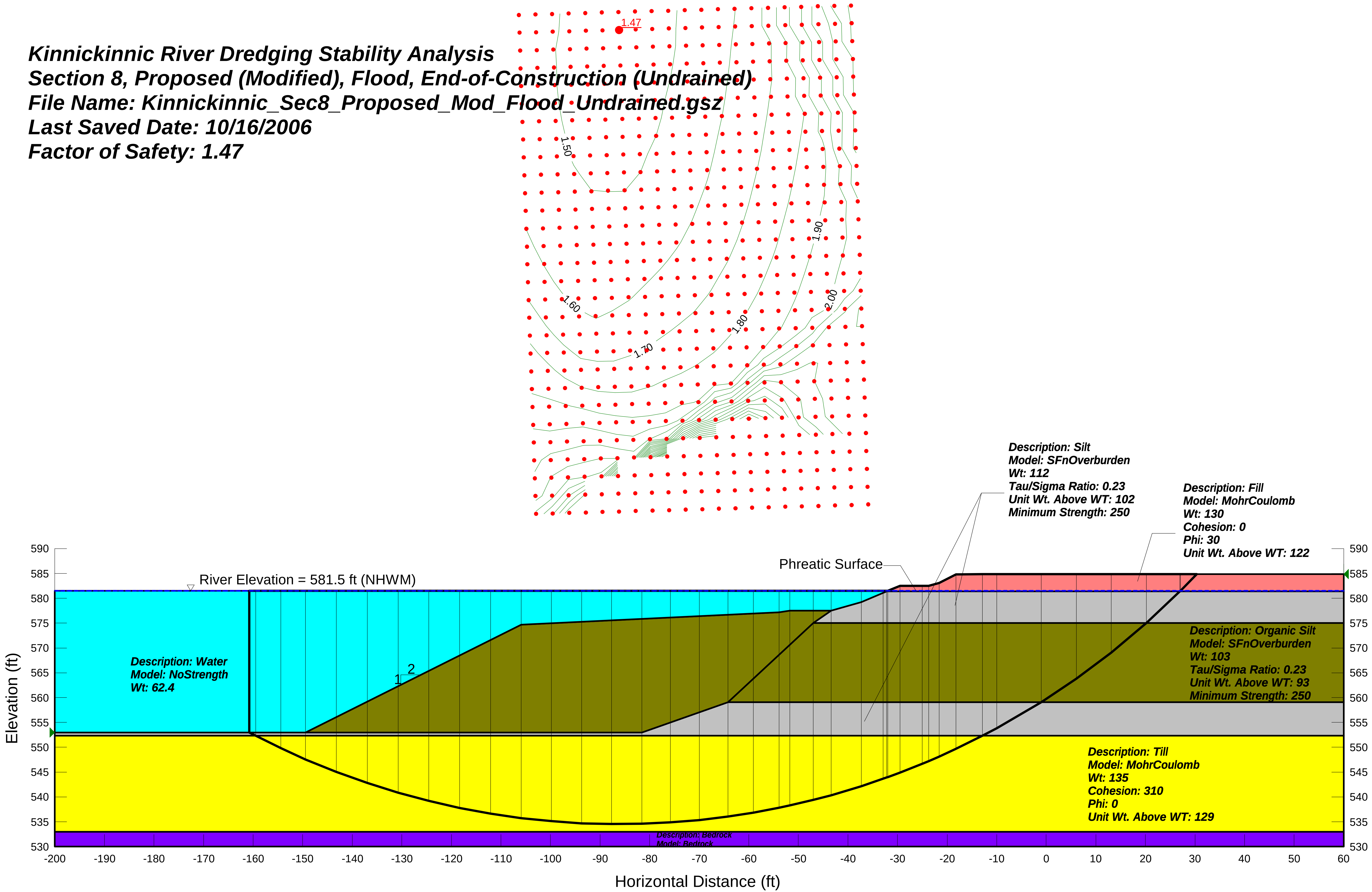
Kinnickinnic River Dredging Stability Analysis
Section 4, Proposed (Modified), Flood, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec4_Proposed_Mod_Flood_Undrained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 1.48
1.48
1.50
1.60
1.70
1.80
1.90
2.00
2.10
2.20
2.30
2.40
2.50
2.60
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Phreatic Surface
Description: Sand
Model: MohrCoulomb
Wt: 128
Cohesion: 0
Phi: 28
Unit Wt. Above WT: 117
River Elevation = 581.5 ft (NHWM)
Description: Water
Model: NoStrength
Wt: 62.4
2
1
Description: Organic Silt
Model: SFnOverburden
Wt: 103
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 93
Minimum Strength: 250
Description: Bedrock
Model: Bedrock
Elevation (ft)
590
585
580
575
570
565
560
555
550
545
540
535
530
-20
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
Horizontal Distance (ft)

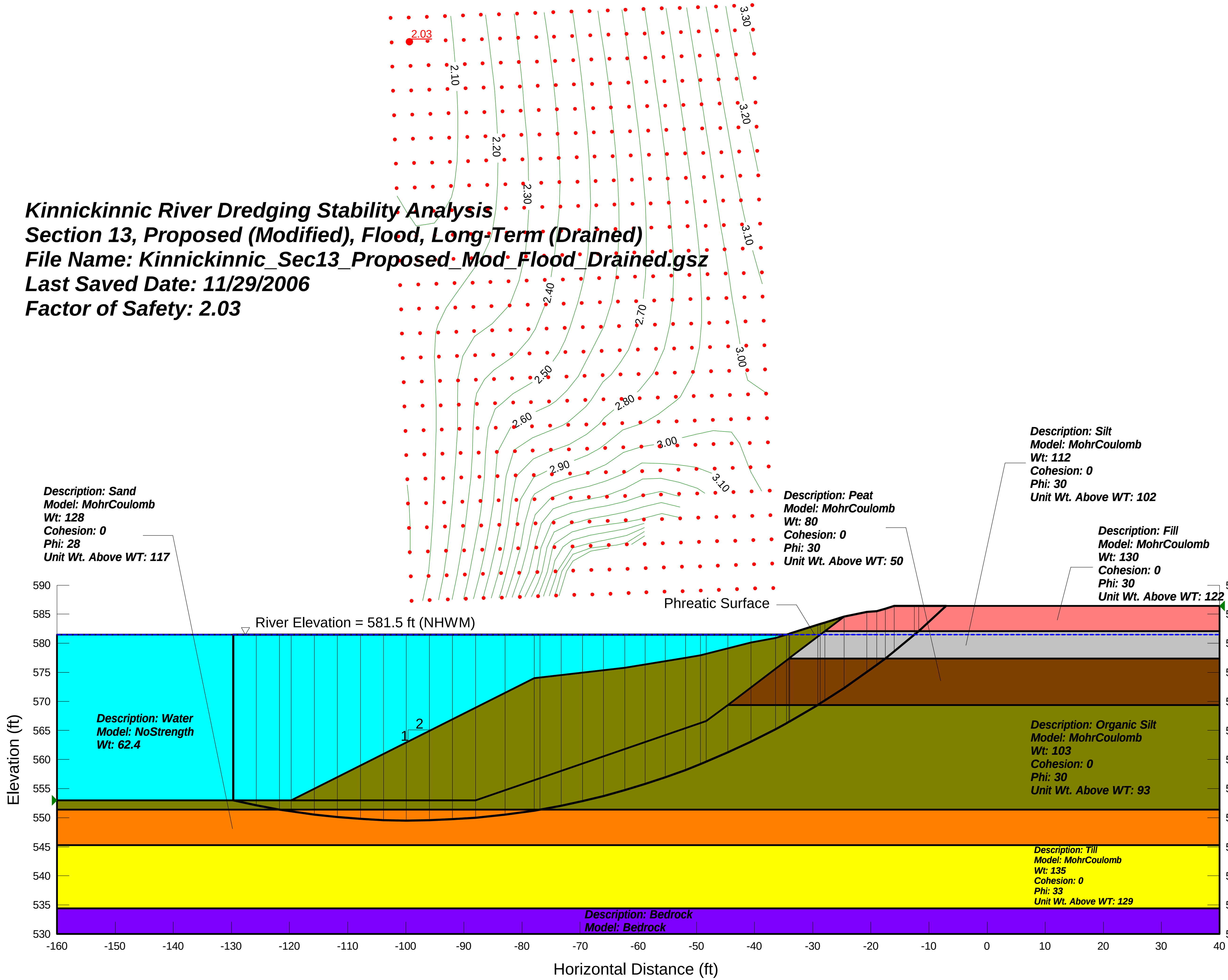

Kinnickinnic River Dredging Stability Analysis
Section 5, Proposed (Modified), Flood, Long-Term (Drained)
File Name: Kinnickinnic_Sec5_Proposed_Mod_Flood_Drained_WithChannel.gsz
Last Saved Date: 12/8/2006
Factor of Safety: 2.06
Description: Sand
Model: MohrCoulomb
Wt: 128
Cohesion: 0
Phi: 28
Unit Wt. Above WT: 117
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Description: Silt
Model: MohrCoulomb
Wt: 112
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 102
Phreatic Surface
River Elevation = 581.5 ft (NHWM Datum)
Timber Wall
Description: Water
Model: NoStrength
Wt: 62.4
Description: Organic Silt
Model: MohrCoulomb
Wt: 103
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 93
Description: Bedrock
Model: Bedrock
Elevation (ft)
Horizontal Distance (ft)


Kinnickinnic River Dredging Stability Analysis
Section 5, Proposed (Modified), Flood, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec5_Proposed_Mod_Flood_Undrained_WithChannel.gsz
Last Saved Date: 12/8/2006
Factor of Safety: 1.46
1.46
Description: Sand
Model: MohrCoulomb
Wt: 128
Cohesion: 0
Phi: 28
Unit Wt. Above WT: 117
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Description: Silt
Model: SFnOverburden
Wt: 112
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 102
Minimum Strength: 250
Phreatic Surface
River Elevation = 581.5 ft (NHWM Datum)
Timber Wall
Description: Water
Model: NoStrength
Wt: 62.4
Description: Organic Silt
Model: SFnOverburden
Wt: 103
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 93
Minimum Strength: 250
Description: Bedrock
Model: Bedrock
Elevation (ft)
Horizontal Distance (ft)

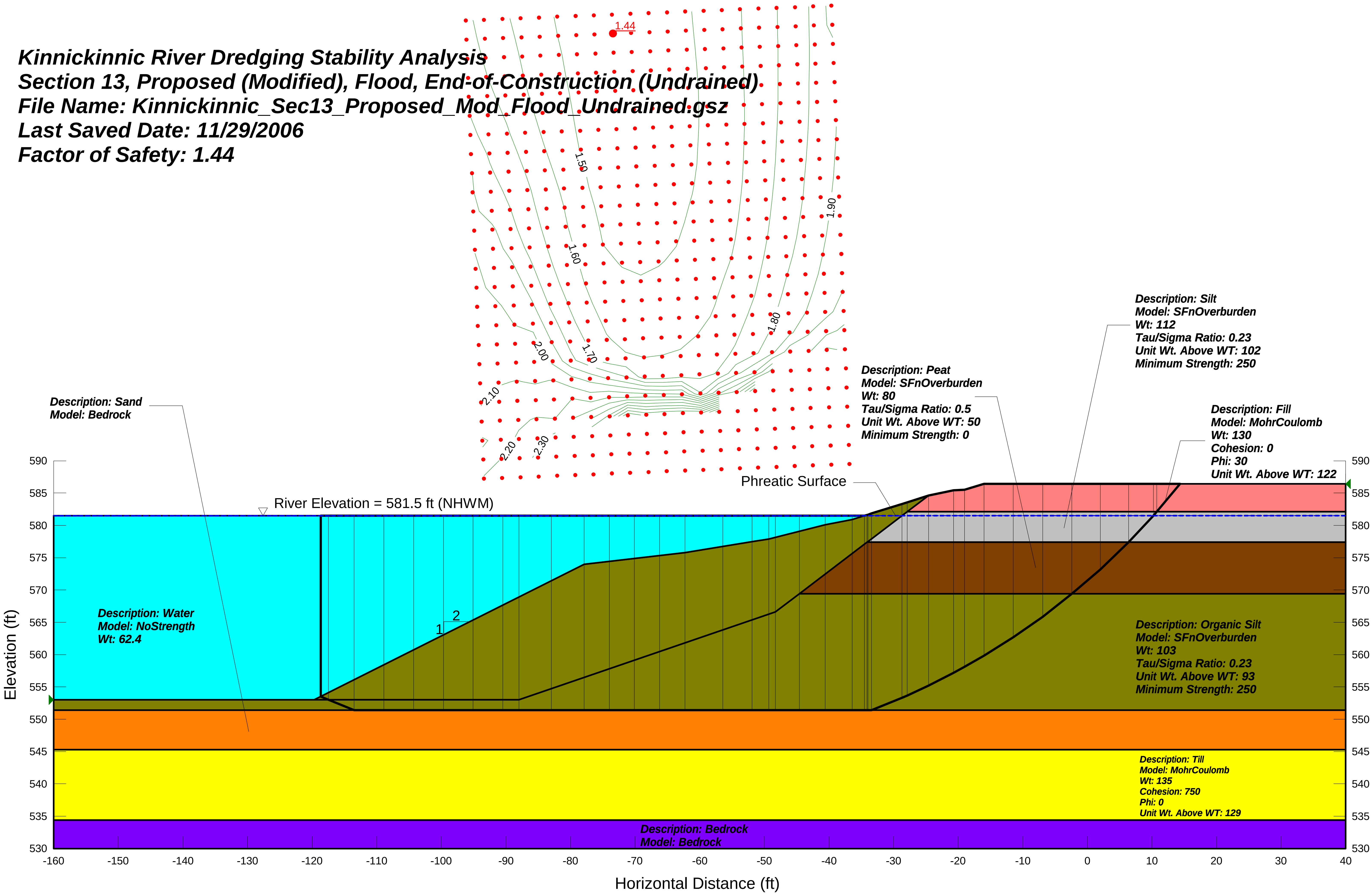
Kinnickinnic River Dredging Stability Analysis
Section 8, Proposed (Modified), Flood, Long-Term (Drained)
File Name: Kinnickinnic_Sec8_Proposed_Mod_Flood_Drained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 1.64



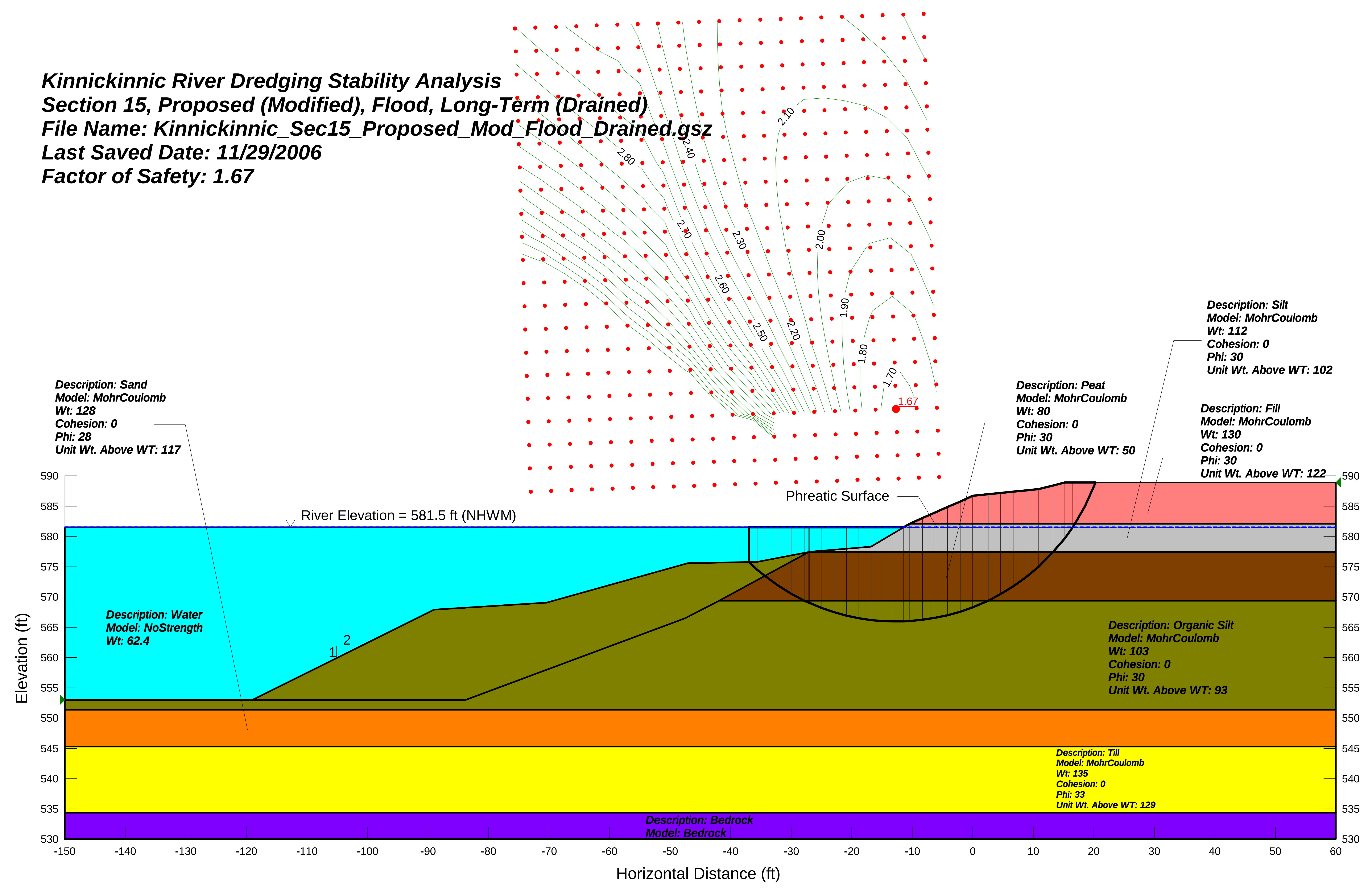

Kinnickinnic River Dredging Stability Analysis
Section 8, Proposed (Modified), Flood, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec8_Proposed_Mod_Flood_Undrained.gsz
Last Saved Date: 10/16/2006
Factor of Safety: 1.47
1.47
1.50
1.60
1.70
1.80
1.90
2.00
Description: Silt
Model: SFnOverburden
Wt: 112
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 102
Minimum Strength: 250
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Phreatic Surface
River Elevation = 581.5 ft (NHWM)
Description: Water
Model: NoStrength
Wt: 62.4
2
1
Description: Organic Silt
Model: SFnOverburden
Wt: 103
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 93
Minimum Strength: 250
Description: Till
Model: MohrCoulomb
Wt: 135
Cohesion: 310
Phi: 0
Unit Wt. Above WT: 129
Description: Bedrock
Model: Bedrock
Elevation (ft)
Horizontal Distance (ft)
590
585
580
575
570
565
560
555
550
545
540
535
530
-200
-190
-180
-170
-160
-150
-140
-130
-120
-110
-100
-90
-80
-70
-60
-50
-40
-30
-20
-10
0
10
20
30
40
50
60



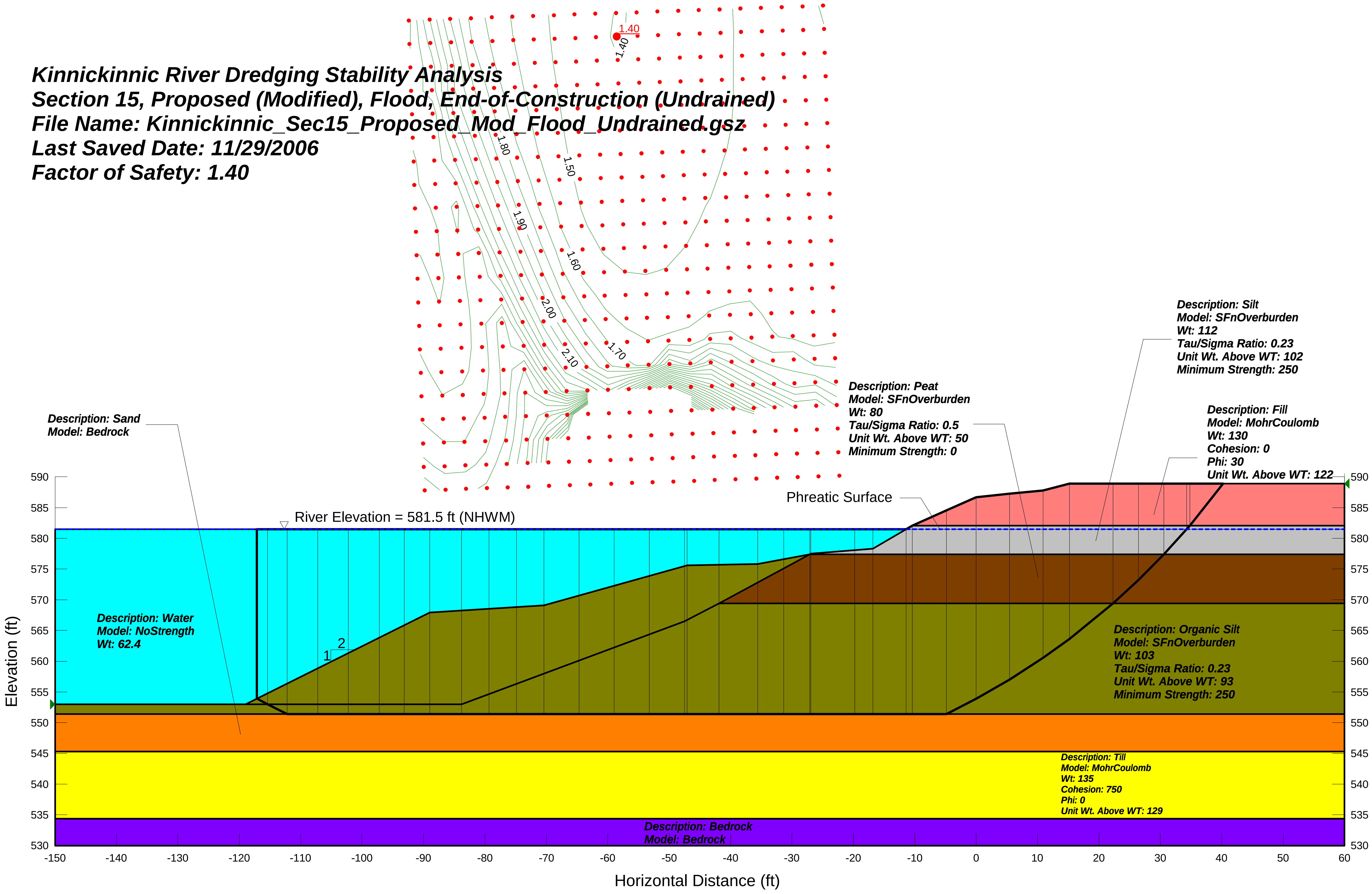
Kinnickinnic River Dredging Stability Analysis
Section 13, Proposed (Modified), Flood, Long-Term (Drained)
File Name: Kinnickinnic_Sec13_Proposed_Mod_Flood_Drained.gsz
Last Saved Date: 11/29/2006
Factor of Safety: 2.03
2.03
2.10
2.20
2.30
2.40
2.50
2.60
2.70
2.80
2.90
3.00
3.10
3.20
3.30
Description: Sand
Model: MohrCoulomb
Wt: 128
Cohesion: 0
Phi: 28
Unit Wt. Above WT: 117
Description: Peat
Model: MohrCoulomb
Wt: 80
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 50
Description: Silt
Model: MohrCoulomb
Wt: 112
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 102
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Phreatic Surface
River Elevation = 581.5 ft (NHWM)
Description: Water
Model: NoStrength
Wt: 62.4
1
2
Description: Organic Silt
Model: MohrCoulomb
Wt: 103
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 93
Description: Till
Model: MohrCoulomb
Wt: 135
Cohesion: 0
Phi: 33
Unit Wt. Above WT: 129
Description: Bedrock
Model: Bedrock
Elevation (ft)
590
585
580
575
570
565
560
555
550
545
540
535
530
Horizontal Distance (ft)
-160
-150
-140
-130
-120
-110
-100
-90
-80
-70
-60
-50
-40
-30
-20
-10
0
10
20
30
40



Kinnickinnic River Dredging Stability Analysis
Section 13, Proposed (Modified), Flood, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec13_Proposed_Mod_Flood_Undrained.gsz
Last Saved Date: 11/29/2006
Factor of Safety: 1.44
1.44
1.50
1.60
1.70
1.80
1.90
2.00
2.10
2.20
2.30
Description: Sand
Model: Bedrock
River Elevation = 581.5 ft (NHWM)
Phreatic Surface
Description: Peat
Model: SFnOverburden
Wt: 80
Tau/Sigma Ratio: 0.5
Unit Wt. Above WT: 50
Minimum Strength: 0
Description: Silt
Model: SFnOverburden
Wt: 112
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 102
Minimum Strength: 250
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Description: Water
Model: NoStrength
Wt: 62.4
2
1
Description: Organic Silt
Model: SFnOverburden
Wt: 103
Tau/Sigma Ratio: 0.23
Unit Wt. Above WT: 93
Minimum Strength: 250
Description: Till
Model: MohrCoulomb
Wt: 135
Cohesion: 750
Phi: 0
Unit Wt. Above WT: 129
Description: Bedrock
Model: Bedrock
Elevation (ft)
590
585
580
575
570
565
560
555
550
545
540
535
530
-160
-150
-140
-130
-120
-110
-100
-90
-80
-70
-60
-50
-40
-30
-20
-10
0
10
20
30
40
Horizontal Distance (ft)


Kinnickinnic River Dredging Stability Analysis
Section 15, Proposed (Modified), Flood, Long-Term (Drained)
File Name: Kinnickinnic_Sec15_Proposed_Mod_Flood_Drained.gsz
Last Saved Date: 11/29/2006
Factor of Safety: 1.67
2.10
2.80
2.40
2.70
2.30
2.00
2.60
1.90
2.50
2.20
1.80
1.70
1.67
Description: Sand
Model: MohrCoulomb
Wt: 128
Cohesion: 0
Phi: 28
Unit Wt. Above WT: 117
Description: Peat
Model: MohrCoulomb
Wt: 80
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 50
Description: Silt
Model: MohrCoulomb
Wt: 112
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 102
Description: Fill
Model: MohrCoulomb
Wt: 130
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 122
Phreatic Surface
River Elevation = 581.5 ft (NHWM)
Description: Water
Model: NoStrength
Wt: 62.4
2
1
Description: Organic Silt
Model: MohrCoulomb
Wt: 103
Cohesion: 0
Phi: 30
Unit Wt. Above WT: 93
Description: Till
Model: MohrCoulomb
Wt: 135
Cohesion: 0
Phi: 33
Unit Wt. Above WT: 129
Description: Bedrock
Model: Bedrock
Elevation (ft)
590
585
580
575
570
565
560
555
550
545
540
535
530
-150
-140
-130
-120
-110
-100
-90
-80
-70
-60
-50
-40
-30
-20
-10
0
10
20
30
40
50
60
Horizontal Distance (ft)

Kinnickinnic River Dredging Stability Analysis
Section 15, Proposed (Modified), Flood, End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec15_Proposed_Mod_Flood_Undrained.gsz
Last Saved Date: 11/29/2006
Factor of Safety: 1.40

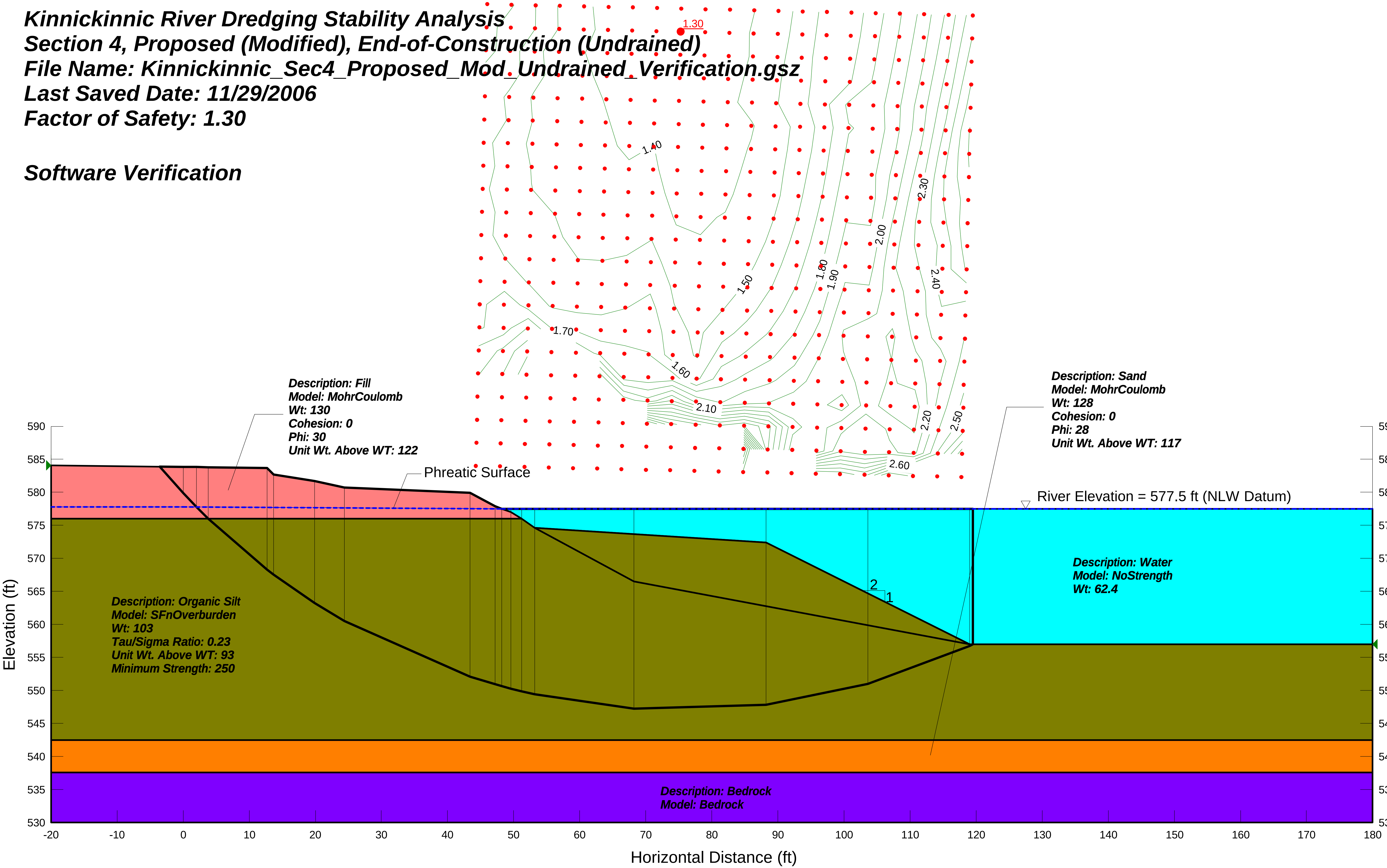


SLOPE/W Verification Procedure: Spencer's Method

Section 4, Modified Geometry, Undrained (End-of-Construction)

Kinnickinnic River Dredging Stability Analysis
Section 4, Proposed (Modified), End-of-Construction (Undrained)
File Name: Kinnickinnic_Sec4_Proposed_Mod_Undrained_Verification.gsz
Last Saved Date: 11/29/2006
Factor of Safety: 1.30

Software Verification



Kinnickinnic River Dredging Feasibility Study
SLOPE/W Verification Procedure: Spencer's Method
Section 4, Modified Geometry, Undrained (End-of-Construction)

Data from SLOPE/W

Slice	Slice 1	Slice 2	Slice 3	Slice 4	Slice 5	Slice 6	Slice 7	Slice 8	Slice 9	Slice 10	Slice 11	Slice 12	Slice 13	Slice 14	Slice 15	Slice 16	Slice 17
Factor of Safety	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
Phi Angle	30 °	30 °	30 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °	0 °
C (Strength)	0 psf	0 psf	0 psf	250 psf	255.97 psf	252.49 psf	257.28 psf	289.01 psf	291.17 psf	264.27 psf	257.86 psf	250 psf	250 psf	250 psf	250 psf	250 psf	250 psf
C (Force)	0 lbs	0 lbs	0 lbs	2943.5 lbs	321.41 lbs	1905.8 lbs	1353.4 lbs	6016.9 lbs	1157 lbs	274.37 lbs	373.57 lbs	412.32 lbs	513.17 lbs	3792.2 lbs	5009.9 lbs	3934.1 lbs	4116.8 lbs
Pore Water Pressure	0 psf	0 psf	56.112 psf	363.14 psf	611.28 psf	772.9 psf	987.22 psf	1363.9 psf	1623.9 psf	1666.7 psf	1686.9 psf	1711.1 psf	1738.1 psf	1837.3 psf	1899.9 psf	1772.5 psf	1496.3 psf
Pore Water Force	0 lbs	0 lbs	142.26 lbs	4275.6 lbs	767.54 lbs	5833.9 lbs	5193.3 lbs	28396 lbs	6452.8 lbs	1730.4 lbs	2443.9 lbs	2822 lbs	3567.7 lbs	27869 lbs	38074 lbs	27892 lbs	24639 lbs
Slice Width	3.5325 ft	2.0002 ft	1.7978 ft	8.902 ft	1 ft	6.2 ft	4.5 ft	19 ft	3.8 ft	1 ft	1.4 ft	1.6 ft	2 ft	15 ft	20 ft	15.4 ft	15.4 ft
Mid-Height	2.0381 ft	5.0219 ft	6.9371 ft	11.825 ft	15.278 ft	16.891 ft	19.359 ft	24.569 ft	27.405 ft	26.907 ft	27.034 ft	27.421 ft	27.854 ft	29.443 ft	30.448 ft	28.405 ft	23.979 ft
Base Length	5.3477 ft	2.898 ft	2.5353 ft	11.774 ft	1.2556 ft	7.548 ft	5.2606 ft	20.819 ft	3.9738 ft	1.0382 ft	1.4487 ft	1.6493 ft	2.0527 ft	15.169 ft	20.04 ft	15.736 ft	16.467 ft
Base Angle	-48.651 °	-46.351 °	-44.837 °	-40.845 °	-37.209 °	-34.756 °	-31.183 °	-23.909 °	-16.995 °	-15.594 °	-14.903 °	-14.04 °	-13.004 °	-8.2029 °	1.6173 °	11.595 °	20.577 °
Applied Lambda	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072
Weight	878.36 lbs	1225.5 lbs	1534.5 lbs	12279 lbs	1724.2 lbs	11601 lbs	9477.2 lbs	49875 lbs	10982 lbs	2815.7 lbs	3931.3 lbs	4475.6 lbs	5559.2 lbs	43437 lbs	59092 lbs	39459 lbs	27625 lbs
Base Normal Force	855.3 lbs	1176.5 lbs	1500.3 lbs	13591 lbs	1891.6 lbs	12580 lbs	10083 lbs	51204 lbs	11033 lbs	2822.9 lbs	3936.9 lbs	4476.3 lbs	5550.5 lbs	43227 lbs	59623 lbs	41737 lbs	31783 lbs
Base Normal Stress	159.94 psf	405.97 psf	591.76 psf	1154.3 psf	1506.5 psf	1666.7 psf	1916.7 psf	2459.5 psf	2776.5 psf	2718.9 psf	2717.5 psf	2714.1 psf	2704 psf	2849.7 psf	2975.2 psf	2652.3 psf	1930.1 psf
Base Shear Res. Force	-493.81 lbs	-679.27 lbs	-784.05 lbs	-2943.5 lbs	-321.4 lbs	-1905.8 lbs	-1353.4 lbs	-6017 lbs	-1157 lbs	-274.38 lbs	-373.57 lbs	-412.32 lbs	-513.18 lbs	-3792.2 lbs	-5009.9 lbs	-3934 lbs	-4116.8 lbs
Base Shear Res. Stress	-92.339 psf	-234.39 psf	-309.25 psf	-250 psf	-255.97 psf	-252.49 psf	-257.27 psf	-289.01 psf	-291.17 psf	-264.28 psf	-257.86 psf	-250 psf	-250 psf	-250 psf	-250 psf	-250 psf	-250 psf
Base Shear Mob. Force	-379.83 lbs	-522.49 lbs	-603.08 lbs	-2264.1 lbs	-247.22 lbs	-1465.9 lbs	-1041 lbs	-4628.2 lbs	-889.97 lbs	-211.05 lbs	-287.35 lbs	-317.15 lbs	-394.73 lbs	-2916.9 lbs	-3853.6 lbs	-3026 lbs	-3166.6 lbs
Base Shear Mob. Stress	-71.026 psf	-180.29 psf	-237.87 psf	-192.3 psf	-196.89 psf	-194.21 psf	-197.89 psf	-222.31 psf	-223.96 psf	-203.28 psf	-198.34 psf	-192.3 psf	-192.3 psf	-192.3 psf	-192.3 psf	-192.3 psf	-192.3 psf
Left Side Normal Force	0 lbs	391.23 lbs	881.99 lbs	1512.2 lbs	8689.8 lbs	9637 lbs	15605 lbs	19935 lbs	36455 lbs	38828 lbs	39383 lbs	40118 lbs	40896 lbs	41760 lbs	45039 lbs	39502 lbs	28147 lbs
Left Side Shear Force	0 lbs	28.174 lbs	63.514 lbs	108.89 lbs	625.77 lbs	693.98 lbs	1123.7 lbs	1435.6 lbs	2625.2 lbs	2796.1 lbs	2836.1 lbs	2889 lbs	2945 lbs	3007.3 lbs	3243.4 lbs	2844.7 lbs	2027 lbs
Right Side Normal Force	391.23 lbs	881.99 lbs	1512.2 lbs	8689.8 lbs	9637 lbs	15605 lbs	19935 lbs	36455 lbs	38828 lbs	39383 lbs	40118 lbs	40896 lbs	41760 lbs	45039 lbs	39502 lbs	28147 lbs	14011 lbs
Right Side Shear Force	28.174 lbs	63.514 lbs	108.89 lbs	625.77 lbs	693.98 lbs	1123.7 lbs	1435.6 lbs	2625.2 lbs	2796.1 lbs	2836.1 lbs	2889 lbs	2945 lbs	3007.3 lbs	3243.4 lbs	2844.7 lbs	2027 lbs	1008.9 lbs
Polygon Closure	4.3918 lbs	12.255 lbs	23.018 lbs	67.955 lbs	18.916 lbs	125.8 lbs	50.415 lbs	512.04 lbs	55.165 lbs	28.229 lbs	39.369 lbs	22.382 lbs	55.592 lbs	434.37 lbs	596.23 lbs	208.69 lbs	317.83 lbs
Top Left Coordinate	-3.5325 ft, 583.9 ft	0 ft, 583.86 ft	2.0002 ft, 583.83 ft	3.798 ft, 583.81 ft	12.7 ft, 583.7 ft	13.7 ft, 582.7 ft	19.9 ft, 581.7 ft	24.4 ft, 580.7 ft	43.4 ft, 579.9 ft	47.2 ft, 577.9 ft	48.2 ft, 577.5 ft	49.6 ft, 577.5 ft	51.2 ft, 577.5 ft	53.2 ft, 577.5 ft	68.2 ft, 577.5 ft	88.2 ft, 577.5 ft	103.6 ft, 577.5 ft
Top Right Coordinate	0 ft, 583.86 ft	2.0002 ft, 583.83 ft	3.798 ft, 583.81 ft	12.7 ft, 583.7 ft	13.7 ft, 582.7 ft	19.9 ft, 581.7 ft	24.4 ft, 580.7 ft	43.4 ft, 579.9 ft	47.2 ft, 577.9 ft	48.2 ft, 577.5 ft	49.6 ft, 577.5 ft	51.2 ft, 577.5 ft	53.2 ft, 577.5 ft	68.2 ft, 577.5 ft	88.2 ft, 577.5 ft	103.6 ft, 577.5 ft	119 ft, 577.5 ft
Bottom Left Coordinate	-3.5325 ft, 583.9 ft	0 ft, 579.88 ft	2.0002 ft, 577.79 ft	3.798 ft, 576 ft	12.7 ft, 568.3 ft	13.7 ft, 567.54 ft	19.9 ft, 563.24 ft	24.4 ft, 560.52 ft	43.4 ft, 552.1 ft	47.2 ft, 550.93 ft	48.2 ft, 550.66 ft	49.6 ft, 550.28 ft	51.2 ft, 549.88 ft	53.2 ft, 549.42 ft	68.2 ft, 547.26 ft	88.2 ft, 547.82 ft	103.6 ft, 550.98 ft
Bottom Right Coordinate	0 ft, 579.88 ft	2.0002 ft, 577.79 ft	3.798 ft, 576 ft	12.7 ft, 568.3 ft	13.7 ft, 567.54 ft	19.9 ft, 563.24 ft	24.4 ft, 560.52 ft	43.4 ft, 552.1 ft	47.2 ft, 550.93 ft	48.2 ft, 550.66 ft	49.6 ft, 550.28 ft	51.2 ft, 549.88 ft	53.2 ft, 549.42 ft	68.2 ft, 547.26 ft	88.2 ft, 547.82 ft	103.6 ft, 550.98 ft	119 ft, 556.76 ft

Calculations

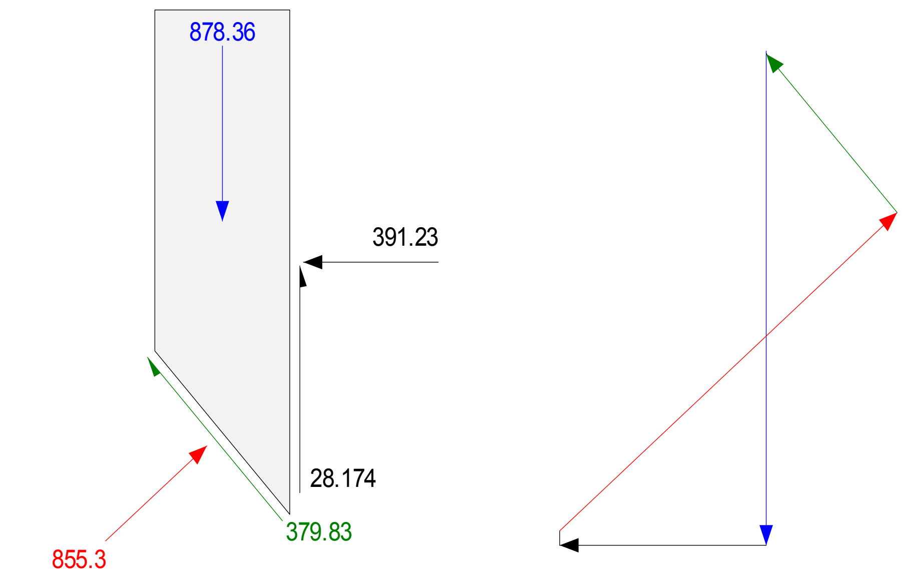
Radius, R [ft] 103.1

																		Sum
Base Length, L [ft]	5.3	2.9	2.5	11.8	1.3	7.5	5.3	20.8	4.0	1.0	1.4	1.6	2.1	15.2	20.0	15.7	16.5	--
Base Shear Mob. Stress [psf]	-71.0	-180.3	-237.9	-192.3	-196.9	-194.2	-197.9	-222.3	-224.0	-203.3	-198.3	-192.3	-192.3	-192.3	-192.3	-192.3	-192.3	--
Base Shear Mob. Force [psf]	-379.8	-522.5	-603.1	-2264.1	-247.2	-1465.9	-1041.0	-4628.2	-890.0	-211.1	-287.4	-317.2	-394.7	-2916.9	-3853.6	-3026.0	-3166.6	--
Driving Moment, M_d [lb*ft]	-39171.5	-53883.9	-62195.1	-233494.4	-25495.6	-151176.8	-107357.3	-477301.7	-91781.7	-21765.4	-29634.1	-32707.4	-40708.1	-300817.0	-397418.0	-312068.4	-326568.4	**-2703545**
Cohesion, c [psf]	0	0	0	250	256.0	252.5	257.3	289.0	291.2	264.3	257.9	250	250	250	250	250	250	--
Friction Angle, ϕ [degrees]	30	30	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	--
Base Normal Stress [psf]	159.9	406.0	591.8	1154.3	1506.5	1666.7	1916.7	2459.5	2776.5	2718.9	2717.5	2714.1	2704.0	2849.7	2975.2	2652.3	1930.1	--
Base Shear Res. Stress [psf]	-92.3	-234.4	-309.3	-250	-256.0	-252.5	-257.3	-289.0	-291.2	-264.3	-257.9	-250	-250	-250	-250	-250	-250	--
Base Shear Res. Force [lbs]	-493.8	-679.3	-784.1	-2943.5	-321.4	-1905.8	-1353.4	-6017.0	-1157.0	-274.4	-373.6	-412.3	-513.2	-3792.2	-5009.9	-3934.0	-4116.8	--
Resisting Moment, M_r [lb*ft]	-50926.1	-70052.5	-80858.3	-303560.3	-33145.7	-196543.3	-139574.8	-620527.3	-119320.3	-28296.5	-38525.9	-42522.2	-52923.8	-391085.9	-516666.1	-405709.6	-424561.6	**-3514800**

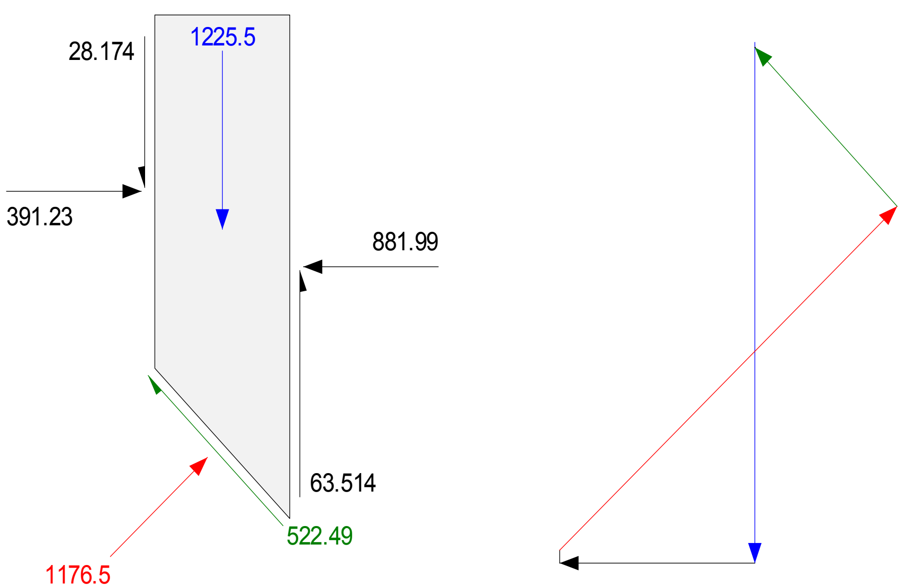
Factor of Safety **1.30**

Force Polygons

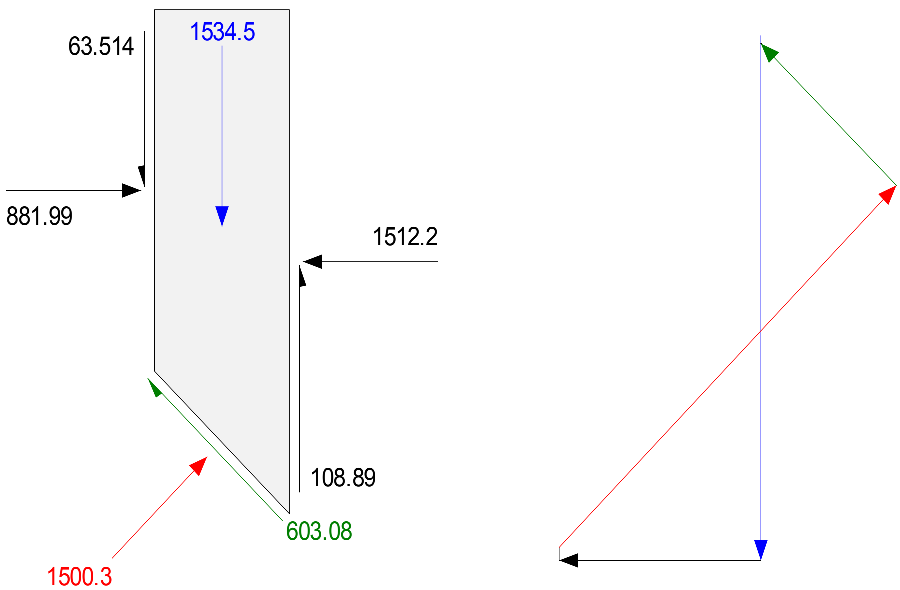
Slice 1 - Spencer Method



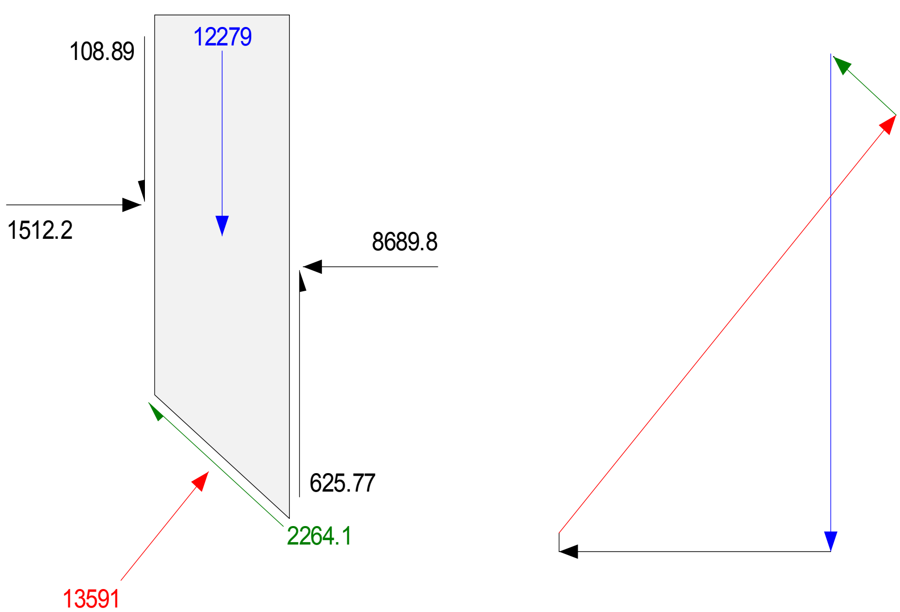
Slice 2 - Spencer Method



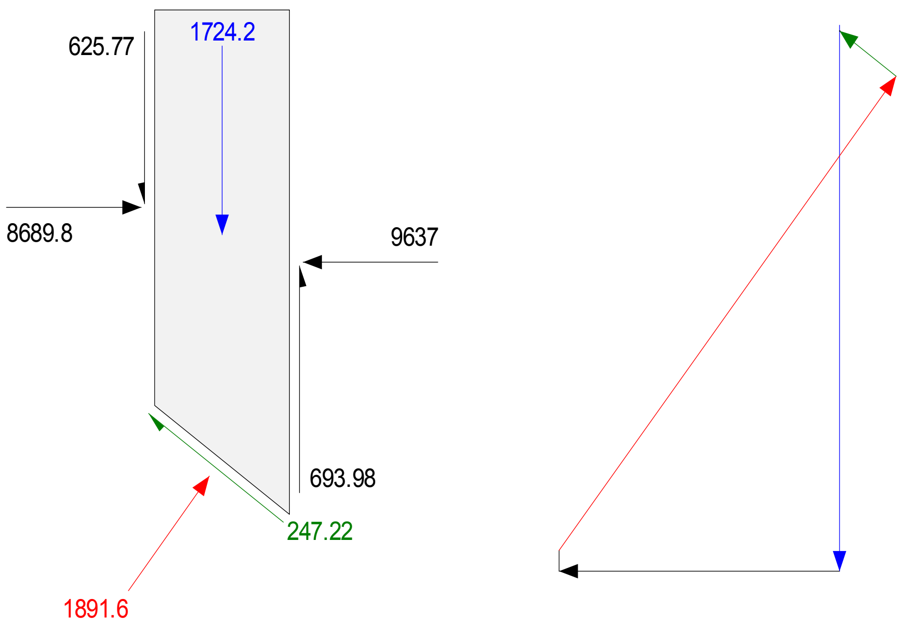
Slice 3 - Spencer Method



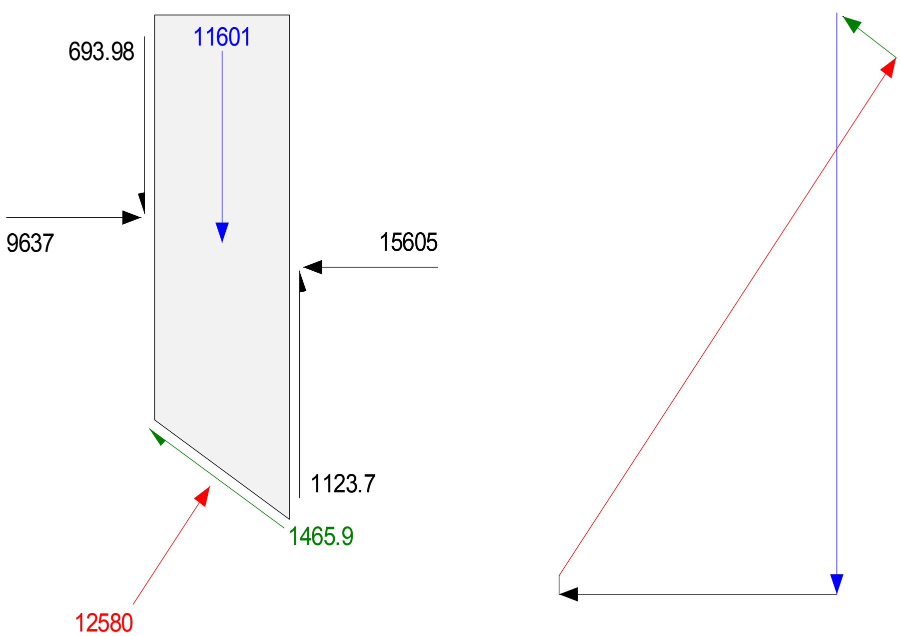
Slice 4 - Spencer Method



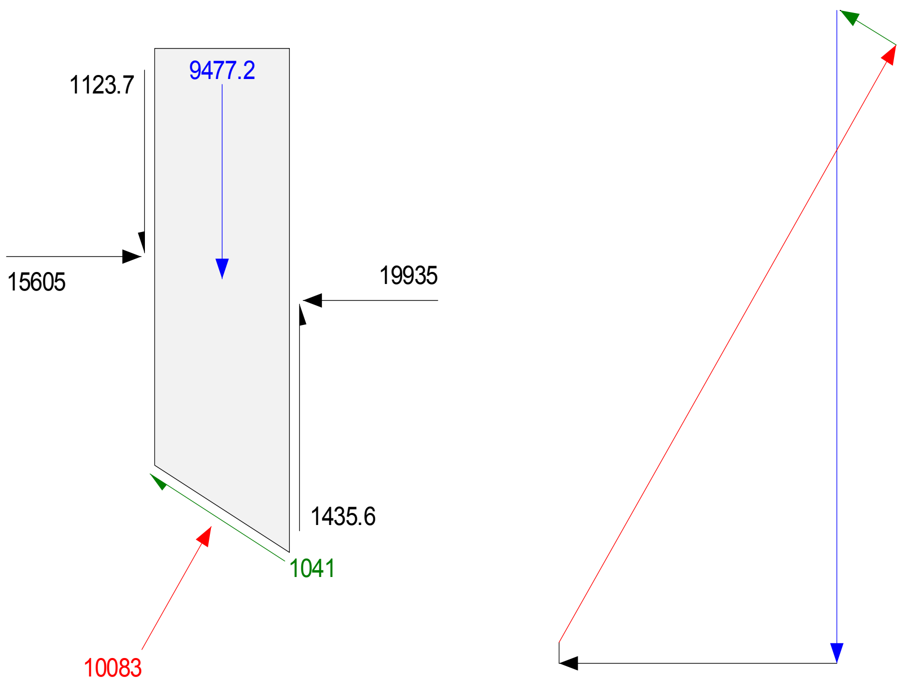
Slice 5 - Spencer Method



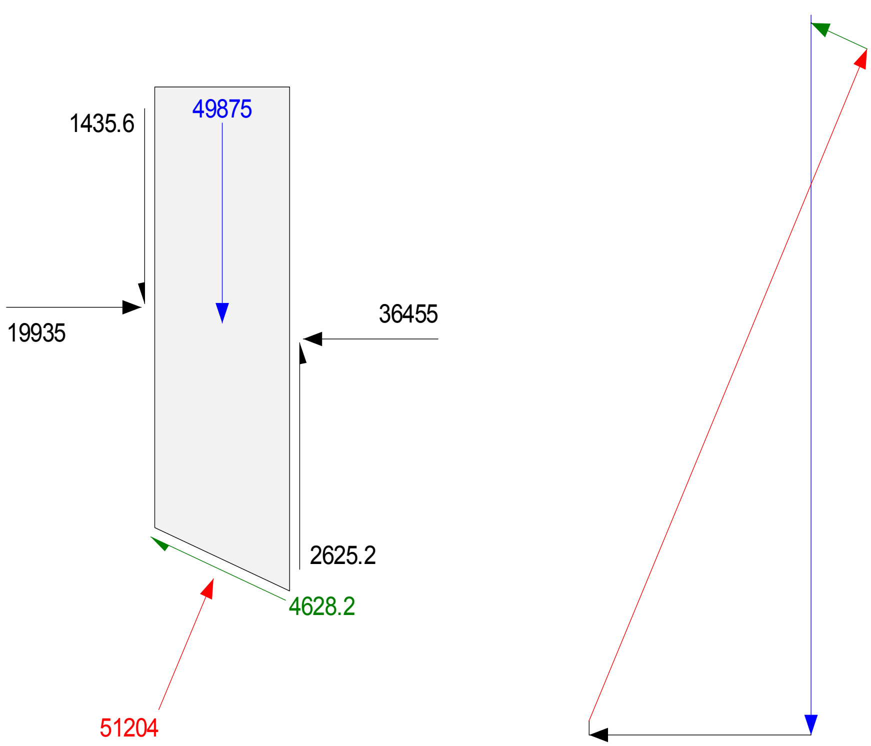
Slice 6 - Spencer Method



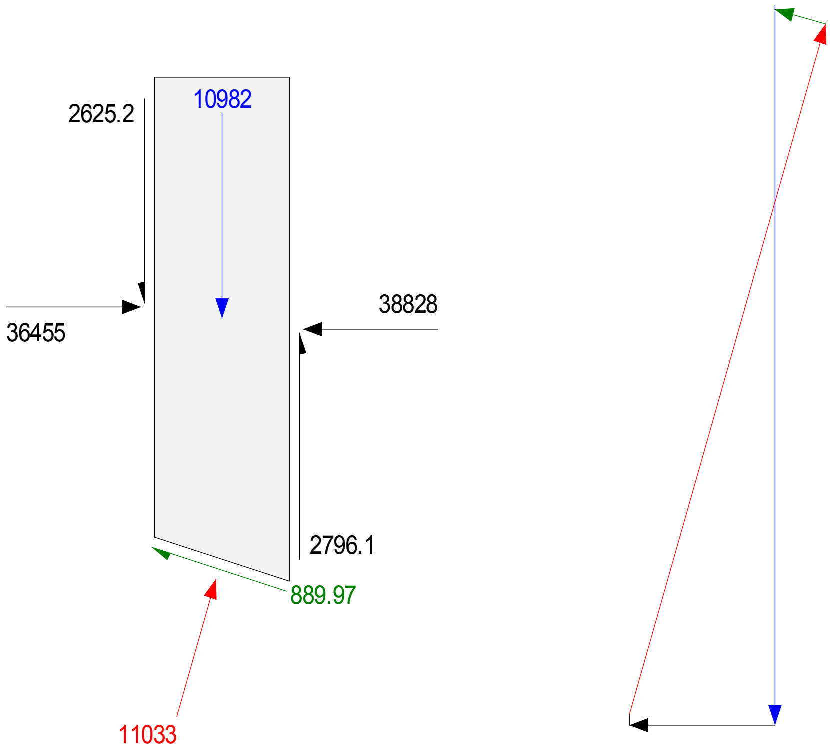
Slice 7 - Spencer Method



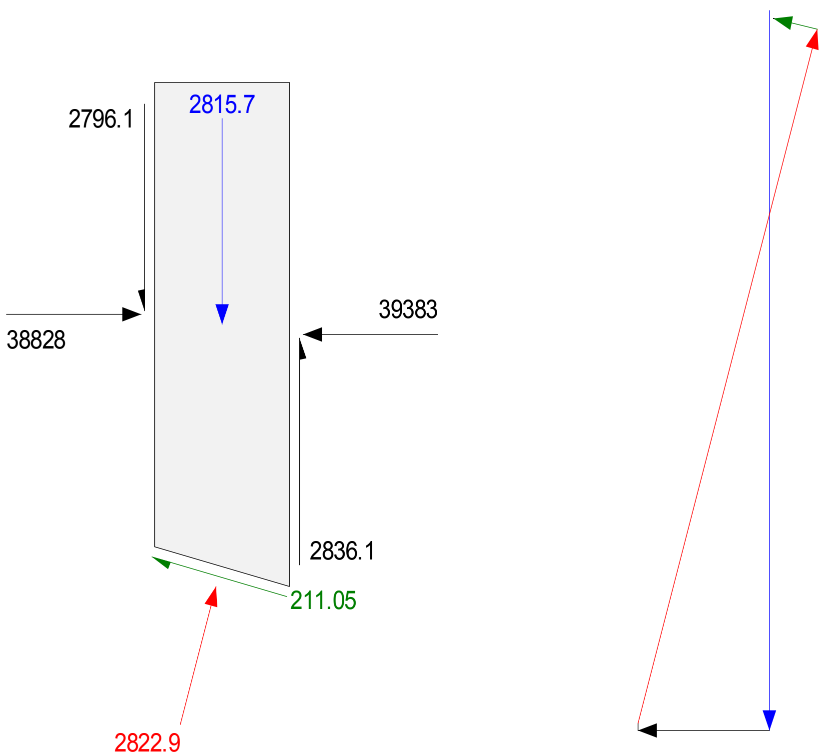
Slice 8 - Spencer Method



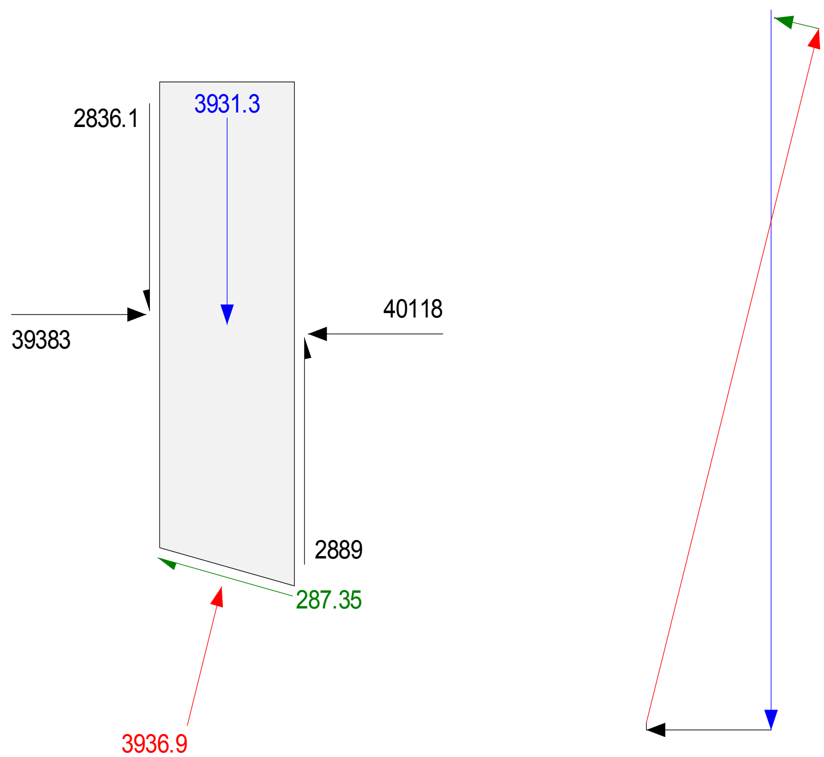
Slice 9 - Spencer Method



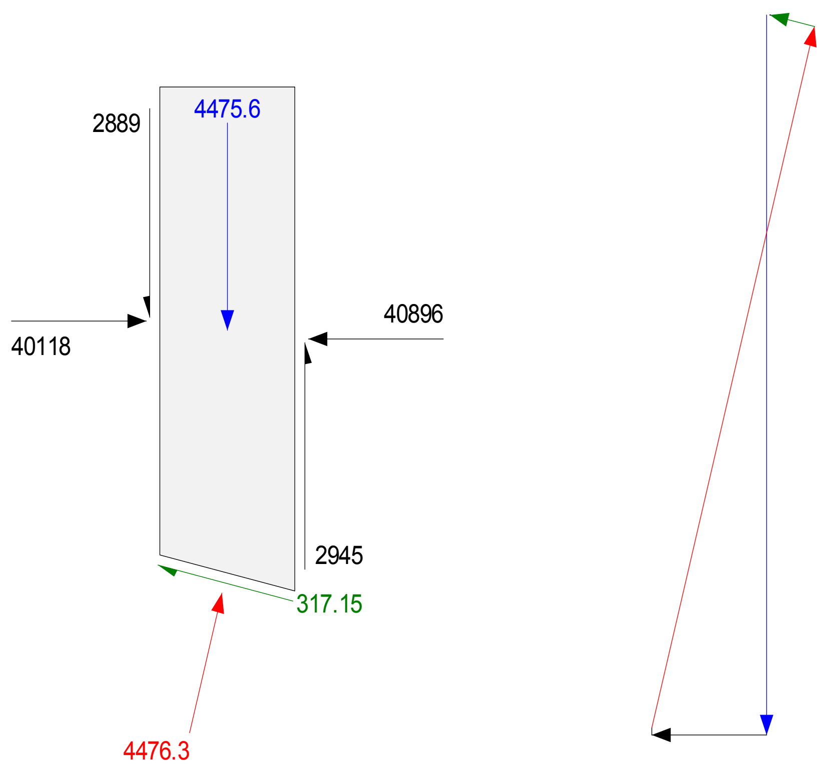
Slice 10 - Spencer Method



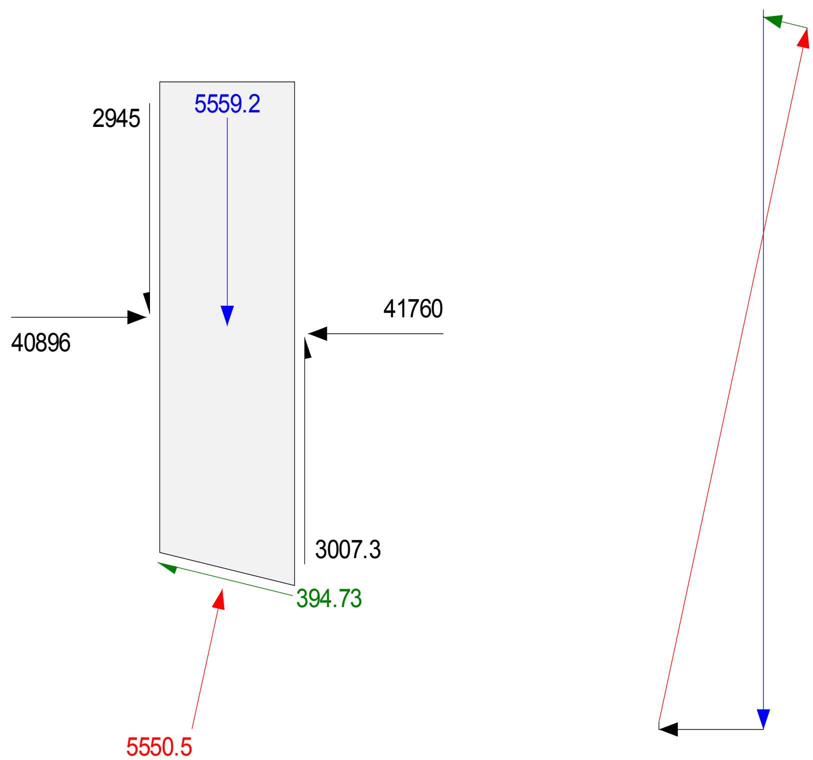
Slice 11 - Spencer Method



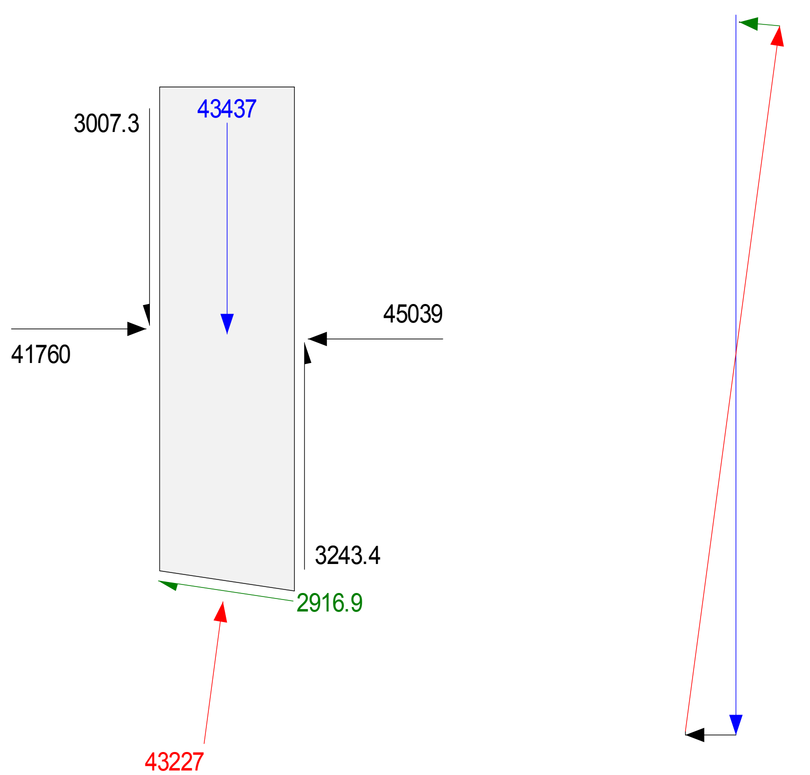
Slice 12 - Spencer Method



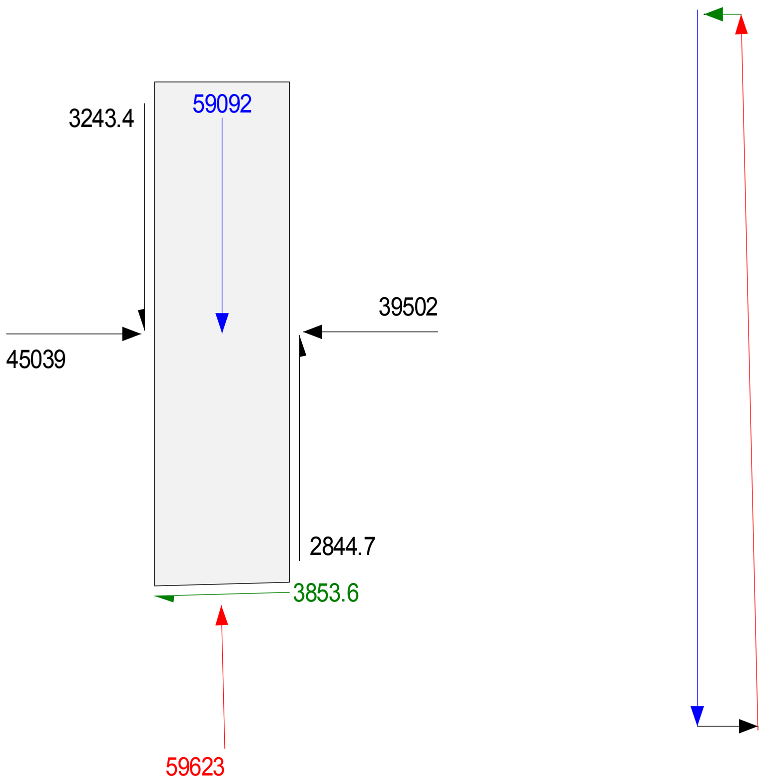
Slice 13 - Spencer Method



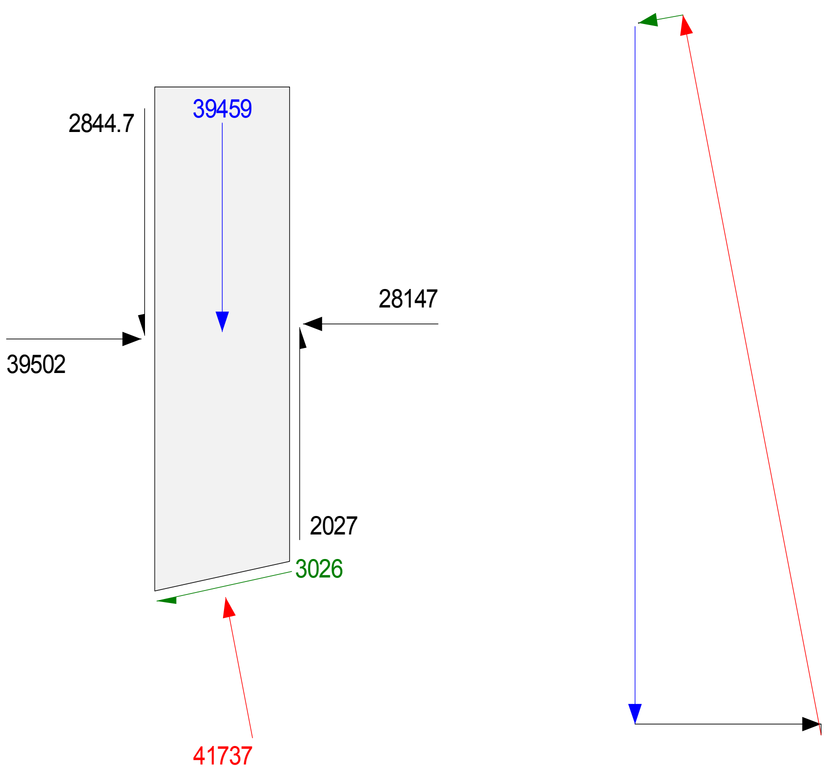
Slice 14 - Spencer Method



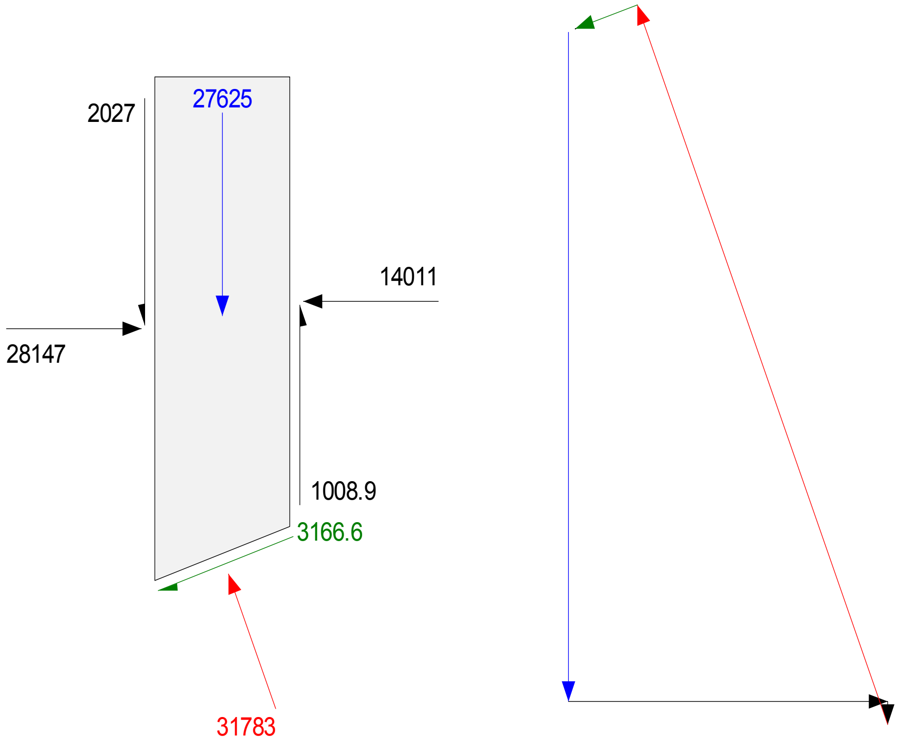
Slice 15 - Spencer Method



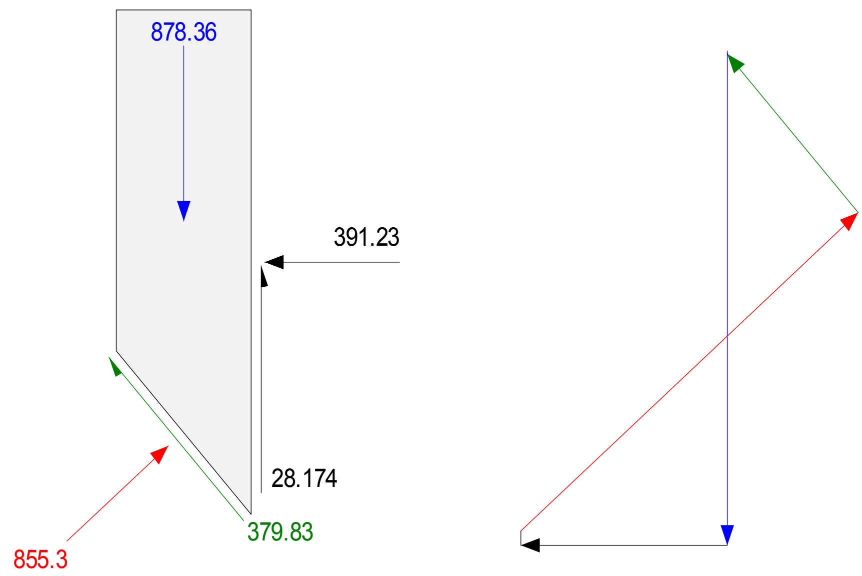
Slice 16 - Spencer Method



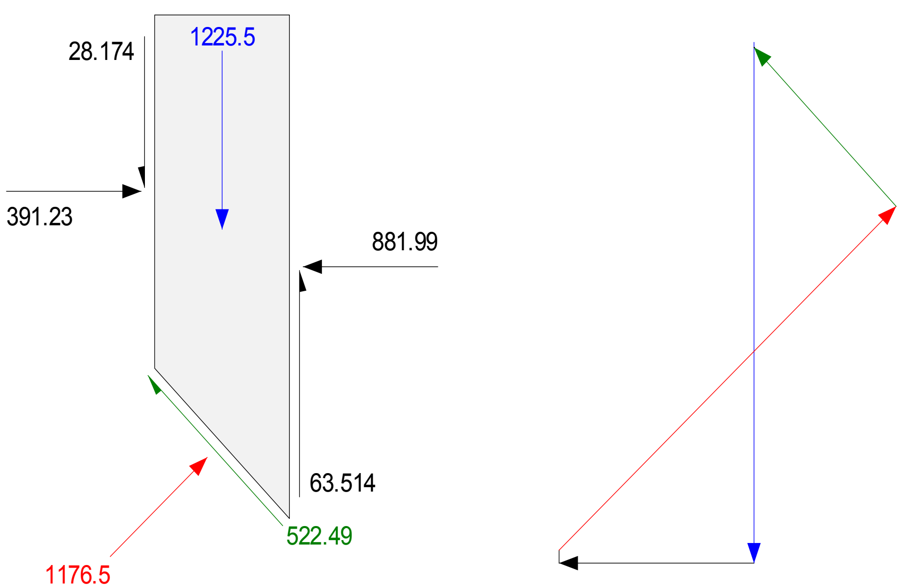
Slice 17 - Spencer Method



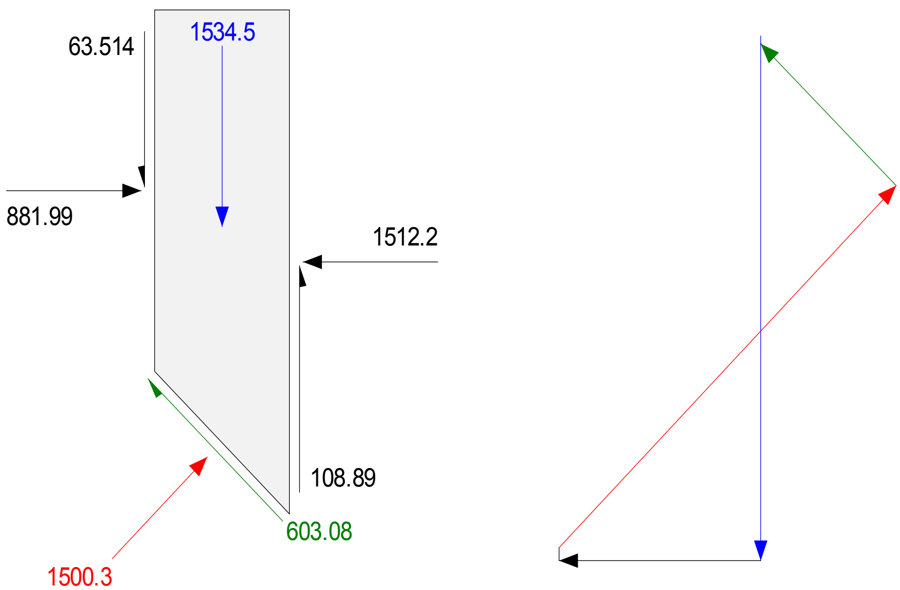
Slice 1 - Spencer Method



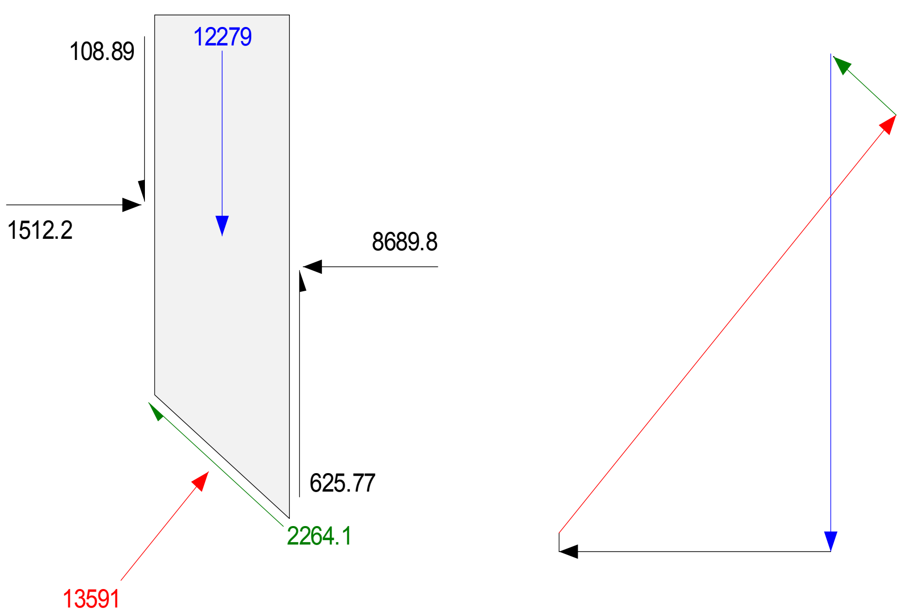
Slice 2 - Spencer Method



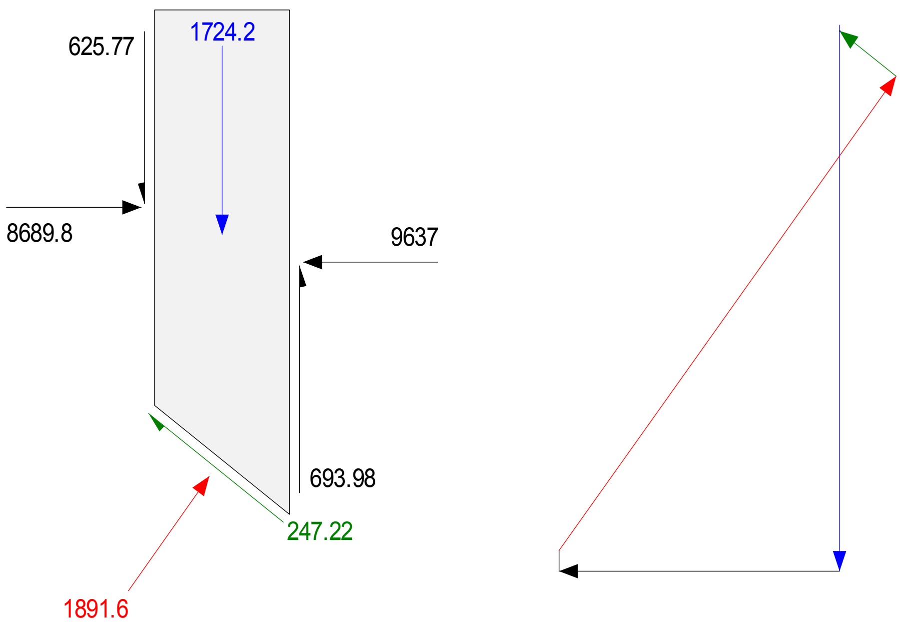
Slice 3 - Spencer Method



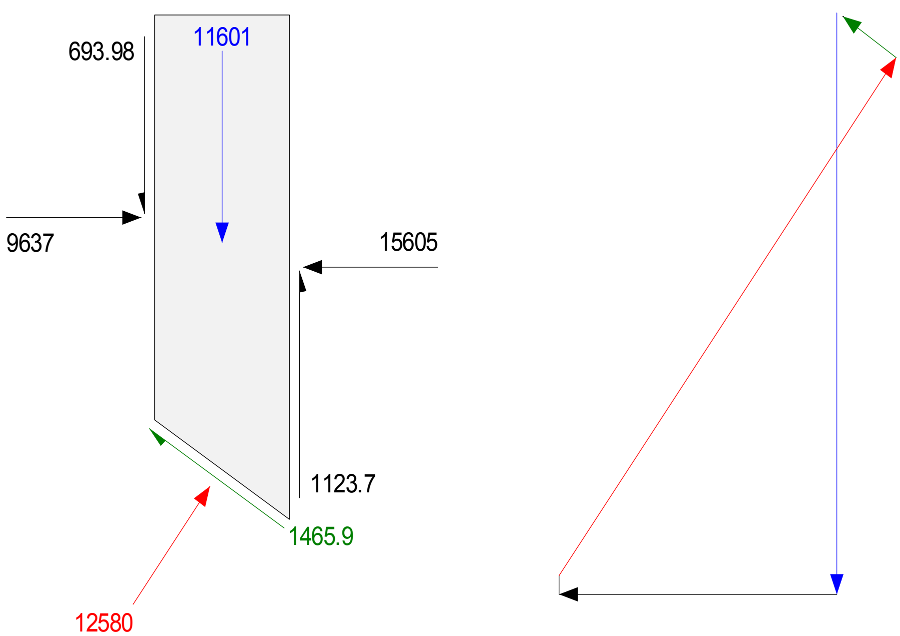
Slice 4 - Spencer Method



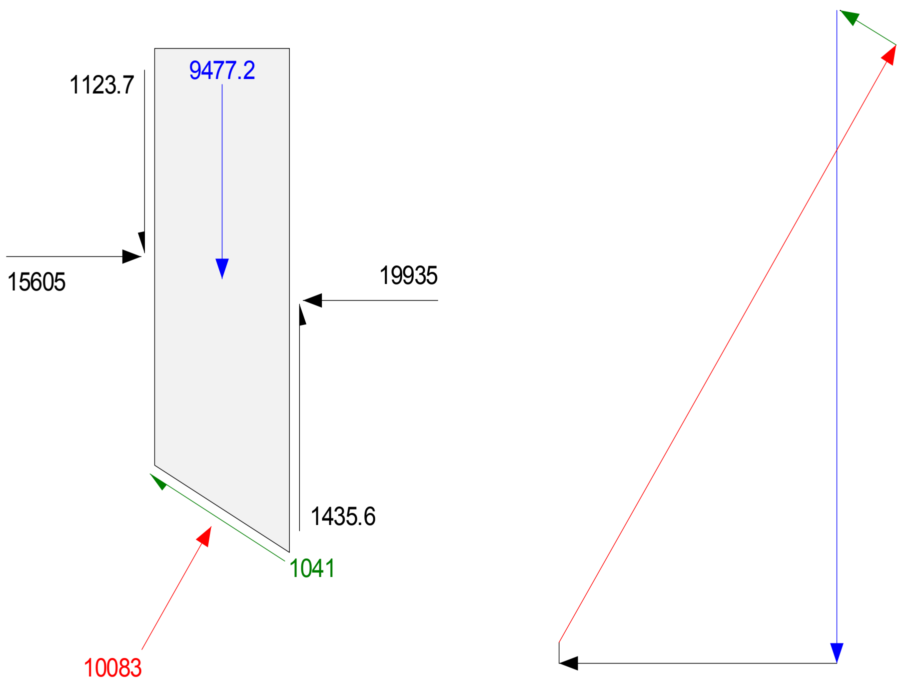
Slice 5 - Spencer Method



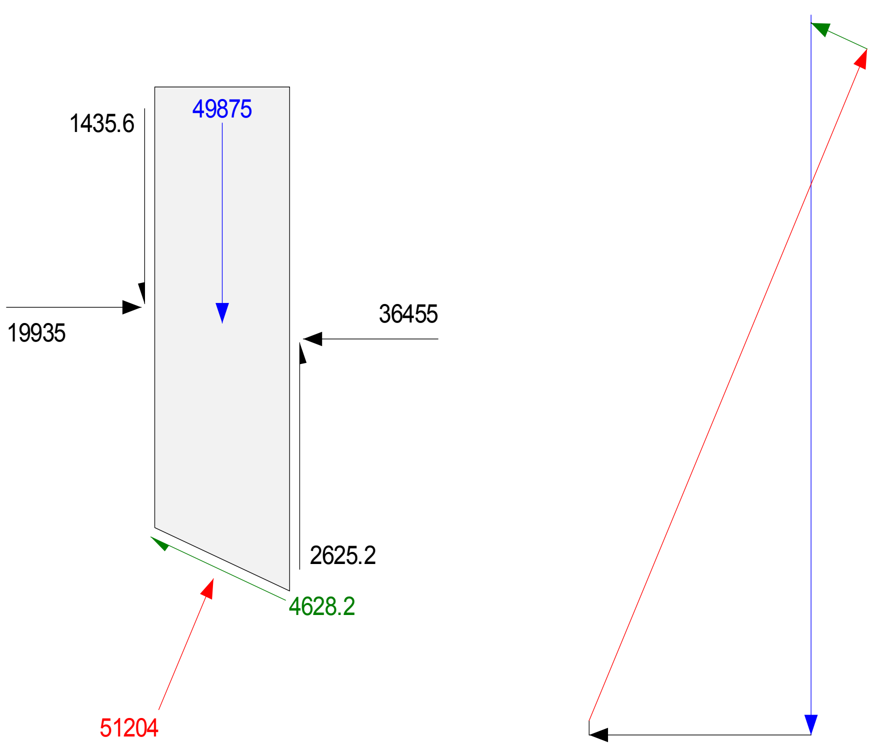
Slice 6 - Spencer Method



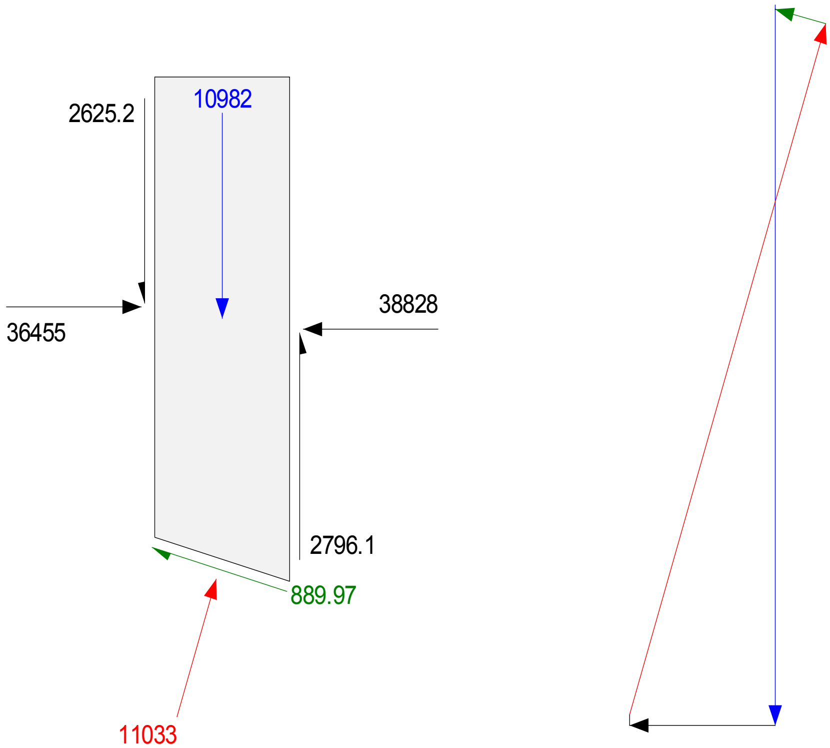
Slice 7 - Spencer Method



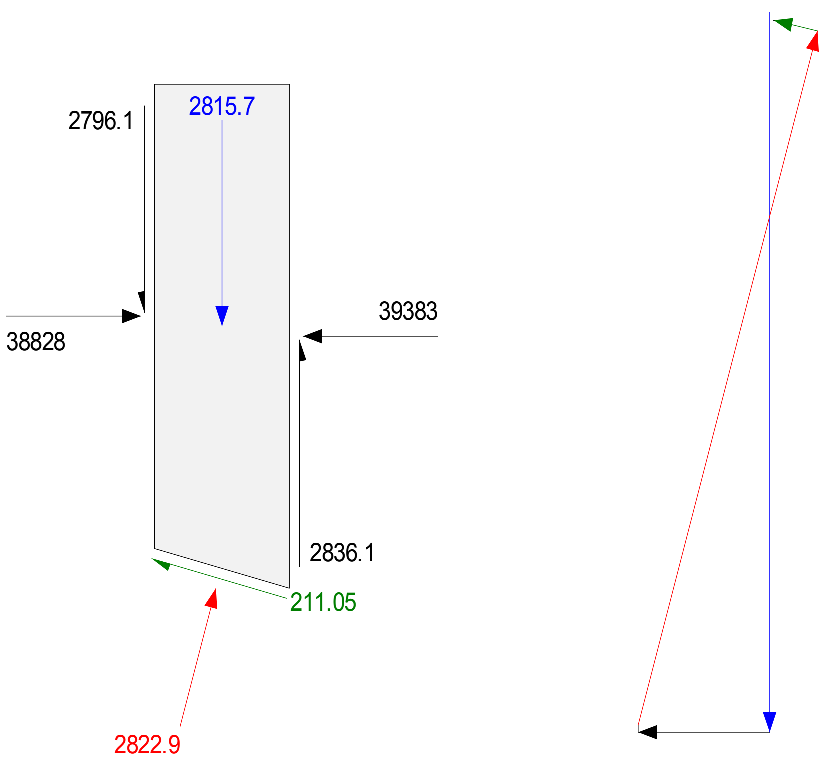
Slice 8 - Spencer Method



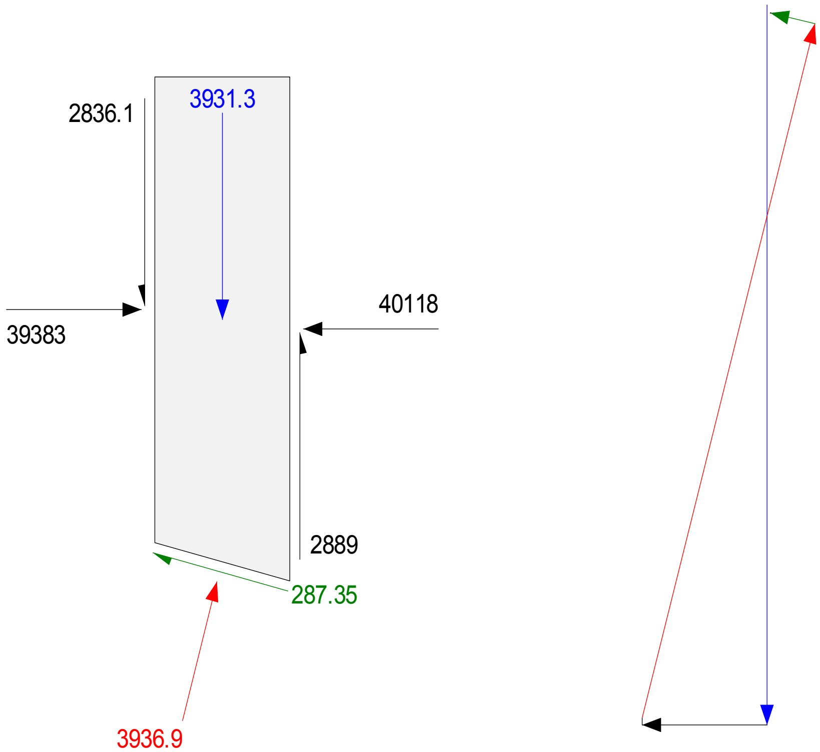
Slice 9 - Spencer Method



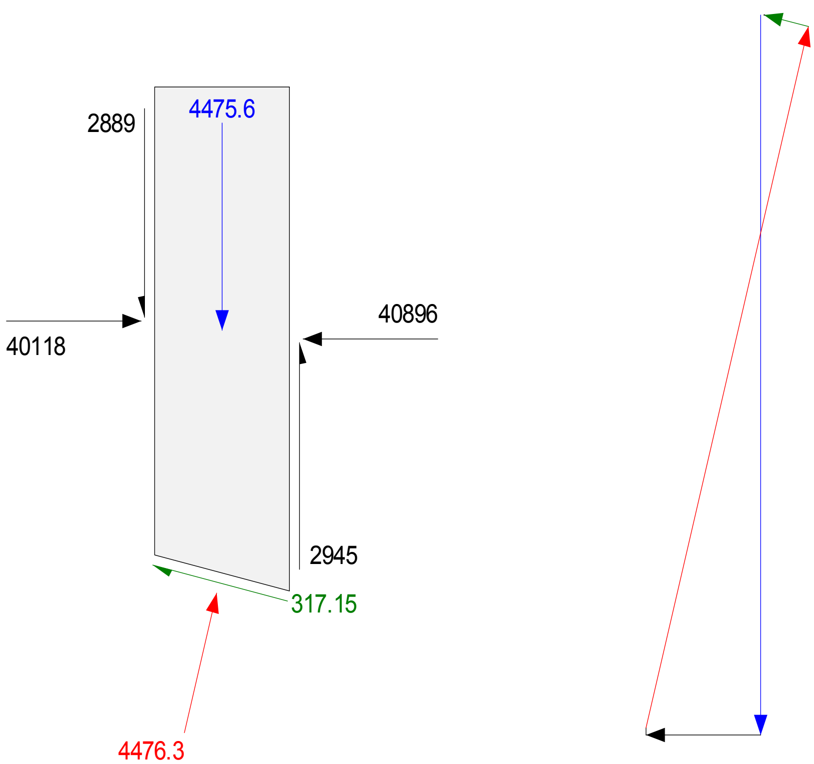
Slice 10 - Spencer Method



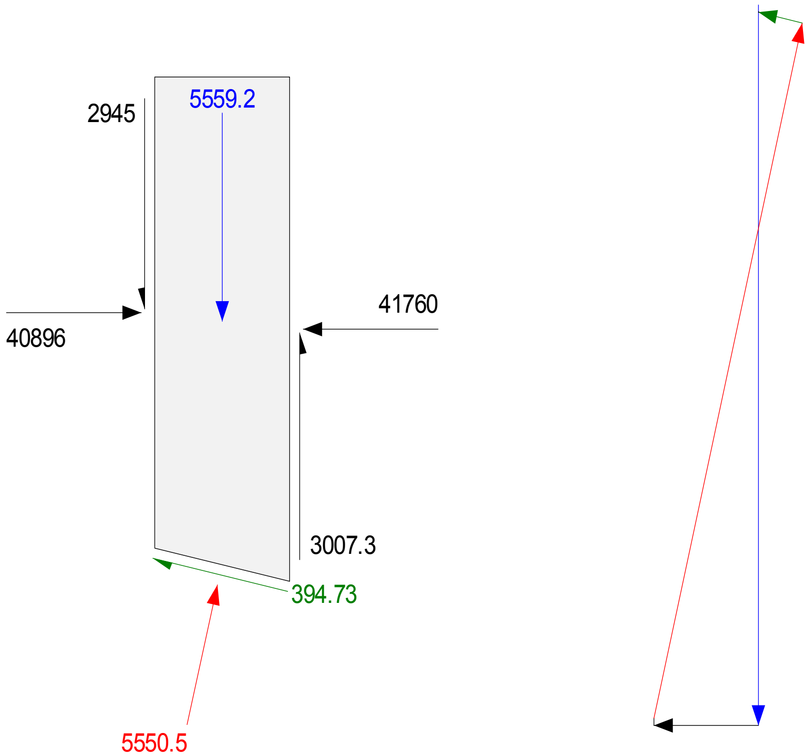
Slice 11 - Spencer Method



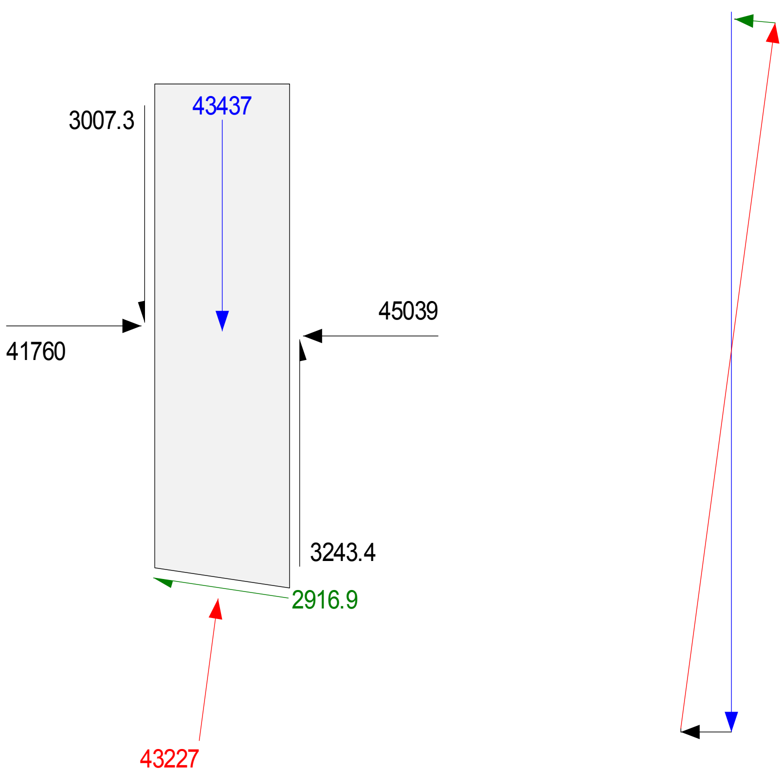
Slice 12 - Spencer Method



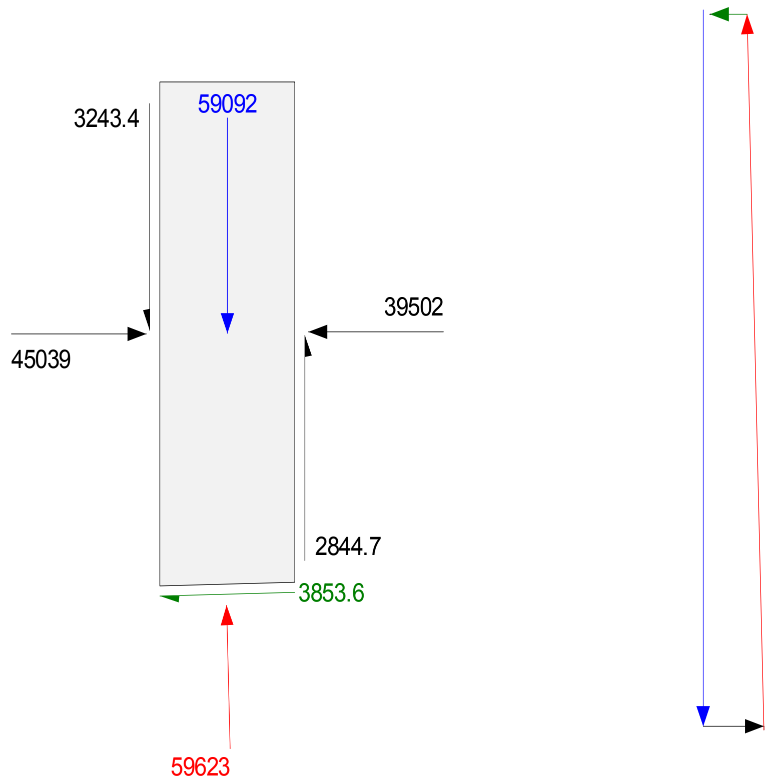
Slice 13 - Spencer Method



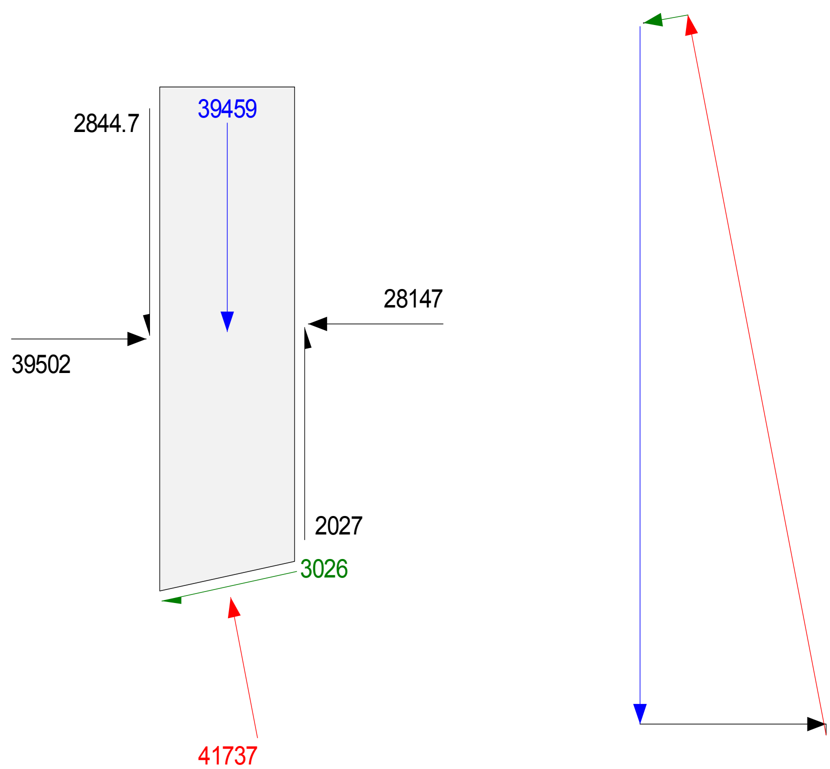
Slice 14 - Spencer Method



Slice 15 - Spencer Method



Slice 16 - Spencer Method



Slice 17 - Spencer Method