“ESTUDIO Y DISEÑO DEFINITIVO DE LA VÍA SAN ANTONIO – SAN MIGUEL, EN LOS CANTONES GUAYAQUIL Y PLAYAS, DE LA PROVINCIA DEL GUAYAS”

INFORME DE TALUDES Y TERRAPLENES

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INDICE

1. GENERALIDADES

1.1 Antecedentes

La Prefectura del Guayas a través su plan de vialidad ha considerado la opción de dotar de una estructura de pavimento a la vía de acceso y sus componentes, incluido la estabilización de taludes y terraplenes del proyecto vial San Antonio – San Miguel.

El Proyecto ha previsto la ejecución del "Expediente Técnico del Estudio Geotécnico de diseño de taludes y terraplenes"; de acuerdo con los términos de referencia.

Para la ejecución de los diseños de estabilización de taludes y terraplenes se ha estudiado el trazado identificando que el corte y terraplenes más críticos son las obras de acceso al puente San Miguel, necesitando por una parte realizar un corte del talud y por otro lado la construcción de un terraplén.

1.2 Objetivo y alcance

Verificar la estabilidad del talud de corte, talud del terraplén de relleno y estimar los asentamientos durante la construcción del terraplén. Emitir las recomendaciones para la construcción de estas obras.

2. METODOLOGIA

2.1 Teoría de equilibrio límite aplicada

El análisis de estabilidad se realiza por el método de equilibrio límite, este método es el más utilizado en la práctica para el cálculo de estabilidad de taludes y se basa fundamentalmente en una consideración de equilibrio plástico límite.

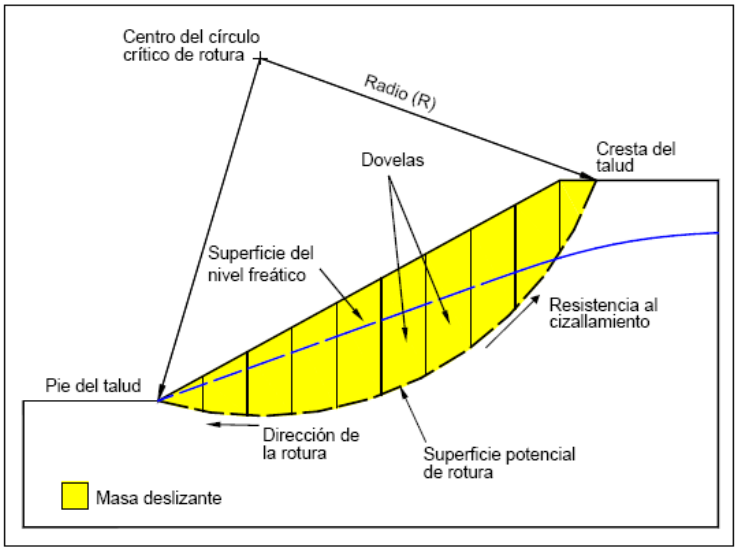
Se han desarrollado una gran variedad de métodos, los cuales en su mayoría se basan en dividir la potencial masa de deslizamiento en un cierto número de dovelas o rebanadas, tal como se ilustra en la figura N°1.1. Las fuerzas que actúan sobre cada dovela figura N°1.2 deben encontrarse en equilibrio, tanto para cada dovela, como para la totalidad de la masa deslizante. Algunos métodos consideran sólo equilibrio de fuerzas, otros sólo de momento y otros satisfacen ambas fuerzas.

Las hipótesis del Método de Equilibrio Límite son:

- La ley de comportamiento Mohr-Coulomb: $\tau = c + \sigma' \tan(\varphi')$ y la resistencia se moviliza total y simultáneamente a lo largo de la superficie de deslizamiento.

- El Factor de Seguridad (FS) de la componente cohesiva y friccionante del material es igual para todos los suelos involucrados en la superficie de deslizamiento y es el mismo para todas las dovelas.

Figura 1: Superficie de falla

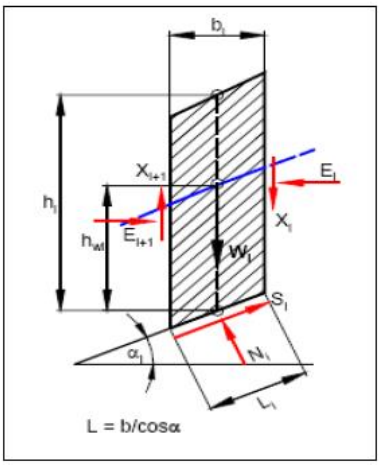


- Se debe verificar el equilibrio de cada dovela como para toda la masa de suelo potencialmente deslizante.

Los métodos de equilibrio límite más comunes son: Felleniuos, Bishop Simplificado, Janbu Simplificado, Janbu Generalizado, Spencer, Morgenstern-Price, GLE, Corps of Engineers y Lowe-Karafiath.

De los métodos indicados, el más preciso es el de Morgenstern-Price, por lo que es el que se va aplicar.

Figura 2: Distribución de fuerzas en dovelas



Morgenstem y Price.- Asume que las fuerzas laterales siguen un sistema predeterminado. El método es muy similar al método Spencer (Spencer: Es aplicable en todo tipo de superficies de falla. Asume que la inclinación de las fuerzas laterales son las mismas para cada tajada. Rigurosamente satisface el equilibrio estático asumiendo que

la fuerza resultante entre tajadas tiene una inclinación constante pero desconocida) con la diferencia que la inclinación de la resultante de las fuerzas entre dovelas se asume que varía de acuerdo a una función arbitraria.

Para el cálculo del Factor de Seguridad se realizó con el módulo programa slope, el análisis es por el método de las dovelas, este método considera el problema bidimensional. La zona del terreno potencialmente deslizante se divide en una serie de fajas verticales estudiándose el equilibrio de cada una de ellas. La gran utilización que tiene actualmente los métodos de las dovelas se debe a su aplicación en una gran generalidad de problemas con un grado razonable de exactitud en la gran mayoría de los casos. Permitiendo considerar la acción de presiones intersticiales, la existencia de cargas externas actuando en el talud, la existencia de materiales de diferentes características y, en muchos casos, son aplicables a superficies de rotura de cualquier forma.

2.2 Establecimiento del Factor de seguridad (FS)

Un talud se considera inestable si FS ≤ 1,0, sin embargo, es común que muchas laderas estables naturales tengan factores de seguridad menor que 1,0 de acuerdo con la práctica de diseño comúnmente adoptado y este fenómeno puede atribuirse a:

a.- Es bastante común la aplicación de un factor adicional de seguridad en los parámetros del suelo.
b.- El uso de una fuerte lluvia con un período de tiempo recurrente en el análisis.
c.- No son considerados en el análisis efectos tridimensionales.
d.- Estabilización adicional debido a la presencia de vegetación o succión de suelo

Un factor aceptable de seguridad debe basarse en la consideración del período recurrente de lluvias fuertes, la consecuencia de los fallos del talud, el conocimiento sobre el comportamiento a largo plazo de los materiales geológicos y la precisión del modelo de diseño. Los requisitos recomendados por investigadores se presentan en las tablas 2.1.

Tabla 2.1 : Factores de seguridad recomendados NEC

Condición **	Fscorte Mínimo	
	Diseño	Construcción
Carga Muerta+Carga Viva Nominal	1.5	1.25
Carga Muerta+ Carga Viva Máxima	1.25	1.1
Carga Muerta+ Carga Viva Nominal + Sismo de diseño Pseudo estático	1.1	1.00 *
Taludes - condición estática y Agua Subterranea Normal	1.5	1.25
Taludes - condición pseudo estática con agua Subterranea Normal y Coeficiente Sísmico de diseño	1.05	1.00 *

En este sentido la aplicación de la norma NEC para un factor de seguridad global mínimo de FS=1,5 resulta oneroso, esta reglamentación está orientada a diseños de talud de corte y apertura de obras nuevas, sin antecedentes de deslizamiento. Además, la norma NEC, está encaminada a taludes construidos en zonas urbanas, donde por obvias razones se requiere una mayor seguridad.

Las normas NEVI-2013, está más orientadas a obras viales, recomienda valores de factores de seguridad globales mínimos, donde considera el riesgo de pérdidas de vidas humanas y económicas.

Tabla 2.2 : Factores de seguridad recomendados NEVI 2013

Factor de riesgo		Pérdidas de vidas humanas		
		Despreciable	Medio	Elevado
Perdidas económicas	Despreciable	1.1	1.2	1.4
	Medio	1.2	1.3	1.4
	Elevado	1.4	1.4	1.5

Fuente: NEVI. (Marzo 2013). Normas para Estudios y Diseño Vial.

Un factor aceptable de seguridad debe basarse en la consideración del período recurrente de lluvias fuertes, la consecuencia de los fallos del talud, el conocimiento sobre el comportamiento a largo plazo de los materiales geológicos y la precisión del modelo de diseño. De acuerdo con los requisitos recomendados en la NEVI-2013 que se presentan en la tablas N°2.2 que para nuestro caso es FS=1,2 a 1,3, considerando que el tráfico por la vía es bajo y que la única infraestructura en riesgo es el tramo de vía existente, que estaría comprometido en caso de falla del talud.

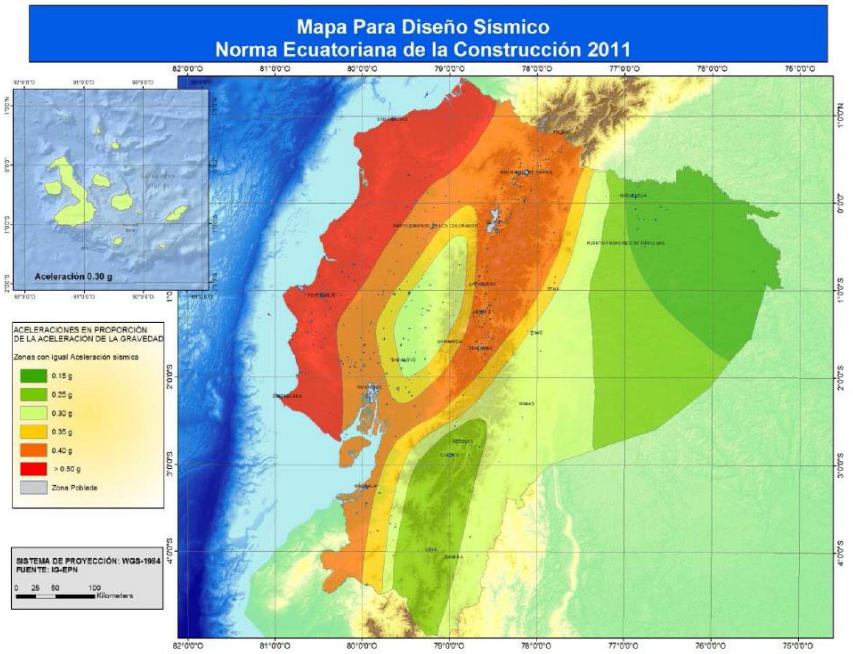
2.3 Consideraciones sísmicas

Una vez que se ha procedido con el diseño de estabilización y se ha verificado el FS en condiciones estáticas, se procede a verifica el FS para condiciones sísmicas. El proyecto se encuentra ubicado en la zona sísmica VI, de acuerdo con la recomendación de la Norma Ecuatoriana de Construcción, el coeficiente de aceleración sísmica que se debe utilizar es de 0,50.

El método utiliza el mismo procedimiento general de cualquiera de los métodos de equilibrio límite, con la diferencia de que se incluyen fuerzas al evento sísmico. Estas fuerzas sísmicas se asumen que son proporcionales al peso de la masa de deslizamiento potencial y de los coeficientes sísmicos kh y kv, expresada en términos de veces la aceleración g producida por el sismo. La magnitud del coeficiente sísmico debe simular la naturaleza de la fuerza del evento que depende de la intensidad o aceleración del sismo, duración del movimiento y frecuencia. Para nuestro caso, aplicando las recomendaciones de la Norma Ecuatoriana de Construcción, se aplica el 60% de la aceleración máxima utilizamos kh = (0,60*0,50) =0.30 y Kv= 0,20.

Cuando se realiza el cálculo del Factor de seguridad bajo la acción sísmica se debe utilizar toda la resistencia del suelo.

Figura 3: Zonas Sísmicas



Zona sísmica	I	II	III	IV	V	VI
Valor factor Z	0.15	0.25	0.30	0.35	0.40	≥ 0.50
Caracterización de la amenaza sísmica	Intermedia	Alta	Alta	Alta	Alta	Muy Alta

Nota: La demanda sísmica para los análisis pseudoestáticos será del 60% de la aceleración máxima en el terreno, kh = 0,6 (amax)/g, donde amax = ZFa.

2.4 Asentamiento

Análisis mediante el módulo edométrico. La ecuación para calcular la compresión de una i-ésima capa de suelo debajo de la cimentación que tiene un espesor h surge de la definición de módulo edométrico Eoed:

$$S_i = \sum \frac{\sigma_{z,i} h_i}{E_{oed,i}}$$

donde:

σz,i - componente vertical de la tensión incremental en el centro de la i-ésima capa

hi - espesor de la i-ésima capa

Eoed,i - módulo edométrico de la i-ésima capa

El módulo edométrico Eoed se puede especificar para cada suelo como constante o con la ayuda de una curva edométrica (relación σef/ε). Cuando se utiliza la curva edométrica, el programa asume para cada capa el valor de Eoed correspondiente a un rango dado de tensión original y final. Si el valor del módulo edométrico Eoed no está disponible, es posible introducir el módulo de deformación Edef y el programa realiza la transformación respectiva.

$$E_{oed} = \frac{E_{def}}{\beta}$$

$$\beta = 1 - \frac{2.\nu^2}{1-\nu}$$

donde: ν - Relación de Poisson

E_{def} - Módulo de deformación

Análisis de consolidación.- Se realiza el análisis de consolidación en el marco "Construcción". La capa consolidada, formada por un suelo permeable inferior impermeable, se asienta posteriormente con el aumento del tiempo. La consolidación afecta los valores de presión de los poros. Los parámetros del suelo que influyen en el análisis de consolidación se ingresan en el marco "Suelos", otros parámetros de consolidación se establecen en el marco "Análisis" en etapas de construcción individuales. El coeficiente de consolidación depende de las propiedades del suelo, se calcula:

$$c_v = \frac{E_{oed}.k}{\gamma_w}$$

donde E_{oed} - Módulo edométrico

k - Coeficiente de permeabilidad

γ_w - Peso unitario del agua

Cuando la capa consolidada está compuesta por un suelo no homogéneo, el coeficiente C_v se evalúa como un promedio de los coeficientes del suelo.

El análisis de consolidación también está influenciado por factores de tiempo, que dependen de la trayectoria de salida del agua. Esta trayectoria es igual al espesor de la capa consolidada en caso de salida en una sola dirección (hacia arriba o hacia abajo) o la mitad del espesor en el caso de salida en ambas direcciones (hacia arriba y hacia abajo). El factor en tiempo real se evalúa de acuerdo con la siguiente fórmula:

$$T_v = \frac{c_v.t}{H^2}$$

donde: C_v - Coeficiente de consolidación

t - Tiempo real

H - Trayectoria de drenaje

El factor tiempo de la duración de la compilación está influenciado por la duración de la acción de carga. Cuando se introduce toda la carga al principio de la etapa, el tiempo de compilación es igual a cero. Cuando la carga aumenta linealmente durante la duración de la etapa, el tiempo de compilación es igual al tiempo de duración de la etapa. El factor tiempo de duración de la compilación se calcula mediante la fórmula:

$$T_c = \frac{c_v.t_c}{H^2}$$

donde: C_v - Coeficiente de consolidación

t_c - Tiempo de construcción

H - Trayectoria de drenaje

El grado de consolidación se evalúa mediante las siguientes fórmulas:

por: $T_v \le T_c$

$$U_{av} = \frac{T_v}{T_c}\left\{1 - \frac{2}{T_v}\sum_{m=0}^{m=\infty}\frac{1}{M^4}\left[1-\exp\left(-M^2.T_v\right)\right]\right\}$$

por: $T_v > T_c$

$$U_{av} = 1 - \frac{2}{T_c}\sum_{m=0}^{m=\infty}\frac{1}{M^4}\left[\exp\left(M^2.T_c\right)-1\right]\exp\left(-M^2.T_v\right)$$

Donde:

$$M = (2m+1)\frac{\pi}{2}$$

donde: Tv - Factor de tiempo real

Tc - Factor de tiempo de duración de construcción

El valor original de deformación en una capa consolidada en determinada etapa de construcción se multiplica por el correspondiente grado de consolidación Uav para obtener el valor de resultado de la deformación:

$$\varepsilon_{fin} = U_{av}.\varepsilon$$

donde: ε_{fin} - Resultado del valor de deformación

ε - Valor original de la deformación

U_{av} - Grado de consolidación

El análisis de consolidación también influye en los valores de presión de poro en la capa consolidada. En el momento de introducir la acción de carga, los valores de presión de poro son los más altos. Cuando el tiempo aumenta hasta el infinito teórico, la presión de los poros disminuye a cero.

Presión de poro:

para: $T_v \le T_c$

$$u = \sum_{m=0}^{m=\infty} \frac{2.u_0}{M^3.T_c}.\sin\frac{M.z}{H}\left[1-\exp\left(-M^2.T_v\right)\right]$$

para: $T_v > T_c$

$$u = \sum_{m=0}^{m=\infty} \frac{2.u_0}{M^3.T_c}.\left[\exp\left(M^2.T_c\right)-1\right]\sin\frac{M.z}{H}\exp\left(-M^2.T_v\right)$$

donde:

$$M = (2m+1)\frac{\pi}{2}$$

donde: Tv - Facto de tiempo real

Tc - Factor de tiempo de duración de construcción

H - Trayectoria de drenaje

z - profundidad, donde se evalúa el valor de la presión de poro

$u0$ - Cambio de tensión efectiva en comparación con la etapa anterior (carga)

3. RESULTADOS DEL ANÁLISIS DE ESTABILIDAD DEL TALUDES

En la Tabla N°3.1 se resumen los resultados obtenidos para diferentes superficies de falla y condiciones analizadas, que permiten la verificación de los diseños para la estabilidad del Talud.

Tabla 3.1 : Factores de seguridad recomendados NEVI 2013

Talud	Método	Estático	Sismo kh=0.30 kv=0.20
Abscisa Km 7+220	Morgenstern-Price	1.625	1.190
Abscisa Km 7+305	Morgenstern-Price	1.498	1.166
Estribo Derecho Abscisa Km 7+245	Morgenstern-Price	5.07	2.543
Estribo Izquierdo Abscisa Km 7+295	Morgenstern-Price	5.98	1.513

El detalle del cálculo, la salida del software aplicado se puede observar en el Anexo: **Cálculos**:

Se evalúa la estabilidad del talud a través de analizar el factor de seguridad según la aplicación de la teoría de Morgenstern-Price.

La leyenda se refiere al consumo o utilización de los parámetros resistentes para mantener estable el talud, Es decir una utilización del 100% equivale a un Factor de seguridad igual a la unidad.

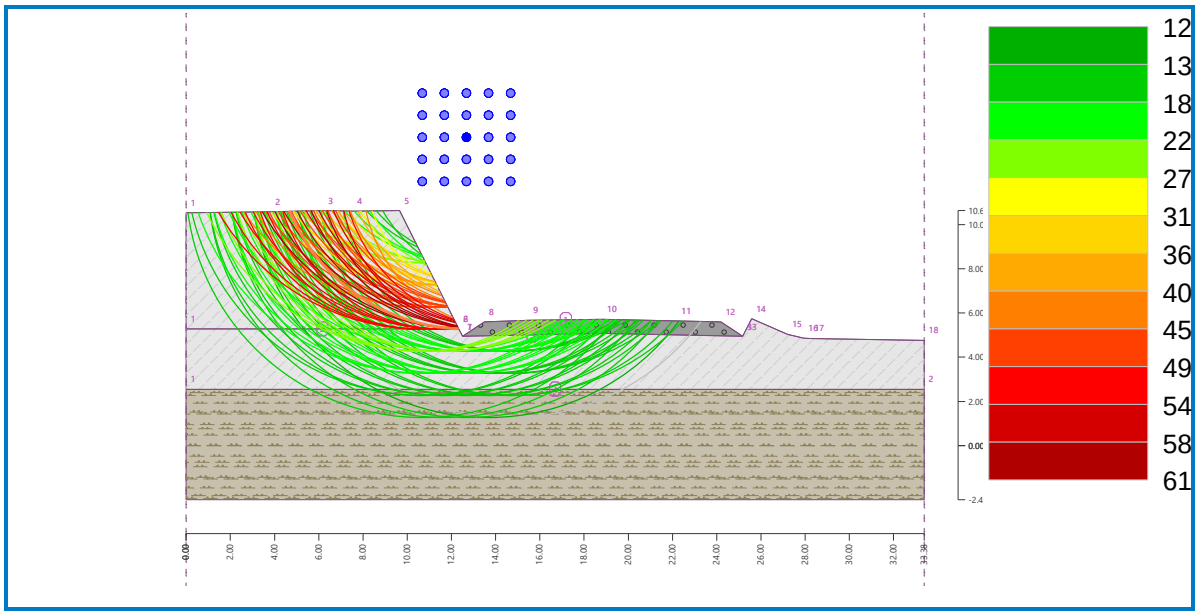


Figura 4: Talud Abscisa Km 7+220 condición estática

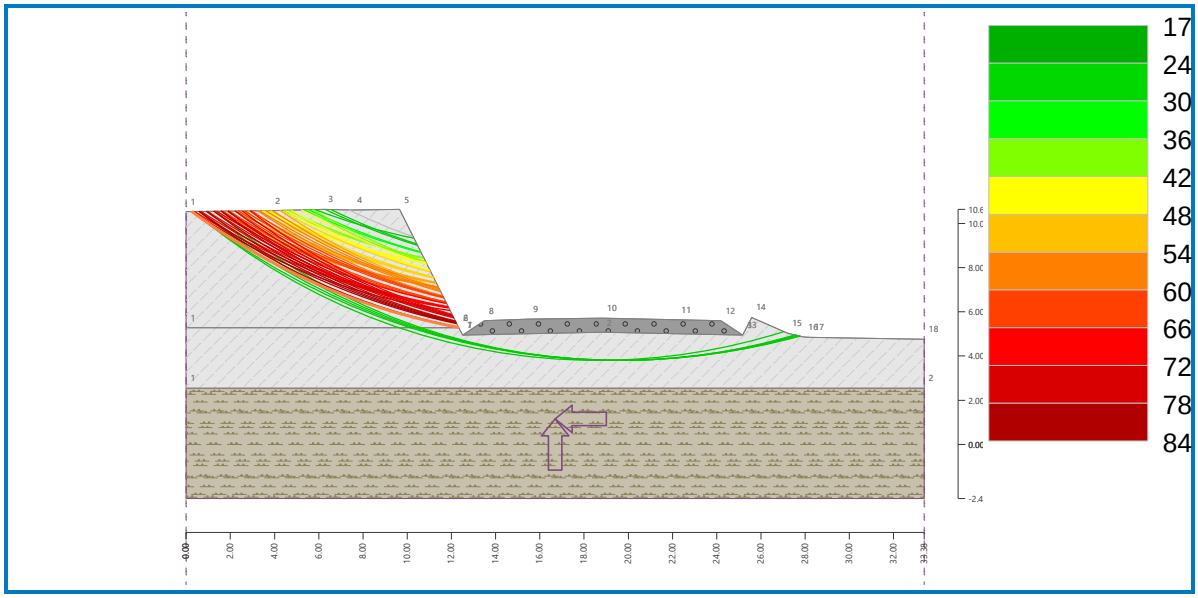


Figura 5: Talud Abscisa km 7+220 condición carga sísmica

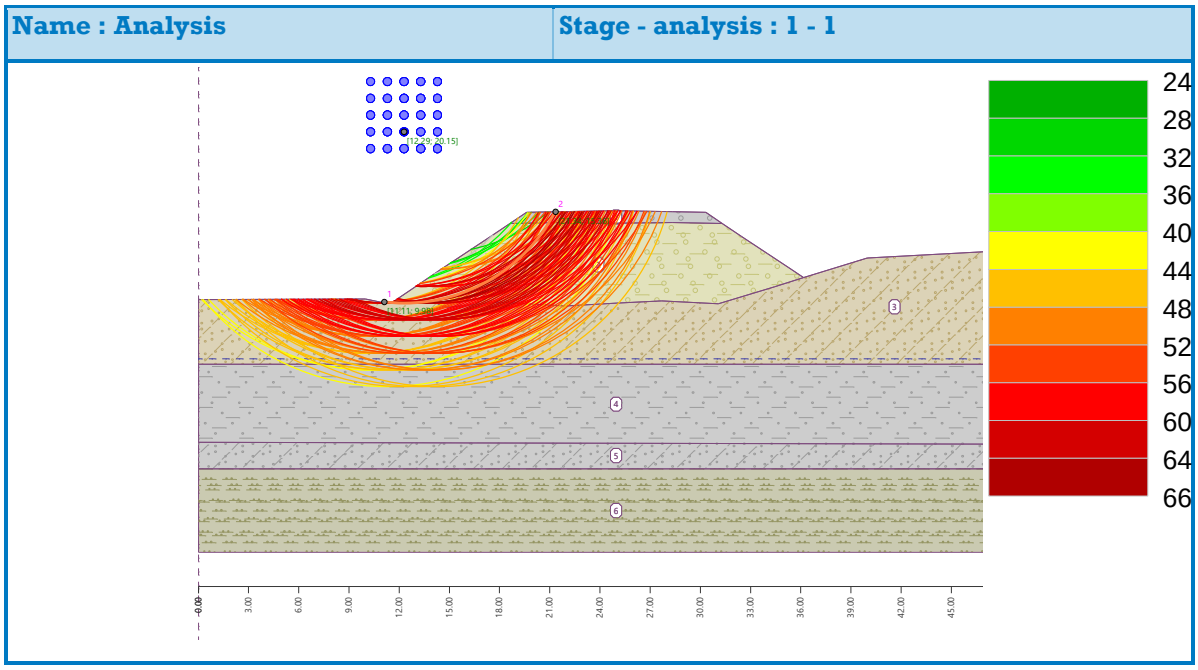


Figura 6: Talud terraplén Abscisa km 7+305 condición carga estática

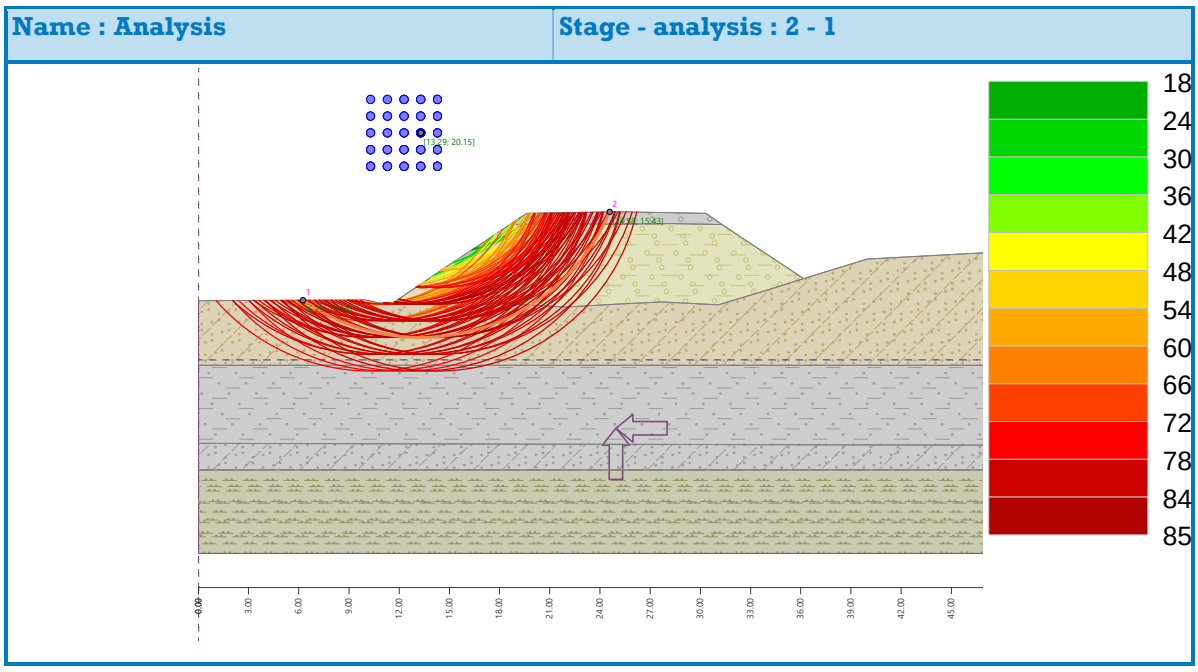


Figura 7: Talud terraplén Abscisa km 7+305 condición carga con sismo

Los factores de seguridad obtenidos en condiciones estáticas son mayores a 1,2 por lo que se cumple con las nomas NEVI-2013 para taludes viales. Los factores de seguridad obtenidos son mayores o prácticamente iguales a 1.00 que acorde con esta Normativa Ecuatoriana es suficiente para asegurar la estabilidad del Talud a carga sísmica.

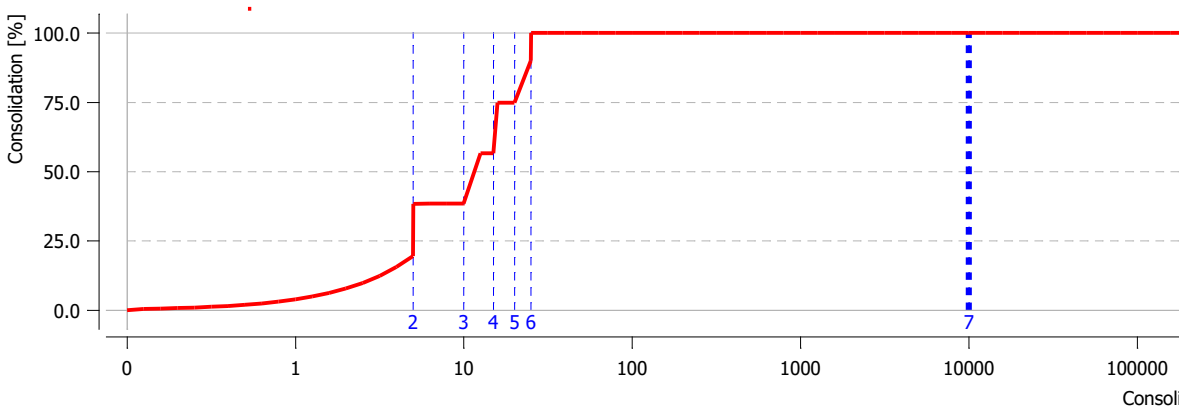
4. RESUMEN DE RESULTADOS DE ASENTAMIENTO DE TERRAPLEN

A continuación se presenta a los resultados obtenidos estimando los asentamientos del terraplén dividido en 7 etapas de construcción

Tabla 4.1 : Resumen de resultados en el cálculo del Factor de Seguridad.

Etapa	Cota de recrecimiento terraplén msnm	Asentamiento total (mm)
1	6.45	0.0
2	7.44	12.5
3	8.44	39.1
4	9.42	68.8
5	10.43	102.3
6	11.34	142.0
7	11.98	173.8

Graph of consolidation



Graph of consolidation in the location of maximum settlement (X = -1.52 m)

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 173.8 mm
Maximum depth of influence zone = 12.04 m

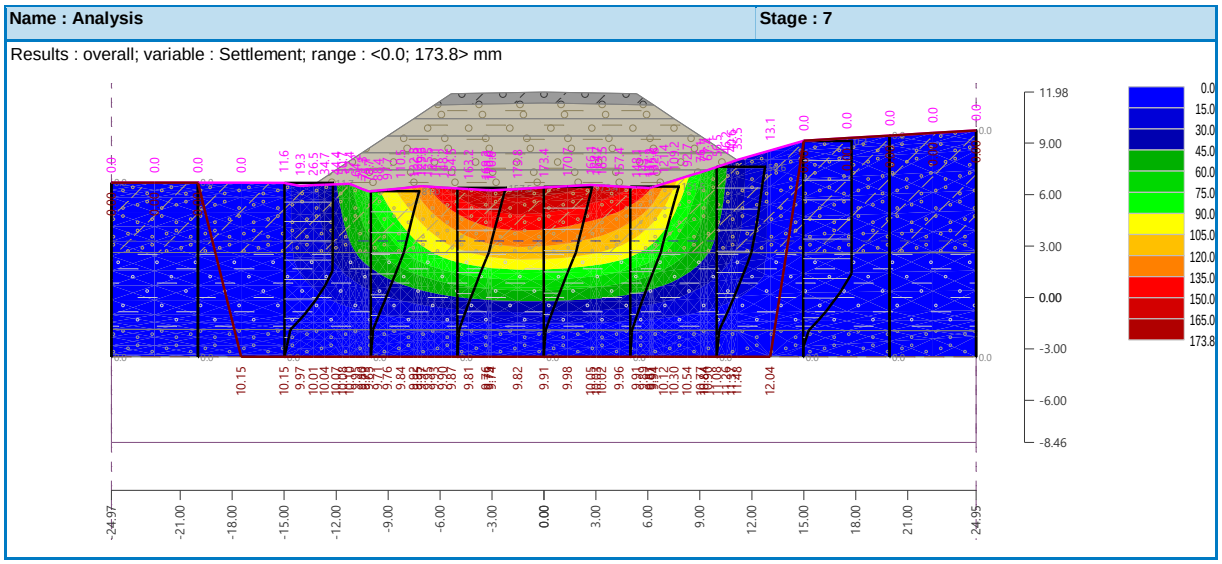


Figura 8: Asentamiento de terraplén en siete etapas de construcción

5. CONCLUSIONES Y RECOMENDACIONES

Se ha determinado que los taludes tienen un factor de seguridad mayor a los mínimos recomendados por las normas NEVI -2013 y NEC, por lo que se recomienda su construcción.

El terraplén se construirá con material proveniente de la cantera Villamil Rock que cumple con las normas como material de mejoramiento y material de relleno de las especificaciones MOP-001-*F-2002.

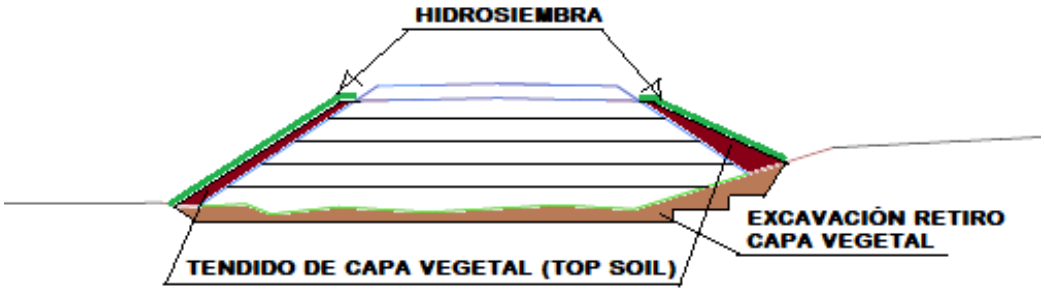
Para mantener la estabilidad a largo plazo de los taludes de corte y del terraplén, se recomienda el siguiente proceso constructivo:

Control de escorrentía superficial. Se debe construir las cunetas que recojan las aguas de escorrentía superficial de lluvias, provenientes de las zonas altas y controladamente por medio de bajantes se entregue a las quebradas aledañas o en su caso a las cunetas de la vía existente.

Control de erosión. Las áreas que queden desprovista de vegetación por la construcción son susceptibles a la erosión, por lo que deben ser tratados con una capa hidrosiembra para una rápida recuperación de la vegetación.

Se recomienda que previo a la construcción del terraplén se retire la capa de suelo vegetal (50 cm) y el volumen excavado acopiar al pie del talud para proceder luego a extenderlo en el talud del terraplén y finalmente sobre este realizar una proyección de hidrosiembra. El rubro es:

206 (5) Hidrosiembras ..... 3,152.71 Metros cuadrados



Prevención de asentamiento. De acuerdo a los análisis de asentamientos realizados se determina que el terraplén de acceso al puente se deformará 17 cm aproximadamente en 45-50 días, por lo que se recomienda que la construcción de la capa de rodadura se realice después de este tiempo, para con esto corregir los posibles desniveles ocasionados por efecto de la sobre carga por efecto del relleno.

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ANEXO

TALUD ABSCISA KM 7+ 220

Slope stability analysis

Input data

Project

Task : Vía San Antonio - San Miguel

Part : Talud absicisa Km 7+220

Description : Verificación de la estabilidad del talud

Author : P. Ludeña

Date : 22/12/2022

Settings

USA - LRFD

Stability analysis

Verification methodology : according to LRFD

Earthquake analysis : Standard

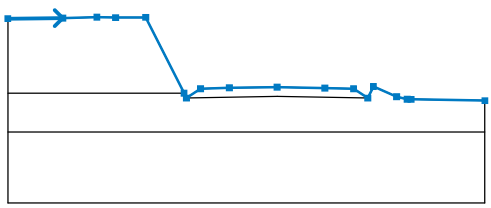
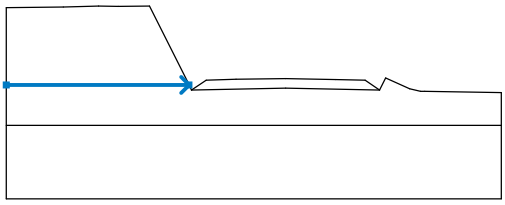
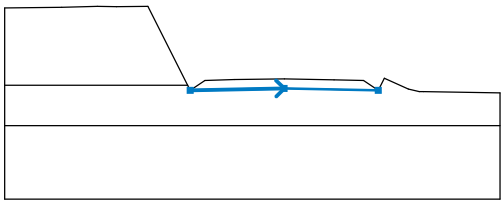
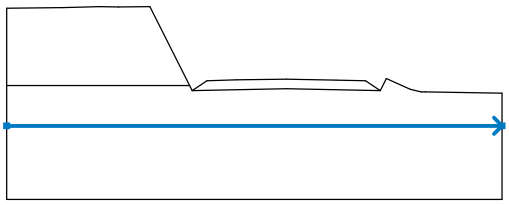
Load factors					
Design situation - Service I					
		Minimum		Maximum	
Earth surcharge load (permanent) :	ES =	1.00	[–]	1.00	[–]
Live load surcharge :	LL =	0.00	[–]	1.00	[–]

Resistance factors			
Design situation - Service I			
Resistance factor on stability :	ϕ_{SS} =	0.65	[–]

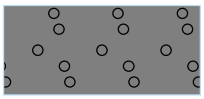
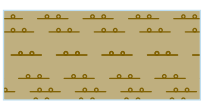
Load factors					
Design situation - Extreme I					
		Minimum		Maximum	
Earth surcharge load (permanent) :	ES =	0.75	[–]	1.50	[–]
Live load surcharge :	LL =	0.00	[–]	1.75	[–]

Resistance factors			
Design situation - Extreme I			
Resistance factor on stability :	ϕ_{SS} =	0.90	[–]

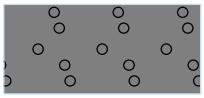
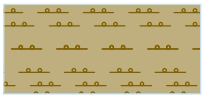
Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		0.00	10.54	3.84	10.58	6.23	10.64
		7.54	10.61	9.65	10.63	12.33	5.28
		12.50	4.94	13.49	5.60	15.50	5.67
		18.84	5.71	22.19	5.64	24.19	5.60
		25.18	4.94	25.58	5.75	27.20	5.03
		27.94	4.86	28.22	4.85	33.38	4.76
2		0.00	5.28	12.33	5.28		
3		12.50	4.94	18.84	5.07	25.18	4.94
4		0.00	2.55	33.38	2.55		

Soil parameters - effective stress state

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m^3]
1	Estructura de Pavimento		41.50	0.00	21.00
2	Roca sedimentaria meteorizada		32.00	200.00	20.00

Soil parameters - uplift

No.	Name	Pattern	γ_{sat} [kN/m³]	γ_s [kN/m³]	n [–]
1	Estructura de Pavimento		21.00		
2	Roca sedimentaria meteorizad		21.00		

Soil parameters - total stress state

No.	Name	Pattern	c_u [kPa]	γ [kN/m³]
1	Suelo residual limoso de alta plasticidad de consistencia media		52.30	20.00
2	Suelo residual arcilloso de consitencia firme		190.00	20.00

Soil parameters

Suelo residual limoso de alta plasticidad de consistencia media

Unit weight : γ = 20.00 kN/m³

Stress-state : total

Cohesion of soil : c_u = 52.30 kPa

Suelo residual arcilloso de consitencia firme

Unit weight : γ = 20.00 kN/m³

Stress-state : total

Cohesion of soil : c_u = 190.00 kPa

Estructura de Pavimento

Unit weight : γ = 21.00 kN/m³

Stress-state : effective

Angle of internal friction : φ_{ef} = 41.50 °

Cohesion of soil : c_{ef} = 0.00 kPa

Saturated unit weight : γ_{sat} = 21.00 kN/m³

Roca sedimentaria meteorizad

Unit weight : γ = 20.00 kN/m³

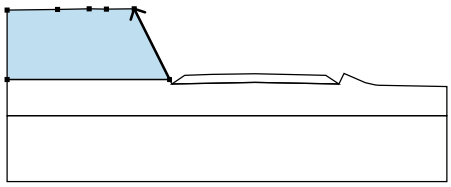
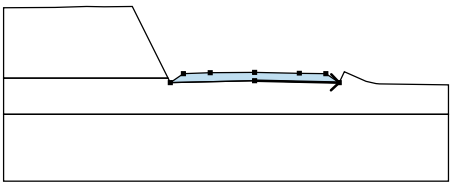
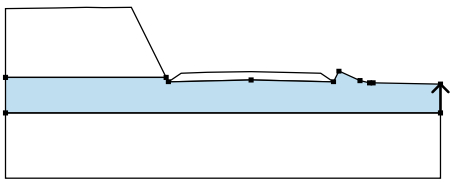
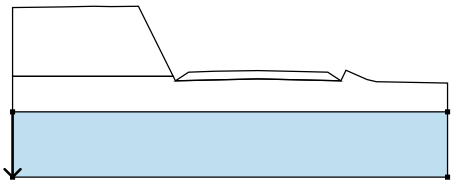
Stress-state : effective

Angle of internal friction : φ_{ef} = 32.00 °

Cohesion of soil : c_{ef} = 200.00 kPa

Saturated unit weight : γ_{sat} = 21.00 kN/m³

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		12.33	5.28	9.65	10.63	Suelo residual limoso de alta plasticidad de consistencia media
		7.54	10.61	6.23	10.64	
		3.84	10.58	0.00	10.54	
		0.00	5.28			
2		18.84	5.07	25.18	4.94	Estructura de Pavimento
		24.19	5.60	22.19	5.64	
		18.84	5.71	15.50	5.67	
		13.49	5.60	12.50	4.94	
3		33.38	2.55	33.38	4.76	Suelo residual arcilloso de consitencia firme
		28.22	4.85	27.94	4.86	
		27.20	5.03	25.58	5.75	
		25.18	4.94	18.84	5.07	
		12.50	4.94	12.33	5.28	
		0.00	5.28	0.00	2.55	
4		0.00	2.55	0.00	-2.45	Roca sedimentaria meteorizad
		33.38	-2.45	33.38	2.55	

Water

Water type : No water

Tensile crack

Tensile crack not input.

Earthquake

Earthquake not included.

Settings of the stage of construction

Design situation : Service I

Results (Stage of construction 1)

Analysis 1 (stage 1)

Circular slip surface

Slip surface parameters							
Center :	x =	12.68	[m]	Angles :	α_1 =	-67.30	[°]
	z =	13.95	[m]		α_2 =	-2.30	[°]
Radius :	R =	8.68	[m]				
The slip surface after optimization.							

Slope stability verification (Morgenstern-Price)

Utilization : 61.5 %

CDR CDR: 1.625

Slope stability ACCEPTABLE

Optimization of circular slip surface (Morgenstern-Price)

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
1	24.64	30.47	28.01	54.0 %	**ACCEPTABLE**
2	24.64	30.47	28.01	54.0 %	**ACCEPTABLE**
3	24.64	30.47	28.01	54.0 %	**ACCEPTABLE**
4	11.36	15.12	12.07	18.8 %	**ACCEPTABLE**
5	10.25	10.83	10.06	12.8 %	**ACCEPTABLE**
6	23.31	61.35	55.82	30.0 %	**ACCEPTABLE**
7	24.34	49.40	45.69	48.8 %	**ACCEPTABLE**
8	24.64	30.47	28.01	54.0 %	**ACCEPTABLE**
9	12.64	21.59	16.42	42.1 %	**ACCEPTABLE**
10	10.00	12.77	9.76	19.2 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
11	22.98	23.14	18.55	5.8 %	**ACCEPTABLE**
12	26.17	66.72	61.76	31.3 %	**ACCEPTABLE**
13	24.64	30.47	28.01	54.0 %	**ACCEPTABLE**
14	13.10	20.32	14.81	53.1 %	**ACCEPTABLE**
15	10.56	13.43	9.07	24.2 %	**ACCEPTABLE**
16	21.86	23.61	19.13	25.9 %	**ACCEPTABLE**
17	23.79	49.29	44.46	36.8 %	**ACCEPTABLE**
18	24.64	30.47	28.01	54.0 %	**ACCEPTABLE**
19	9.58	26.03	16.82	7.2 %	**ACCEPTABLE**
20	13.74	19.87	14.25	52.5 %	**ACCEPTABLE**
21	6.97	11.68	4.18	4.7 %	**ACCEPTABLE**
22	11.32	14.32	9.18	37.3 %	**ACCEPTABLE**
23	10.05	13.56	4.35	13.1 %	**ACCEPTABLE**
24	21.23	23.96	19.61	36.3 %	**ACCEPTABLE**
25	13.30	12.21	6.65	55.1 %	**ACCEPTABLE**
26	7.92	12.06	3.37	4.9 %	**ACCEPTABLE**
27	29.41	44.90	42.16	38.5 %	**ACCEPTABLE**
28	15.40	12.31	6.82	29.7 %	**ACCEPTABLE**
29	14.60	17.56	11.94	52.7 %	**ACCEPTABLE**
30	13.30	12.21	6.65	55.1 %	**ACCEPTABLE**
31	225.59	345.95	401.09	35.8 %	**ACCEPTABLE**
32	9.24	11.80	3.88	21.6 %	**ACCEPTABLE**
33	21.29	26.54	22.39	45.0 %	**ACCEPTABLE**
34	11.31	10.95	5.78	37.6 %	**ACCEPTABLE**
35	15.18	12.69	7.33	40.8 %	**ACCEPTABLE**
36	14.95	12.45	7.05	41.8 %	**ACCEPTABLE**
37	14.33	15.67	10.14	54.6 %	**ACCEPTABLE**
38	13.30	12.21	6.65	55.1 %	**ACCEPTABLE**
39	32.07	37.62	37.54	45.1 %	**ACCEPTABLE**
40	21.84	24.18	20.86	49.2 %	**ACCEPTABLE**
41	13.05	12.63	7.35	60.6 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
42	19.13	23.46	19.02	51.0 %	ACCEPTABLE
43	10.22	12.29	5.38	38.1 %	ACCEPTABLE
44	15.31	17.54	12.33	55.8 %	ACCEPTABLE
45	11.37	11.45	6.32	37.4 %	ACCEPTABLE
46	14.44	13.37	8.07	54.1 %	ACCEPTABLE
47	13.69	12.46	7.09	56.1 %	ACCEPTABLE
48	13.30	14.43	9.03	59.3 %	ACCEPTABLE
49	13.05	12.63	7.35	60.6 %	ACCEPTABLE
50	17.15	18.98	14.42	56.6 %	ACCEPTABLE
51	15.39	16.55	11.62	58.9 %	ACCEPTABLE
52	12.10	11.99	6.84	43.5 %	ACCEPTABLE
53	14.58	13.58	8.55	57.8 %	ACCEPTABLE
54	14.01	12.92	7.80	58.8 %	ACCEPTABLE
55	13.73	14.26	9.09	61.2 %	ACCEPTABLE
56	19.13	23.30	19.13	55.1 %	ACCEPTABLE
57	11.50	13.85	7.42	47.1 %	ACCEPTABLE
58	16.48	19.33	14.56	57.6 %	ACCEPTABLE
59	13.05	14.19	8.97	57.6 %	ACCEPTABLE
60	12.36	13.15	7.95	48.3 %	ACCEPTABLE
61	15.37	15.50	10.58	57.8 %	ACCEPTABLE
62	14.56	14.46	9.39	59.1 %	ACCEPTABLE
63	14.35	16.14	11.02	60.4 %	ACCEPTABLE
64	13.73	14.26	9.09	61.2 %	ACCEPTABLE
65	12.08	13.79	7.75	52.4 %	ACCEPTABLE
66	17.70	20.17	15.89	55.5 %	ACCEPTABLE
67	12.19	13.96	7.92	52.4 %	ACCEPTABLE
68	16.37	18.31	13.73	54.9 %	ACCEPTABLE
69	13.68	14.56	9.52	51.2 %	ACCEPTABLE
70	13.15	13.82	8.74	48.7 %	ACCEPTABLE
71	15.51	15.68	10.96	54.6 %	ACCEPTABLE
72	12.35	13.02	6.98	52.6 %	ACCEPTABLE

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
73	14.92	14.94	10.09	54.8 %	ACCEPTABLE
74	12.94	12.47	7.39	47.5 %	ACCEPTABLE
75	12.66	12.11	7.03	45.0 %	ACCEPTABLE
76	13.77	13.51	8.49	51.8 %	ACCEPTABLE
77	14.77	16.08	11.19	53.8 %	ACCEPTABLE
78	81.81	97.08	115.13	47.2 %	ACCEPTABLE
79	83.51	110.46	127.00	49.1 %	ACCEPTABLE
80	13.73	14.26	9.09	61.2 %	ACCEPTABLE
81	12.72	14.11	8.34	55.5 %	ACCEPTABLE
82	16.97	18.55	14.25	51.2 %	ACCEPTABLE
83	12.68	14.05	8.28	55.5 %	ACCEPTABLE
84	16.24	17.59	13.11	14.7 %	ACCEPTABLE
85	14.22	14.91	10.05	48.9 %	ACCEPTABLE
86	13.84	14.40	9.48	48.1 %	ACCEPTABLE
87	15.61	15.80	11.22	50.5 %	ACCEPTABLE
88	12.78	13.41	7.65	55.6 %	ACCEPTABLE
89	15.19	15.29	10.61	18.1 %	ACCEPTABLE
90	13.59	13.31	8.37	47.3 %	ACCEPTABLE
91	13.34	13.01	8.04	46.4 %	ACCEPTABLE
92	14.29	14.18	9.34	49.1 %	ACCEPTABLE
93	15.09	16.07	11.35	50.5 %	ACCEPTABLE
94	12.25	13.44	7.65	55.5 %	ACCEPTABLE
95	13.73	14.26	9.09	61.2 %	ACCEPTABLE
96	13.10	14.23	8.66	57.5 %	ACCEPTABLE
97	12.71	13.19	7.59	57.6 %	ACCEPTABLE
98	16.55	17.63	13.32	13.1 %	ACCEPTABLE
99	13.02	14.11	8.54	57.6 %	ACCEPTABLE
100	16.13	17.09	12.68	14.2 %	ACCEPTABLE
101	14.67	15.22	10.50	19.8 %	ACCEPTABLE
102	12.42	13.28	7.67	57.7 %	ACCEPTABLE
103	14.39	14.86	10.10	21.1 %	ACCEPTABLE

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
104	12.82	13.33	7.74	57.6 %	**ACCEPTABLE**
105	15.69	15.89	11.40	15.2 %	**ACCEPTABLE**
106	13.09	13.68	8.11	57.5 %	**ACCEPTABLE**
107	15.39	15.54	10.98	16.0 %	**ACCEPTABLE**
108	14.16	14.02	9.23	22.0 %	**ACCEPTABLE**
109	13.96	13.78	8.96	23.4 %	**ACCEPTABLE**
110	14.72	14.71	10.02	18.9 %	**ACCEPTABLE**
111	15.33	16.06	11.47	16.7 %	**ACCEPTABLE**
112	12.74	13.72	8.12	57.6 %	**ACCEPTABLE**
113	82.04	100.65	118.23	45.7 %	**ACCEPTABLE**
114	13.73	14.26	9.09	61.2 %	**ACCEPTABLE**
115	13.33	14.27	8.83	58.7 %	**ACCEPTABLE**
116	13.03	13.52	8.05	58.8 %	**ACCEPTABLE**
117	15.45	16.30	11.64	17.5 %	**ACCEPTABLE**
118	13.25	14.16	8.72	58.9 %	**ACCEPTABLE**
119	15.21	15.99	11.29	51.0 %	**ACCEPTABLE**
120	12.65	13.35	7.85	58.9 %	**ACCEPTABLE**
121	14.37	14.91	10.05	50.1 %	**ACCEPTABLE**
122	12.82	13.58	8.10	59.0 %	**ACCEPTABLE**
123	14.18	14.67	9.78	49.9 %	**ACCEPTABLE**
124	13.12	13.63	8.18	58.9 %	**ACCEPTABLE**
125	13.30	13.87	8.43	58.7 %	**ACCEPTABLE**
126	14.81	15.08	10.31	50.4 %	**ACCEPTABLE**
127	13.17	13.36	8.13	61.5 %	**ACCEPTABLE**
128	12.78	13.34	7.86	59.1 %	**ACCEPTABLE**
129	14.60	15.01	10.19	50.6 %	**ACCEPTABLE**
130	12.73	13.28	7.80	59.1 %	**ACCEPTABLE**
131	14.40	14.75	9.90	50.3 %	**ACCEPTABLE**
132	13.74	13.92	8.97	48.7 %	**ACCEPTABLE**
133	13.58	13.71	8.74	48.2 %	**ACCEPTABLE**
134	14.27	14.22	9.36	49.8 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
135	14.10	14.02	9.13	49.5 %	ACCEPTABLE
136	13.50	13.28	8.30	48.1 %	ACCEPTABLE
137	13.36	13.12	8.13	47.2 %	ACCEPTABLE
138	13.78	13.63	8.69	48.7 %	ACCEPTABLE
139	14.05	14.31	9.41	49.2 %	ACCEPTABLE
140	82.33	101.62	119.08	47.9 %	ACCEPTABLE
141	82.83	105.58	122.60	48.7 %	ACCEPTABLE
142	13.17	13.36	8.13	61.5 %	ACCEPTABLE
143	12.91	13.36	7.96	59.9 %	ACCEPTABLE
144	14.07	14.39	9.42	51.8 %	ACCEPTABLE
145	12.87	13.31	7.91	59.9 %	ACCEPTABLE
146	13.95	14.24	9.25	51.9 %	ACCEPTABLE
147	13.55	13.73	8.68	51.3 %	ACCEPTABLE
148	13.44	13.59	8.54	50.2 %	ACCEPTABLE
149	13.88	13.92	8.92	51.9 %	ACCEPTABLE
150	12.91	13.13	7.74	59.9 %	ACCEPTABLE
151	13.78	13.79	8.78	51.3 %	ACCEPTABLE
152	13.39	13.32	8.26	50.2 %	ACCEPTABLE
153	13.30	13.20	8.13	49.8 %	ACCEPTABLE
154	13.58	13.55	8.51	50.9 %	ACCEPTABLE
155	13.74	13.98	8.95	52.0 %	ACCEPTABLE
156	12.77	13.16	7.76	60.0 %	ACCEPTABLE
157	13.17	13.36	8.13	61.5 %	ACCEPTABLE
158	13.00	13.37	8.02	60.3 %	ACCEPTABLE
159	13.75	14.02	8.96	53.4 %	ACCEPTABLE
160	12.97	13.32	7.98	60.5 %	ACCEPTABLE
161	13.67	13.92	8.85	53.4 %	ACCEPTABLE
162	13.42	13.61	8.50	53.0 %	ACCEPTABLE
163	13.35	13.52	8.40	53.0 %	ACCEPTABLE
164	12.92	13.12	7.77	60.4 %	ACCEPTABLE
165	13.64	13.73	8.65	53.6 %	ACCEPTABLE

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
166	13.00	13.21	7.87	60.4 %	**ACCEPTABLE**
167	13.57	13.64	8.55	53.4 %	**ACCEPTABLE**
168	13.32	13.34	8.22	52.7 %	**ACCEPTABLE**
169	13.26	13.25	8.13	51.9 %	**ACCEPTABLE**
170	13.44	13.48	8.38	52.7 %	**ACCEPTABLE**
171	13.54	13.76	8.67	53.0 %	**ACCEPTABLE**
172	12.90	13.23	7.88	60.5 %	**ACCEPTABLE**
173	13.17	13.36	8.13	61.5 %	**ACCEPTABLE**
174	13.06	13.37	8.06	60.7 %	**ACCEPTABLE**
175	12.98	13.17	7.86	60.8 %	**ACCEPTABLE**
176	13.55	13.79	8.67	55.0 %	**ACCEPTABLE**
177	13.04	13.34	8.03	60.8 %	**ACCEPTABLE**
178	13.50	13.73	8.60	55.0 %	**ACCEPTABLE**
179	13.34	13.52	8.37	54.8 %	**ACCEPTABLE**
180	12.92	13.19	7.87	60.8 %	**ACCEPTABLE**
181	13.29	13.46	8.31	54.4 %	**ACCEPTABLE**
182	13.01	13.20	7.89	60.8 %	**ACCEPTABLE**
183	13.48	13.60	8.47	55.2 %	**ACCEPTABLE**
184	13.05	13.26	7.95	60.7 %	**ACCEPTABLE**
185	13.43	13.54	8.41	54.4 %	**ACCEPTABLE**
186	13.02	13.13	7.88	61.5 %	**ACCEPTABLE**
187	13.27	13.35	8.19	55.1 %	**ACCEPTABLE**
188	13.23	13.29	8.13	54.7 %	**ACCEPTABLE**
189	13.35	13.44	8.30	54.4 %	**ACCEPTABLE**
190	13.42	13.62	8.48	55.1 %	**ACCEPTABLE**
191	12.99	13.27	7.96	60.8 %	**ACCEPTABLE**
192	82.46	101.20	118.83	48.1 %	**ACCEPTABLE**
193	82.43	101.20	118.83	47.3 %	**ACCEPTABLE**
194	13.17	13.36	8.13	61.5 %	**ACCEPTABLE**
195	13.10	13.36	8.08	61.0 %	**ACCEPTABLE**
196	13.04	13.23	7.95	61.1 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
197	13.42	13.64	8.48	56.8 %	**ACCEPTABLE**
198	13.08	13.34	8.06	61.1 %	**ACCEPTABLE**
199	13.39	13.60	8.44	56.4 %	**ACCEPTABLE**
200	12.97	13.20	7.91	61.1 %	**ACCEPTABLE**
201	13.28	13.47	8.29	56.8 %	**ACCEPTABLE**
202	13.00	13.24	7.95	61.0 %	**ACCEPTABLE**
203	13.25	13.43	8.25	56.4 %	**ACCEPTABLE**
204	13.06	13.25	7.97	61.1 %	**ACCEPTABLE**
205	13.37	13.52	8.36	55.9 %	**ACCEPTABLE**
206	13.09	13.29	8.01	61.0 %	**ACCEPTABLE**
207	13.34	13.48	8.31	56.4 %	**ACCEPTABLE**
208	13.07	13.20	7.96	61.5 %	**ACCEPTABLE**
209	13.00	13.20	7.91	61.0 %	**ACCEPTABLE**
210	13.31	13.47	8.30	55.9 %	**ACCEPTABLE**
211	12.98	13.18	7.89	61.1 %	**ACCEPTABLE**
212	13.28	13.43	8.26	56.0 %	**ACCEPTABLE**
213	13.18	13.31	8.12	56.4 %	**ACCEPTABLE**
214	13.15	13.27	8.08	56.0 %	**ACCEPTABLE**
215	13.27	13.36	8.18	56.4 %	**ACCEPTABLE**
216	12.99	13.13	7.84	61.0 %	**ACCEPTABLE**
217	13.24	13.32	8.14	56.4 %	**ACCEPTABLE**
218	13.14	13.19	8.00	55.9 %	**ACCEPTABLE**
219	13.11	13.16	7.96	56.4 %	**ACCEPTABLE**
220	13.19	13.25	8.07	55.5 %	**ACCEPTABLE**
221	13.23	13.37	8.19	55.9 %	**ACCEPTABLE**
222	12.95	13.14	7.85	61.1 %	**ACCEPTABLE**
223	82.48	101.39	118.99	48.0 %	**ACCEPTABLE**
224	82.46	101.39	118.99	47.6 %	**ACCEPTABLE**
225	47.45	154.90	151.89	22.2 %	**ACCEPTABLE**
226	9.82	10.98	9.63	13.5 %	**ACCEPTABLE**
227	47.45	154.90	151.89	22.2 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
228	9.66	13.59	9.94	20.3 %	ACCEPTABLE
229	40.21	77.00	75.39	29.3 %	ACCEPTABLE
230	10.22	15.36	11.12	22.2 %	ACCEPTABLE
231	40.21	77.00	75.39	29.3 %	ACCEPTABLE
232	11.32	28.50	21.12	24.2 %	ACCEPTABLE
233	35.81	77.00	75.39	46.6 %	ACCEPTABLE
234	10.29	14.38	10.79	20.2 %	ACCEPTABLE
235	9.65	12.23	9.60	18.6 %	ACCEPTABLE
236	28.03	50.83	46.55	29.8 %	ACCEPTABLE
237	12.68	13.14	8.46	25.4 %	ACCEPTABLE
238	17.56	39.05	33.38	38.9 %	ACCEPTABLE
239	40.21	77.00	75.39	29.3 %	ACCEPTABLE
240	11.32	28.50	21.12	24.2 %	ACCEPTABLE
241	35.81	77.00	75.39	46.6 %	ACCEPTABLE
242	35.81	77.00	75.39	46.6 %	ACCEPTABLE
243	11.41	19.49	14.34	35.0 %	ACCEPTABLE
244	9.76	14.41	10.31	21.8 %	ACCEPTABLE
245	27.51	53.13	49.04	35.5 %	ACCEPTABLE
246	13.30	18.23	12.72	55.4 %	ACCEPTABLE
247	34.48	89.94	86.48	32.6 %	ACCEPTABLE
248	11.43	19.58	14.41	35.7 %	ACCEPTABLE
249	9.38	13.31	9.57	20.4 %	ACCEPTABLE
250	15.79	17.58	11.94	46.6 %	ACCEPTABLE
251	12.13	10.93	6.06	31.7 %	ACCEPTABLE
252	15.37	31.62	25.96	43.3 %	ACCEPTABLE
253	18.37	36.31	31.53	49.3 %	ACCEPTABLE
254	13.30	18.23	12.72	55.4 %	ACCEPTABLE
255	6.66	17.86	9.13	3.9 %	ACCEPTABLE
256	23.30	49.19	44.52	39.8 %	ACCEPTABLE
257	11.71	18.71	13.32	53.4 %	ACCEPTABLE
258	9.90	13.95	9.35	25.8 %	ACCEPTABLE

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
259	8.14	12.17	3.42	6.2 %	ACCEPTABLE
260	14.96	17.80	12.20	51.7 %	ACCEPTABLE
261	14.67	26.49	20.87	47.1 %	ACCEPTABLE
262	75.28	102.33	115.53	47.2 %	ACCEPTABLE
263	13.30	18.23	12.72	55.4 %	ACCEPTABLE
264	6.99	11.72	5.28	12.5 %	ACCEPTABLE
265	8.60	11.85	4.34	19.5 %	ACCEPTABLE
266	8.56	17.64	9.76	17.5 %	ACCEPTABLE
267	18.86	34.39	29.29	45.2 %	ACCEPTABLE
268	12.00	18.26	12.75	53.4 %	ACCEPTABLE
269	7.17	12.41	5.65	13.9 %	ACCEPTABLE
270	10.46	14.64	9.54	31.5 %	ACCEPTABLE
271	9.23	13.50	5.59	22.0 %	ACCEPTABLE
272	14.41	17.96	12.39	53.8 %	ACCEPTABLE
273	10.83	11.47	6.45	32.3 %	ACCEPTABLE
274	10.51	10.89	6.07	28.6 %	ACCEPTABLE
275	12.21	13.97	8.47	58.5 %	ACCEPTABLE
276	31.35	56.17	53.62	41.6 %	ACCEPTABLE
277	8.44	13.77	6.19	19.5 %	ACCEPTABLE
278	15.06	22.14	16.61	51.0 %	ACCEPTABLE
279	7.48	10.76	4.35	12.8 %	ACCEPTABLE
280	10.31	12.23	7.36	28.7 %	ACCEPTABLE
281	14.86	16.20	10.68	52.6 %	ACCEPTABLE
282	9.18	11.11	3.47	22.2 %	ACCEPTABLE
283	13.23	13.68	8.09	56.9 %	ACCEPTABLE
284	12.75	17.33	11.75	55.1 %	ACCEPTABLE
285	7.45	10.66	4.31	12.3 %	ACCEPTABLE
286	87.09	173.36	183.76	45.5 %	ACCEPTABLE
287	12.21	13.97	8.47	58.5 %	ACCEPTABLE
288	8.57	11.47	5.07	27.7 %	ACCEPTABLE
289	9.48	10.97	4.18	32.1 %	ACCEPTABLE

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
290	20.75	30.49	26.30	51.4 %	**ACCEPTABLE**
291	9.53	13.72	6.74	32.5 %	**ACCEPTABLE**
292	15.38	20.74	15.57	55.9 %	**ACCEPTABLE**
293	11.99	14.60	9.33	53.7 %	**ACCEPTABLE**
294	8.49	11.31	4.98	26.9 %	**ACCEPTABLE**
295	11.09	12.96	7.88	35.0 %	**ACCEPTABLE**
296	14.86	16.30	11.11	57.5 %	**ACCEPTABLE**
297	9.95	11.83	4.80	35.1 %	**ACCEPTABLE**
298	13.57	14.41	9.09	59.7 %	**ACCEPTABLE**
299	9.27	11.59	4.93	32.6 %	**ACCEPTABLE**
300	26.74	37.78	35.16	48.0 %	**ACCEPTABLE**
301	10.41	13.90	6.83	36.5 %	**ACCEPTABLE**
302	17.85	23.03	18.28	53.2 %	**ACCEPTABLE**
303	12.64	14.38	9.03	60.4 %	**ACCEPTABLE**
304	8.80	11.77	5.37	30.7 %	**ACCEPTABLE**
305	19.95	29.34	24.91	50.9 %	**ACCEPTABLE**
306	9.82	14.05	7.14	34.8 %	**ACCEPTABLE**
307	15.02	20.25	14.98	55.5 %	**ACCEPTABLE**
308	8.66	11.46	5.17	29.5 %	**ACCEPTABLE**
309	11.04	12.91	7.82	34.8 %	**ACCEPTABLE**
310	14.69	16.18	10.91	57.1 %	**ACCEPTABLE**
311	13.43	14.29	8.91	59.3 %	**ACCEPTABLE**
312	11.28	11.07	5.99	35.5 %	**ACCEPTABLE**
313	13.13	16.77	11.39	58.3 %	**ACCEPTABLE**
314	8.80	11.77	5.36	30.6 %	**ACCEPTABLE**
315	76.66	100.13	114.49	47.1 %	**ACCEPTABLE**
316	12.64	14.38	9.03	60.4 %	**ACCEPTABLE**
317	10.12	13.05	6.73	42.8 %	**ACCEPTABLE**
318	17.48	23.11	18.51	57.0 %	**ACCEPTABLE**
319	10.67	14.11	7.67	43.8 %	**ACCEPTABLE**
320	15.12	19.17	14.16	59.2 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
321	9.07	11.03	5.23	36.6 %	ACCEPTABLE
322	12.53	14.83	9.65	47.7 %	ACCEPTABLE
323	9.62	12.09	5.96	40.8 %	ACCEPTABLE
324	11.81	13.63	8.51	40.3 %	ACCEPTABLE
325	14.72	16.25	11.22	60.4 %	ACCEPTABLE
326	11.66	14.80	8.35	46.3 %	ACCEPTABLE
327	23.76	31.61	28.55	52.6 %	ACCEPTABLE
328	12.16	15.68	9.24	46.2 %	ACCEPTABLE
329	18.89	23.95	19.67	55.4 %	ACCEPTABLE
330	9.83	11.57	5.47	42.3 %	ACCEPTABLE
331	13.77	15.92	10.74	61.0 %	ACCEPTABLE
332	10.91	14.40	8.01	45.1 %	ACCEPTABLE
333	20.04	27.54	23.44	54.5 %	ACCEPTABLE
334	11.48	15.49	9.06	45.3 %	ACCEPTABLE
335	16.61	21.76	16.95	57.1 %	ACCEPTABLE
336	9.45	11.63	5.69	40.5 %	ACCEPTABLE
337	13.11	15.86	10.65	55.2 %	ACCEPTABLE
338	10.09	12.85	6.63	43.6 %	ACCEPTABLE
339	12.27	14.45	9.26	46.2 %	ACCEPTABLE
340	15.79	17.89	13.00	58.4 %	ACCEPTABLE
341	11.68	13.82	7.39	47.4 %	ACCEPTABLE
342	14.60	16.15	11.07	60.1 %	ACCEPTABLE
343	11.58	11.93	6.69	44.4 %	ACCEPTABLE
344	12.23	12.69	7.50	46.7 %	ACCEPTABLE
345	11.84	12.12	6.99	41.1 %	ACCEPTABLE
346	13.21	14.11	8.90	58.9 %	ACCEPTABLE
347	14.47	18.14	13.02	59.6 %	ACCEPTABLE
348	10.48	13.58	7.26	44.5 %	ACCEPTABLE
349	13.77	15.92	10.74	61.0 %	ACCEPTABLE
350	11.98	15.24	9.19	50.9 %	ACCEPTABLE
351	18.28	23.41	19.15	54.7 %	ACCEPTABLE

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
352	12.19	15.60	9.56	51.0 %	ACCEPTABLE
353	16.53	20.65	16.02	54.8 %	ACCEPTABLE
354	13.78	16.33	11.29	50.6 %	ACCEPTABLE
355	13.12	15.29	10.21	47.4 %	ACCEPTABLE
356	15.86	17.97	13.26	55.3 %	ACCEPTABLE
357	12.32	14.46	8.42	52.1 %	ACCEPTABLE
358	15.00	16.74	11.88	54.3 %	ACCEPTABLE
359	12.97	13.84	8.76	47.4 %	ACCEPTABLE
360	12.59	13.30	8.21	45.1 %	ACCEPTABLE
361	13.83	15.08	10.06	51.4 %	ACCEPTABLE
362	14.91	18.11	13.21	52.8 %	ACCEPTABLE
363	13.77	15.92	10.74	61.0 %	ACCEPTABLE
364	12.66	15.63	9.86	54.5 %	ACCEPTABLE
365	12.26	14.14	8.35	55.2 %	ACCEPTABLE
366	17.39	21.32	17.02	12.7 %	ACCEPTABLE
367	12.70	15.70	9.93	54.5 %	ACCEPTABLE
368	16.41	19.85	15.34	15.1 %	ACCEPTABLE
369	14.36	16.77	11.90	48.8 %	ACCEPTABLE
370	11.80	14.22	8.44	54.5 %	ACCEPTABLE
371	13.86	16.02	11.09	47.6 %	ACCEPTABLE
372	12.31	14.21	8.42	55.2 %	ACCEPTABLE
373	12.78	14.92	9.16	55.2 %	ACCEPTABLE
374	15.31	17.18	12.48	50.5 %	ACCEPTABLE
375	12.54	13.71	8.44	61.0 %	ACCEPTABLE
376	13.33	14.39	9.42	46.0 %	ACCEPTABLE
377	14.39	15.89	11.04	49.2 %	ACCEPTABLE
378	15.25	18.11	13.38	49.9 %	ACCEPTABLE
379	12.19	14.87	9.08	54.5 %	ACCEPTABLE
380	85.46	126.19	141.31	50.2 %	ACCEPTABLE
381	13.77	15.92	10.74	61.0 %	ACCEPTABLE
382	13.07	15.80	10.22	56.7 %	ACCEPTABLE

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
383	12.71	14.67	9.06	57.1 %	**ACCEPTABLE**
384	16.88	20.14	15.82	13.3 %	**ACCEPTABLE**
385	13.04	15.77	10.18	56.6 %	**ACCEPTABLE**
386	16.30	19.30	14.85	14.7 %	**ACCEPTABLE**
387	12.09	14.26	8.64	56.8 %	**ACCEPTABLE**
388	14.82	17.14	12.42	19.7 %	**ACCEPTABLE**
389	12.38	14.72	9.10	56.8 %	**ACCEPTABLE**
390	14.45	16.61	11.83	21.4 %	**ACCEPTABLE**
391	12.77	14.75	9.16	57.3 %	**ACCEPTABLE**
392	15.95	18.07	13.57	15.3 %	**ACCEPTABLE**
393	13.10	15.24	9.67	57.2 %	**ACCEPTABLE**
394	15.53	17.49	12.91	16.4 %	**ACCEPTABLE**
395	12.89	14.34	9.08	61.5 %	**ACCEPTABLE**
396	12.24	14.21	8.59	57.1 %	**ACCEPTABLE**
397	15.19	17.35	12.69	18.0 %	**ACCEPTABLE**
398	12.25	14.23	8.61	57.1 %	**ACCEPTABLE**
399	14.78	16.76	12.04	19.6 %	**ACCEPTABLE**
400	13.76	15.30	10.44	25.4 %	**ACCEPTABLE**
401	13.48	14.90	10.00	28.5 %	**ACCEPTABLE**
402	14.60	15.89	11.14	20.5 %	**ACCEPTABLE**
403	12.32	13.80	8.18	57.4 %	**ACCEPTABLE**
404	14.29	15.47	10.68	22.1 %	**ACCEPTABLE**
405	13.39	14.23	9.33	28.9 %	**ACCEPTABLE**
406	13.17	13.93	9.01	31.1 %	**ACCEPTABLE**
407	13.81	14.81	9.95	25.6 %	**ACCEPTABLE**
408	14.23	15.98	11.17	22.6 %	**ACCEPTABLE**
409	12.89	14.34	9.08	61.5 %	**ACCEPTABLE**
410	12.47	14.28	8.78	58.6 %	**ACCEPTABLE**
411	12.31	13.68	8.18	58.8 %	**ACCEPTABLE**
412	14.32	16.19	11.29	50.0 %	**ACCEPTABLE**
413	12.46	14.26	8.76	58.6 %	**ACCEPTABLE**

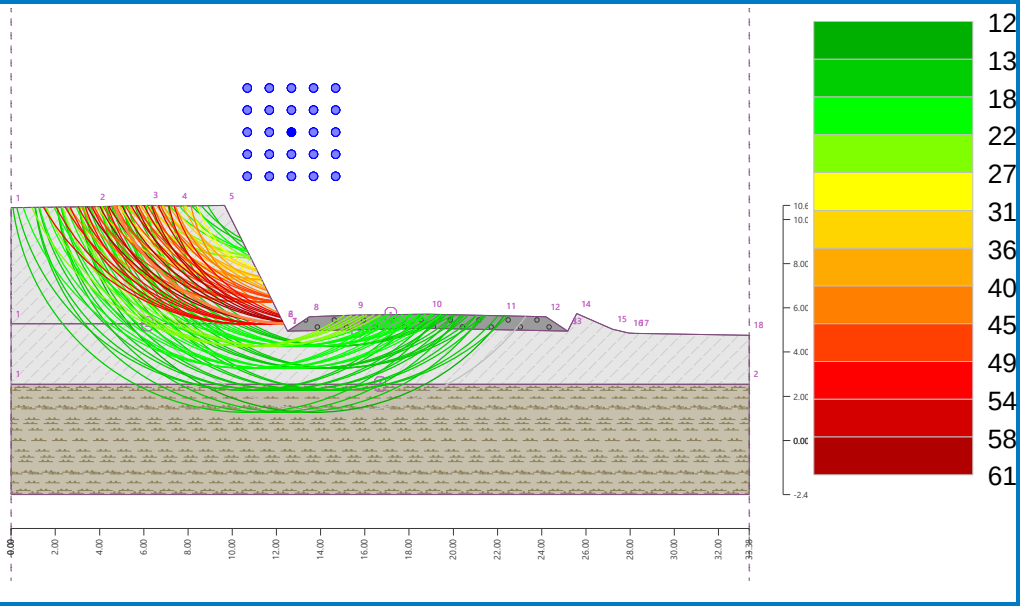
No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
414	14.08	15.85	10.92	49.4 %	**ACCEPTABLE**
415	13.48	14.99	10.00	47.4 %	**ACCEPTABLE**
416	13.29	14.72	9.71	46.9 %	**ACCEPTABLE**
417	12.33	13.72	8.21	58.7 %	**ACCEPTABLE**
418	14.01	15.35	10.42	49.2 %	**ACCEPTABLE**
419	12.50	13.97	8.47	58.8 %	**ACCEPTABLE**
420	13.81	15.08	10.12	48.6 %	**ACCEPTABLE**
421	13.25	14.31	9.29	47.3 %	**ACCEPTABLE**
422	13.09	14.08	9.06	45.9 %	**ACCEPTABLE**
423	13.52	14.67	9.69	47.5 %	**ACCEPTABLE**
424	13.77	15.40	10.44	48.2 %	**ACCEPTABLE**
425	12.28	13.99	8.49	58.6 %	**ACCEPTABLE**
426	12.89	14.34	9.08	61.5 %	**ACCEPTABLE**
427	12.62	14.31	8.89	59.6 %	**ACCEPTABLE**
428	12.49	13.89	8.47	59.7 %	**ACCEPTABLE**
429	13.79	15.50	10.47	51.1 %	**ACCEPTABLE**
430	12.60	14.29	8.87	59.6 %	**ACCEPTABLE**
431	13.64	15.29	10.25	50.6 %	**ACCEPTABLE**
432	12.24	13.75	8.32	59.5 %	**ACCEPTABLE**
433	13.28	14.77	9.69	49.3 %	**ACCEPTABLE**
434	12.35	13.92	8.49	59.5 %	**ACCEPTABLE**
435	13.16	14.59	9.50	49.0 %	**ACCEPTABLE**
436	12.51	13.92	8.50	59.7 %	**ACCEPTABLE**
437	13.61	15.00	9.95	50.9 %	**ACCEPTABLE**
438	12.63	14.09	8.67	59.7 %	**ACCEPTABLE**
439	13.49	14.82	9.75	50.9 %	**ACCEPTABLE**
440	12.58	13.77	8.50	61.0 %	**ACCEPTABLE**
441	13.14	14.33	9.23	49.4 %	**ACCEPTABLE**
442	13.03	14.17	9.07	48.4 %	**ACCEPTABLE**
443	13.31	14.56	9.48	49.8 %	**ACCEPTABLE**
444	12.38	13.73	8.30	59.6 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
445	13.46	15.03	9.96	50.2 %	**ACCEPTABLE**
446	12.48	14.11	8.68	59.5 %	**ACCEPTABLE**
447	12.89	14.34	9.08	61.5 %	**ACCEPTABLE**
448	12.71	14.32	8.96	60.3 %	**ACCEPTABLE**
449	12.62	14.04	8.66	60.2 %	**ACCEPTABLE**
450	13.47	15.08	9.97	52.6 %	**ACCEPTABLE**
451	12.70	14.31	8.94	60.2 %	**ACCEPTABLE**
452	13.38	14.96	9.83	52.9 %	**ACCEPTABLE**
453	12.45	13.94	8.56	60.2 %	**ACCEPTABLE**
454	13.15	14.63	9.48	52.2 %	**ACCEPTABLE**
455	12.53	14.05	8.68	60.3 %	**ACCEPTABLE**
456	13.07	14.51	9.36	51.5 %	**ACCEPTABLE**
457	12.64	14.06	8.69	60.3 %	**ACCEPTABLE**
458	13.36	14.77	9.64	53.0 %	**ACCEPTABLE**
459	12.72	14.18	8.81	60.3 %	**ACCEPTABLE**
460	13.28	14.65	9.52	51.9 %	**ACCEPTABLE**
461	12.68	13.95	8.68	61.5 %	**ACCEPTABLE**
462	12.50	13.93	8.56	60.3 %	**ACCEPTABLE**
463	12.43	13.67	8.29	60.3 %	**ACCEPTABLE**
464	13.22	14.64	9.50	52.2 %	**ACCEPTABLE**
465	12.49	13.92	8.54	60.2 %	**ACCEPTABLE**
466	13.14	14.52	9.37	51.8 %	**ACCEPTABLE**
467	12.93	14.22	9.06	50.7 %	**ACCEPTABLE**
468	12.33	13.69	8.31	60.2 %	**ACCEPTABLE**
469	12.85	14.11	8.95	50.3 %	**ACCEPTABLE**
470	12.44	13.69	8.31	60.3 %	**ACCEPTABLE**
471	13.13	14.35	9.20	51.9 %	**ACCEPTABLE**
472	12.51	13.80	8.42	60.3 %	**ACCEPTABLE**
473	13.05	14.24	9.08	51.9 %	**ACCEPTABLE**
474	12.85	13.95	8.79	50.4 %	**ACCEPTABLE**
475	12.78	13.85	8.68	50.4 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
476	12.95	14.09	8.93	51.2 %	**ACCEPTABLE**
477	13.03	14.37	9.21	51.4 %	**ACCEPTABLE**
478	12.42	13.81	8.43	60.2 %	**ACCEPTABLE**
479	12.68	13.95	8.68	61.5 %	**ACCEPTABLE**
480	12.56	13.94	8.60	60.7 %	**ACCEPTABLE**
481	12.51	13.76	8.42	60.7 %	**ACCEPTABLE**
482	13.03	14.40	9.21	53.9 %	**ACCEPTABLE**
483	12.55	13.93	8.59	60.7 %	**ACCEPTABLE**
484	12.98	14.32	9.13	53.4 %	**ACCEPTABLE**
485	12.40	13.70	8.36	60.7 %	**ACCEPTABLE**
486	12.84	14.13	8.93	53.0 %	**ACCEPTABLE**
487	12.45	13.77	8.43	60.7 %	**ACCEPTABLE**
488	12.79	14.06	8.86	52.1 %	**ACCEPTABLE**
489	12.52	13.77	8.43	60.7 %	**ACCEPTABLE**
490	12.98	14.21	9.02	53.5 %	**ACCEPTABLE**
491	12.57	13.85	8.51	60.7 %	**ACCEPTABLE**
492	12.92	14.14	8.95	53.1 %	**ACCEPTABLE**
493	12.55	13.71	8.43	61.5 %	**ACCEPTABLE**
494	12.79	13.95	8.75	52.6 %	**ACCEPTABLE**
495	12.40	13.61	8.27	60.7 %	**ACCEPTABLE**
496	12.74	13.88	8.68	51.8 %	**ACCEPTABLE**
497	12.86	14.04	8.85	52.2 %	**ACCEPTABLE**
498	12.46	13.69	8.35	60.7 %	**ACCEPTABLE**
499	12.91	14.22	9.03	52.6 %	**ACCEPTABLE**
500	12.50	13.86	8.51	60.6 %	**ACCEPTABLE**
501	12.68	13.95	8.68	61.5 %	**ACCEPTABLE**
502	12.60	13.94	8.63	61.0 %	**ACCEPTABLE**
503	12.57	13.82	8.50	61.0 %	**ACCEPTABLE**
504	12.91	14.24	9.03	54.8 %	**ACCEPTABLE**
505	12.60	13.94	8.62	60.9 %	**ACCEPTABLE**
506	12.88	14.19	8.98	54.3 %	**ACCEPTABLE**

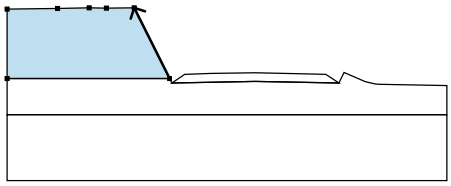
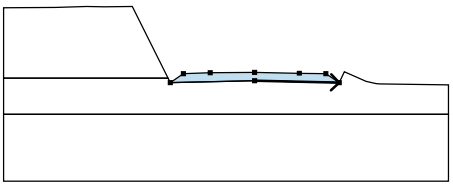
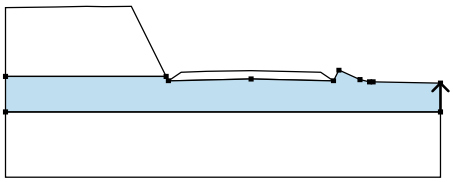
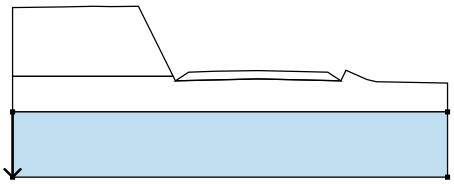
No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
507	12.49	13.78	8.46	60.9 %	**ACCEPTABLE**
508	12.79	14.07	8.85	54.4 %	**ACCEPTABLE**
509	12.52	13.83	8.51	60.9 %	**ACCEPTABLE**
510	12.76	14.02	8.80	53.8 %	**ACCEPTABLE**
511	12.57	13.83	8.51	61.0 %	**ACCEPTABLE**
512	12.88	14.12	8.91	54.3 %	**ACCEPTABLE**
513	12.61	13.88	8.56	61.0 %	**ACCEPTABLE**
514	12.84	14.07	8.86	53.9 %	**ACCEPTABLE**
515	12.59	13.79	8.51	61.4 %	**ACCEPTABLE**
516	12.46	13.67	8.35	61.0 %	**ACCEPTABLE**
517	12.76	13.95	8.73	54.1 %	**ACCEPTABLE**
518	12.49	13.72	8.40	61.0 %	**ACCEPTABLE**
519	12.72	13.91	8.68	54.9 %	**ACCEPTABLE**
520	12.80	14.01	8.79	54.3 %	**ACCEPTABLE**
521	12.53	13.78	8.46	61.0 %	**ACCEPTABLE**
522	12.83	14.13	8.91	54.9 %	**ACCEPTABLE**
523	12.56	13.89	8.57	60.9 %	**ACCEPTABLE**
524	12.68	13.95	8.68	61.5 %	**ACCEPTABLE**

Name : Analysis	**Stage - analysis : 1 - 1**



Input data (Stage of construction 2)

Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		12.33	5.28	9.65	10.63	Suelo residual limoso de alta plasticidad de consistencia media
		7.54	10.61	6.23	10.64	
		3.84	10.58	0.00	10.54	
		0.00	5.28			
2		18.84	5.07	25.18	4.94	Estructura de Pavimento
		24.19	5.60	22.19	5.64	
		18.84	5.71	15.50	5.67	
		13.49	5.60	12.50	4.94	
3		33.38	2.55	33.38	4.76	Suelo residual arcilloso de consitencia firme
		28.22	4.85	27.94	4.86	
		27.20	5.03	25.58	5.75	
		25.18	4.94	18.84	5.07	
		12.50	4.94	12.33	5.28	
		0.00	5.28	0.00	2.55	
4		0.00	2.55	0.00	-2.45	Roca sedimentaria meteorizad
		33.38	-2.45	33.38	2.55	

Water

Water type : No water

Tensile crack

Tensile crack not input.

Earthquake

Horizontal seismic coefficient : K_h = 0.3000

Vertical seismic coefficient : K_v = 0.2000

Settings of the stage of construction

Design situation : Extreme I

Results (Stage of construction 2)

Analysis 1 (stage 2)

Circular slip surface

Slip surface parameters							
Center :	x =	17.62	[m]	Angles :	α_1 =	-36.60	[°]
	z =	33.93	[m]		α_2 =	-10.47	[°]
Radius :	R =	29.13	[m]				
The slip surface after optimization.							

Slope stability verification (Morgenstern-Price)

Utilization : 84.0 %

CDR CDR: 1.190

Slope stability ACCEPTABLE

Optimization of circular slip surface (Morgenstern-Price)

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
1	12.68	13.95	8.68	81.0 %	**ACCEPTABLE**
2	12.68	13.95	8.68	81.0 %	**ACCEPTABLE**
3	12.68	13.95	8.68	81.0 %	**ACCEPTABLE**
4	31.28	92.25	87.42	50.3 %	**ACCEPTABLE**
5	10.65	12.34	10.61	21.7 %	**ACCEPTABLE**
6	23.08	42.69	37.22	47.5 %	**ACCEPTABLE**
7	22.83	45.69	41.76	81.4 %	**ACCEPTABLE**
8	23.16	33.33	27.94	32.2 %	**ACCEPTABLE**
9	16.09	33.40	27.84	75.7 %	**ACCEPTABLE**
10	22.83	45.69	41.76	81.4 %	**ACCEPTABLE**
11	22.83	45.69	41.76	81.4 %	**ACCEPTABLE**
12	93.97	299.12	303.43	47.9 %	**ACCEPTABLE**
13	10.13	13.78	10.45	32.1 %	**ACCEPTABLE**
14	9.55	11.80	9.43	24.9 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
15	21.28	34.07	28.75	52.2 %	**ACCEPTABLE**
16	12.46	12.45	8.00	31.4 %	**ACCEPTABLE**
17	22.83	45.69	41.76	81.4 %	**ACCEPTABLE**
18	42.80	116.35	114.06	57.1 %	**ACCEPTABLE**
19	10.94	18.01	13.09	50.3 %	**ACCEPTABLE**
20	9.56	13.76	9.90	33.1 %	**ACCEPTABLE**
21	20.15	34.90	29.64	62.5 %	**ACCEPTABLE**
22	87.96	146.69	160.37	71.5 %	**ACCEPTABLE**
23	22.83	45.69	41.76	81.4 %	**ACCEPTABLE**
24	5.65	12.50	5.79	34.4 %	**ACCEPTABLE**
25	31.27	76.98	73.34	63.8 %	**ACCEPTABLE**
26	5.78	13.48	6.30	33.4 %	**ACCEPTABLE**
27	9.98	15.93	11.16	43.2 %	**ACCEPTABLE**
28	6.57	11.43	4.43	29.5 %	**ACCEPTABLE**
29	19.57	35.72	30.55	68.4 %	**ACCEPTABLE**
30	9.45	12.05	7.37	34.9 %	**ACCEPTABLE**
31	10.57	13.73	8.92	43.4 %	**ACCEPTABLE**
32	6.51	11.07	4.31	29.2 %	**ACCEPTABLE**
33	10.08	12.55	8.10	36.4 %	**ACCEPTABLE**
34	6.67	11.98	4.66	29.7 %	**ACCEPTABLE**
35	16.05	33.33	27.76	75.7 %	**ACCEPTABLE**
36	5.83	13.85	6.53	33.0 %	**ACCEPTABLE**
37	24.62	50.14	46.52	80.7 %	**ACCEPTABLE**
38	22.83	45.69	41.76	81.4 %	**ACCEPTABLE**
39	26.06	60.18	55.97	68.7 %	**ACCEPTABLE**
40	6.46	12.64	6.60	47.1 %	**ACCEPTABLE**
41	12.21	29.99	22.15	44.1 %	**ACCEPTABLE**
42	19.20	36.30	31.19	71.9 %	**ACCEPTABLE**
43	10.53	15.18	10.07	49.2 %	**ACCEPTABLE**
44	6.93	11.42	5.42	42.3 %	**ACCEPTABLE**
45	10.52	15.17	10.06	49.3 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
46	16.54	34.27	28.81	76.2 %	**ACCEPTABLE**
47	22.83	45.69	41.76	81.4 %	**ACCEPTABLE**
48	13.65	33.67	26.75	57.6 %	**ACCEPTABLE**
49	27.83	61.49	57.96	73.2 %	**ACCEPTABLE**
50	15.16	34.54	27.78	56.9 %	**ACCEPTABLE**
51	21.30	41.09	36.59	75.6 %	**ACCEPTABLE**
52	18.72	38.41	33.46	78.3 %	**ACCEPTABLE**
53	41.13	88.14	87.73	77.4 %	**ACCEPTABLE**
54	22.83	45.69	41.76	81.4 %	**ACCEPTABLE**
55	16.08	36.85	30.73	66.0 %	**ACCEPTABLE**
56	31.02	66.28	63.69	76.8 %	**ACCEPTABLE**
57	17.52	34.06	29.21	83.6 %	**ACCEPTABLE**
58	21.92	44.40	40.22	80.6 %	**ACCEPTABLE**
59	28.63	57.25	54.38	77.5 %	**ACCEPTABLE**
60	19.34	36.20	31.66	82.0 %	**ACCEPTABLE**
61	17.68	34.32	29.51	83.7 %	**ACCEPTABLE**
62	21.83	44.25	40.05	80.6 %	**ACCEPTABLE**
63	28.40	56.78	53.86	77.5 %	**ACCEPTABLE**
64	19.25	36.03	31.47	82.0 %	**ACCEPTABLE**
65	17.64	34.26	29.44	83.7 %	**ACCEPTABLE**
66	98.18	207.27	219.49	73.6 %	**ACCEPTABLE**
67	51.73	112.53	114.27	75.6 %	**ACCEPTABLE**
68	17.68	34.32	29.51	83.7 %	**ACCEPTABLE**
69	22.79	45.19	41.36	18.4 %	**ACCEPTABLE**
70	16.94	31.80	27.06	29.7 %	**ACCEPTABLE**
71	20.68	38.89	34.74	20.3 %	**ACCEPTABLE**
72	17.68	34.32	29.51	83.7 %	**ACCEPTABLE**
73	18.65	35.11	30.73	23.3 %	**ACCEPTABLE**
74	16.80	30.98	26.33	27.7 %	**ACCEPTABLE**
75	21.81	41.12	37.29	18.9 %	**ACCEPTABLE**
76	16.16	28.80	24.07	29.6 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
77	20.68	39.62	35.57	20.3 %	ACCEPTABLE
78	17.68	34.32	29.51	83.7 %	ACCEPTABLE
79	19.87	37.51	33.38	20.3 %	ACCEPTABLE
80	18.33	34.13	29.75	23.3 %	ACCEPTABLE
81	22.26	42.09	38.39	18.6 %	ACCEPTABLE
82	19.10	35.23	30.98	20.4 %	ACCEPTABLE
83	17.75	32.29	27.83	24.3 %	ACCEPTABLE
84	20.52	38.30	34.29	20.4 %	ACCEPTABLE
85	21.44	40.97	37.11	19.4 %	ACCEPTABLE
86	99.65	220.57	232.30	74.1 %	ACCEPTABLE
87	99.48	220.57	232.30	73.4 %	ACCEPTABLE
88	17.68	34.32	29.51	83.7 %	ACCEPTABLE
89	22.67	44.39	40.63	18.5 %	ACCEPTABLE
90	21.09	40.84	36.80	20.2 %	ACCEPTABLE
91	20.49	39.07	34.94	20.6 %	ACCEPTABLE
92	18.66	35.01	30.58	23.5 %	ACCEPTABLE
93	17.73	32.96	28.39	25.7 %	ACCEPTABLE
94	19.51	36.91	32.61	20.6 %	ACCEPTABLE
95	17.68	34.32	29.51	83.7 %	ACCEPTABLE
96	16.96	33.40	28.34	81.7 %	ACCEPTABLE
97	19.80	38.38	34.05	21.1 %	ACCEPTABLE
98	17.15	33.58	28.55	81.6 %	ACCEPTABLE
99	17.72	33.41	28.76	27.2 %	ACCEPTABLE
100	17.68	34.32	29.51	83.7 %	ACCEPTABLE
101	17.07	33.42	28.43	82.6 %	ACCEPTABLE
102	17.19	33.71	28.73	82.4 %	ACCEPTABLE
103	17.32	33.83	28.87	82.3 %	ACCEPTABLE
104	17.68	34.32	29.51	83.7 %	ACCEPTABLE
105	17.28	33.73	28.80	83.0 %	ACCEPTABLE
106	17.24	33.53	28.60	83.1 %	ACCEPTABLE
107	17.36	33.92	29.00	82.9 %	ACCEPTABLE

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
108	17.17	33.35	28.40	82.9 %	**ACCEPTABLE**
109	17.09	33.29	28.33	83.0 %	**ACCEPTABLE**
110	17.68	34.32	29.51	83.7 %	**ACCEPTABLE**
111	17.41	33.94	29.04	83.1 %	**ACCEPTABLE**
112	17.39	33.79	28.90	83.3 %	**ACCEPTABLE**
113	17.47	34.06	29.18	83.2 %	**ACCEPTABLE**
114	17.33	33.67	28.77	83.3 %	**ACCEPTABLE**
115	17.52	34.10	29.22	83.0 %	**ACCEPTABLE**
116	17.28	33.63	28.72	83.3 %	**ACCEPTABLE**
117	73.60	256.07	256.27	42.6 %	**ACCEPTABLE**
118	9.82	11.07	9.63	19.5 %	**ACCEPTABLE**
119	10.90	18.64	13.42	60.8 %	**ACCEPTABLE**
120	17.80	40.03	34.34	68.7 %	**ACCEPTABLE**
121	33.81	58.36	54.85	27.0 %	**ACCEPTABLE**
122	17.76	39.97	34.27	68.6 %	**ACCEPTABLE**
123	10.90	18.64	13.42	60.8 %	**ACCEPTABLE**
124	17.80	40.03	34.34	68.7 %	**ACCEPTABLE**
125	9.97	13.84	10.31	32.3 %	**ACCEPTABLE**
126	9.44	12.10	9.37	30.3 %	**ACCEPTABLE**
127	33.17	62.04	58.84	45.3 %	**ACCEPTABLE**
128	12.38	12.77	8.08	35.4 %	**ACCEPTABLE**
129	18.07	40.61	34.98	68.9 %	**ACCEPTABLE**
130	9.97	13.84	10.32	32.3 %	**ACCEPTABLE**
131	9.44	12.10	9.38	29.7 %	**ACCEPTABLE**
132	32.97	61.65	58.40	45.3 %	**ACCEPTABLE**
133	12.39	12.79	8.10	35.3 %	**ACCEPTABLE**
134	18.04	40.51	34.88	69.0 %	**ACCEPTABLE**
135	9.97	13.83	10.31	32.4 %	**ACCEPTABLE**
136	9.44	12.10	9.37	30.3 %	**ACCEPTABLE**
137	32.71	61.06	57.76	45.4 %	**ACCEPTABLE**
138	12.39	12.79	8.10	35.3 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
139	17.99	40.37	34.73	69.0 %	**ACCEPTABLE**
140	61.60	97.83	104.25	58.7 %	**ACCEPTABLE**
141	18.01	40.40	34.76	68.9 %	**ACCEPTABLE**
142	11.20	19.12	13.95	58.3 %	**ACCEPTABLE**
143	9.58	14.29	10.10	35.8 %	**ACCEPTABLE**
144	33.20	65.60	62.71	56.2 %	**ACCEPTABLE**
145	19.09	42.66	37.26	69.9 %	**ACCEPTABLE**
146	11.24	19.20	14.02	58.8 %	**ACCEPTABLE**
147	9.60	14.31	10.13	35.8 %	**ACCEPTABLE**
148	32.63	64.34	61.32	56.1 %	**ACCEPTABLE**
149	19.05	42.59	37.18	69.8 %	**ACCEPTABLE**
150	67.10	127.95	133.71	61.6 %	**ACCEPTABLE**
151	16.60	36.63	30.82	70.0 %	**ACCEPTABLE**
152	11.03	18.62	13.51	54.7 %	**ACCEPTABLE**
153	9.51	14.08	9.96	35.3 %	**ACCEPTABLE**
154	28.49	54.43	50.67	58.1 %	**ACCEPTABLE**
155	18.01	39.44	33.95	71.4 %	**ACCEPTABLE**
156	11.07	18.68	13.58	54.4 %	**ACCEPTABLE**
157	9.54	14.11	10.00	35.3 %	**ACCEPTABLE**
158	27.72	52.82	48.88	57.9 %	**ACCEPTABLE**
159	17.88	39.13	33.62	71.5 %	**ACCEPTABLE**
160	11.06	18.64	13.55	54.2 %	**ACCEPTABLE**
161	9.54	14.09	9.99	35.1 %	**ACCEPTABLE**
162	27.50	52.31	48.33	58.0 %	**ACCEPTABLE**
163	17.81	38.92	33.40	71.5 %	**ACCEPTABLE**
164	11.06	18.64	13.55	54.2 %	**ACCEPTABLE**
165	9.54	14.09	9.99	35.1 %	**ACCEPTABLE**
166	27.38	51.97	47.98	58.2 %	**ACCEPTABLE**
167	17.80	38.88	33.36	71.5 %	**ACCEPTABLE**
168	11.06	18.64	13.54	54.5 %	**ACCEPTABLE**
169	9.54	14.08	9.99	34.9 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
170	27.32	51.83	47.83	58.3 %	ACCEPTABLE
171	17.79	38.84	33.32	71.6 %	ACCEPTABLE
172	11.05	18.64	13.54	54.4 %	ACCEPTABLE
173	9.54	14.08	9.99	34.9 %	ACCEPTABLE
174	27.27	51.69	47.68	58.3 %	ACCEPTABLE
175	17.78	38.81	33.28	71.4 %	ACCEPTABLE
176	67.10	127.95	133.71	61.6 %	ACCEPTABLE
177	16.60	36.63	30.82	70.0 %	ACCEPTABLE
178	17.79	38.82	33.30	71.6 %	ACCEPTABLE
179	5.21	12.06	5.24	28.6 %	ACCEPTABLE
180	6.63	17.24	8.04	16.1 %	ACCEPTABLE
181	6.10	26.51	17.03	13.5 %	ACCEPTABLE
182	5.29	13.33	5.80	26.7 %	ACCEPTABLE
183	10.10	16.55	11.58	45.5 %	ACCEPTABLE
184	6.15	11.25	4.06	23.9 %	ACCEPTABLE
185	7.00	21.87	12.30	12.8 %	ACCEPTABLE
186	27.33	53.94	50.16	64.8 %	ACCEPTABLE
187	8.67	11.80	6.63	43.7 %	ACCEPTABLE
188	10.57	14.12	9.14	45.2 %	ACCEPTABLE
189	6.15	11.14	4.03	23.9 %	ACCEPTABLE
190	10.06	12.92	8.25	39.1 %	ACCEPTABLE
191	6.21	11.92	4.28	23.5 %	ACCEPTABLE
192	18.97	41.23	35.98	72.6 %	ACCEPTABLE
193	5.27	12.17	5.32	29.1 %	ACCEPTABLE
194	6.77	17.51	8.35	17.5 %	ACCEPTABLE
195	6.36	27.35	17.91	14.7 %	ACCEPTABLE
196	5.36	13.40	5.90	27.4 %	ACCEPTABLE
197	10.11	16.55	11.59	45.5 %	ACCEPTABLE
198	6.20	11.32	4.13	24.5 %	ACCEPTABLE
199	7.26	22.80	13.27	14.0 %	ACCEPTABLE
200	26.74	52.74	48.83	64.8 %	ACCEPTABLE

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
201	8.79	11.90	6.78	42.0 %	ACCEPTABLE
202	10.60	14.19	9.21	46.1 %	ACCEPTABLE
203	6.19	11.18	4.09	24.5 %	ACCEPTABLE
204	10.08	12.95	8.29	39.2 %	ACCEPTABLE
205	6.26	11.99	4.36	24.1 %	ACCEPTABLE
206	18.78	40.75	35.47	72.7 %	ACCEPTABLE
207	5.27	12.15	5.31	29.1 %	ACCEPTABLE
208	6.76	17.43	8.27	17.5 %	ACCEPTABLE
209	6.34	27.14	17.70	14.2 %	ACCEPTABLE
210	5.35	13.39	5.89	27.3 %	ACCEPTABLE
211	10.10	16.52	11.57	45.4 %	ACCEPTABLE
212	6.20	11.31	4.12	24.4 %	ACCEPTABLE
213	7.24	22.61	13.08	14.0 %	ACCEPTABLE
214	26.46	52.05	48.08	64.7 %	ACCEPTABLE
215	8.78	11.88	6.76	42.0 %	ACCEPTABLE
216	10.59	14.16	9.18	45.5 %	ACCEPTABLE
217	6.18	11.16	4.09	24.5 %	ACCEPTABLE
218	10.08	12.93	8.28	39.2 %	ACCEPTABLE
219	6.26	11.97	4.35	24.1 %	ACCEPTABLE
220	18.68	40.49	35.19	72.6 %	ACCEPTABLE
221	5.37	13.57	5.99	27.1 %	ACCEPTABLE
222	21.67	48.96	44.01	69.7 %	ACCEPTABLE
223	18.73	40.59	35.31	72.8 %	ACCEPTABLE
224	6.77	16.38	8.79	38.6 %	ACCEPTABLE
225	72.02	177.01	181.30	66.1 %	ACCEPTABLE
226	6.00	12.41	6.10	39.8 %	ACCEPTABLE
227	6.60	15.53	8.11	38.4 %	ACCEPTABLE
228	7.23	14.69	7.08	36.8 %	ACCEPTABLE
229	29.53	59.56	56.46	69.7 %	ACCEPTABLE
230	6.50	11.38	5.08	36.4 %	ACCEPTABLE
231	6.94	13.36	6.12	37.7 %	ACCEPTABLE

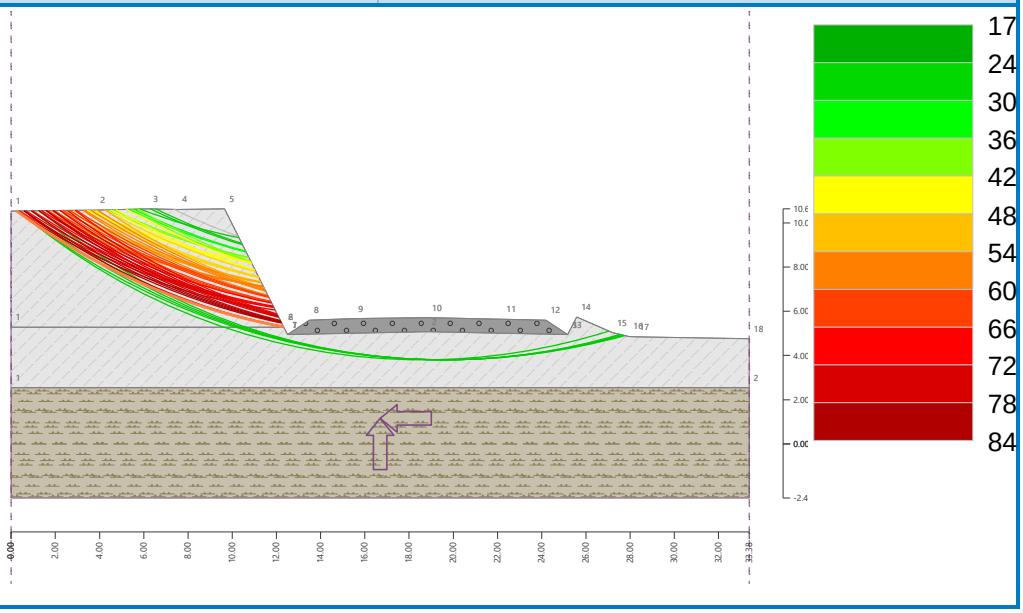
No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
232	10.89	16.15	10.94	57.9 %	ACCEPTABLE
233	7.16	14.37	6.83	37.0 %	ACCEPTABLE
234	21.30	45.68	40.99	74.7 %	ACCEPTABLE
235	52.51	128.77	129.28	65.7 %	ACCEPTABLE
236	6.15	12.59	6.30	41.5 %	ACCEPTABLE
237	11.05	29.98	21.64	36.6 %	ACCEPTABLE
238	26.62	53.59	49.84	69.5 %	ACCEPTABLE
239	6.64	11.49	5.22	38.2 %	ACCEPTABLE
240	7.13	13.55	6.37	39.7 %	ACCEPTABLE
241	20.16	43.34	38.40	74.2 %	ACCEPTABLE
242	27.85	63.93	60.12	69.5 %	ACCEPTABLE
243	21.26	45.54	40.85	74.8 %	ACCEPTABLE
244	12.47	33.19	25.75	50.4 %	ACCEPTABLE
245	17.75	34.88	30.01	82.5 %	ACCEPTABLE
246	22.03	46.45	42.02	76.5 %	ACCEPTABLE
247	18.55	34.69	29.80	78.4 %	ACCEPTABLE
248	11.28	17.71	12.48	61.9 %	ACCEPTABLE
249	36.05	82.18	80.11	71.2 %	ACCEPTABLE
250	17.73	34.80	29.92	82.4 %	ACCEPTABLE
251	23.71	48.45	44.61	17.6 %	ACCEPTABLE
252	32.35	65.39	63.29	77.1 %	ACCEPTABLE
253	20.54	38.80	34.48	81.6 %	ACCEPTABLE
254	18.58	36.32	31.66	83.4 %	ACCEPTABLE
255	43.97	97.06	96.96	74.7 %	ACCEPTABLE
256	22.89	46.82	42.79	79.9 %	ACCEPTABLE
257	30.69	62.07	59.58	76.7 %	ACCEPTABLE
258	19.98	37.75	33.30	81.4 %	ACCEPTABLE
259	18.19	35.62	30.86	83.0 %	ACCEPTABLE
260	18.58	36.31	31.65	83.4 %	ACCEPTABLE
261	15.81	32.45	26.68	72.6 %	ACCEPTABLE
262	18.58	36.31	31.65	83.4 %	ACCEPTABLE

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
263	16.07	33.02	27.52	76.8 %	**ACCEPTABLE**
264	19.31	36.62	32.33	20.8 %	**ACCEPTABLE**
265	16.70	33.69	28.28	76.4 %	**ACCEPTABLE**
266	18.28	33.47	29.04	23.7 %	**ACCEPTABLE**
267	16.58	29.76	25.09	28.0 %	**ACCEPTABLE**
268	20.22	37.73	33.61	20.6 %	**ACCEPTABLE**
269	21.56	41.65	37.74	19.2 %	**ACCEPTABLE**
270	18.58	36.31	31.65	83.4 %	**ACCEPTABLE**
271	16.85	34.03	28.79	79.0 %	**ACCEPTABLE**
272	20.97	39.85	35.92	19.8 %	**ACCEPTABLE**
273	19.21	35.98	31.76	20.6 %	**ACCEPTABLE**
274	17.31	34.55	29.38	78.7 %	**ACCEPTABLE**
275	20.10	37.31	33.25	20.1 %	**ACCEPTABLE**
276	18.55	33.98	29.66	23.0 %	**ACCEPTABLE**
277	21.75	40.89	37.12	18.9 %	**ACCEPTABLE**
278	22.82	43.90	40.30	18.4 %	**ACCEPTABLE**
279	99.79	220.76	232.61	72.8 %	**ACCEPTABLE**
280	18.58	36.31	31.65	83.4 %	**ACCEPTABLE**
281	17.08	33.99	28.89	80.7 %	**ACCEPTABLE**
282	17.03	33.50	28.40	80.8 %	**ACCEPTABLE**
283	17.39	34.75	29.69	80.4 %	**ACCEPTABLE**
284	22.46	43.80	40.02	18.4 %	**ACCEPTABLE**
285	19.01	36.10	31.73	21.0 %	**ACCEPTABLE**
286	17.72	35.13	30.13	80.3 %	**ACCEPTABLE**
287	19.63	37.08	32.82	20.5 %	**ACCEPTABLE**
288	20.63	39.28	35.19	20.4 %	**ACCEPTABLE**
289	21.23	41.05	37.05	19.9 %	**ACCEPTABLE**
290	100.41	222.87	234.74	74.5 %	**ACCEPTABLE**
291	18.58	36.31	31.65	83.4 %	**ACCEPTABLE**
292	17.57	34.76	29.80	81.6 %	**ACCEPTABLE**
293	17.52	34.39	29.43	81.7 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
294	17.78	35.25	30.32	81.4 %	**ACCEPTABLE**
295	20.98	40.94	36.82	20.2 %	**ACCEPTABLE**
296	17.33	33.94	28.96	81.9 %	**ACCEPTABLE**
297	21.56	41.96	37.95	19.7 %	**ACCEPTABLE**
298	18.01	35.52	30.63	81.3 %	**ACCEPTABLE**
299	17.12	33.71	28.69	81.9 %	**ACCEPTABLE**
300	18.58	36.31	31.65	83.4 %	**ACCEPTABLE**
301	17.90	35.27	30.41	82.2 %	**ACCEPTABLE**
302	17.86	35.01	30.15	82.3 %	**ACCEPTABLE**
303	18.04	35.59	30.75	82.1 %	**ACCEPTABLE**
304	17.28	33.83	28.88	82.6 %	**ACCEPTABLE**
305	17.73	34.71	29.83	82.4 %	**ACCEPTABLE**
306	18.20	35.79	30.97	81.9 %	**ACCEPTABLE**
307	17.62	33.93	29.13	84.0 %	**ACCEPTABLE**
308	17.16	33.54	28.57	82.7 %	**ACCEPTABLE**
309	17.29	33.83	28.88	82.6 %	**ACCEPTABLE**
310	19.15	37.08	32.61	21.9 %	**ACCEPTABLE**
311	17.27	33.44	28.50	82.7 %	**ACCEPTABLE**
312	17.62	33.93	29.13	84.0 %	**ACCEPTABLE**
313	17.32	33.68	28.77	83.2 %	**ACCEPTABLE**
314	17.40	33.86	28.96	83.1 %	**ACCEPTABLE**
315	17.38	33.60	28.71	83.2 %	**ACCEPTABLE**
316	17.62	33.93	29.13	84.0 %	**ACCEPTABLE**
317	17.42	33.76	28.89	83.5 %	**ACCEPTABLE**
318	17.33	33.41	28.52	83.4 %	**ACCEPTABLE**
319	17.47	33.89	29.02	83.4 %	**ACCEPTABLE**
320	17.46	33.71	28.85	83.5 %	**ACCEPTABLE**
321	17.29	33.46	28.57	83.6 %	**ACCEPTABLE**
322	17.62	33.93	29.13	84.0 %	**ACCEPTABLE**

Annexes

Name : Analysis	**Stage - analysis : 2 - 1**



ANEXO

TALUD DE TERRAPLEN KM 7+305

Slope stability analysis

Input data

Project

Task : Vía San Antonio - San Miguel

Part : Abscisa Km 7+305

Description : Talud de Terraplen

Author : P Ludeña

Date : 21/12/2022

Project ID : Ing. Marco Apunte Ordoñez

Settings

USA - LRFD

Stability analysis

Verification methodology : according to LRFD

Earthquake analysis : Standard

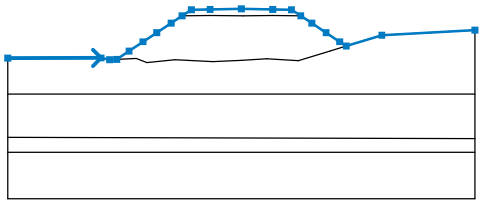
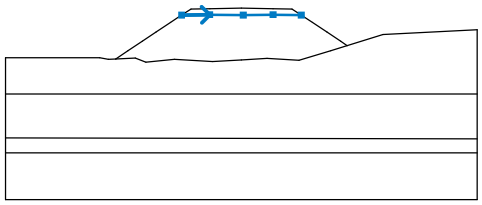
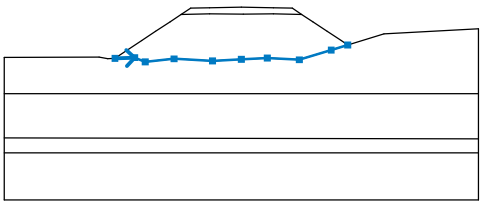
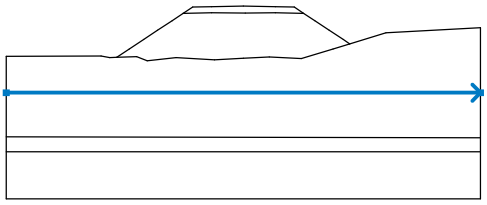
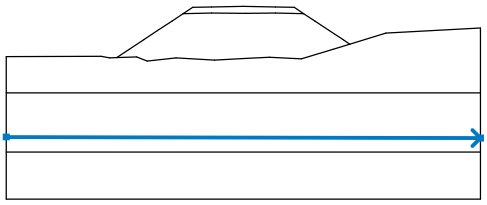
Load factors					
Design situation - Service I					
		Minimum		Maximum	
Earth surcharge load (permanent) :	ES =	1.00	[–]	1.00	[–]
Live load surcharge :	LL =	0.00	[–]	1.00	[–]

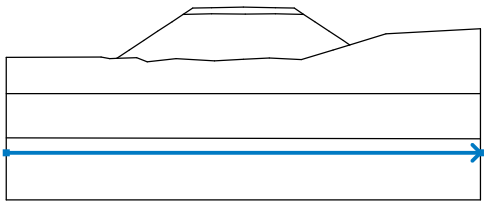
Resistance factors			
Design situation - Service I			
Resistance factor on stability :	ϕ_{SS} =	0.65	[–]

Load factors					
Design situation - Extreme I					
		Minimum		Maximum	
Earth surcharge load (permanent) :	ES =	0.75	[–]	1.50	[–]
Live load surcharge :	LL =	0.00	[–]	1.75	[–]

Resistance factors			
Design situation - Extreme I			
Resistance factor on stability :	ϕ_{SS} =	0.90	[–]

Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		0.00	10.12	9.97	10.15	10.89	9.97
		11.65	10.00	12.96	10.89	14.46	11.89
		15.93	12.87	17.46	13.89	18.63	14.67
		19.62	15.33	21.62	15.37	24.97	15.44
		28.32	15.37	30.32	15.33	31.31	14.67
		32.48	13.89	34.01	12.87	35.48	11.89
		36.17	11.43	39.97	12.60	49.92	13.13
2		18.63	14.67	21.62	14.73	25.17	14.69
		28.32	14.73	31.31	14.67		
3		11.65	10.00	13.73	10.09	14.85	9.65
		17.88	9.96	21.92	9.74	24.97	9.90
		27.68	10.05	31.07	9.86	34.42	10.89
		36.17	11.43				
4		0.00	6.25	49.92	6.25		
5		0.00	1.59	49.92	1.47		

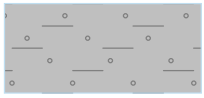
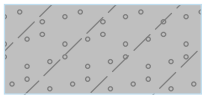
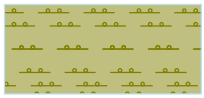
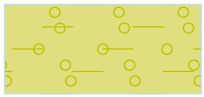
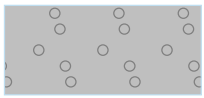
No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
6		0.00	0.00	49.92	0.00		

Soil parameters - effective stress state

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m^3]
1	Arenas y limos compacidad suelta		29.70	10.00	17.00
2	Arenas arcillosas y limos altas plasticidad consistencia media		17.00	35.00	17.00
3	Arenas limosas de compaciad media		38.60	10.00	18.00
4	Roca sedimentaria meteorizada		32.00	200.00	20.00
5	Relleno compactado		35.00	8.00	19.00
6	Estructura de pavimento		44.00	50.00	21.00

Soil parameters - uplift

No.	Name	Pattern	γ_{sat} [kN/m^3]	γ_s [kN/m^3]	n [–]
1	Arenas y limos compacidad suelta		18.00		

No.	Name	Pattern	γ_{sat} [kN/m³]	γ_s [kN/m³]	n [–]
2	Arenas arcillosas y limos altas plasticidad consistencia media		18.00		
3	Arenas limosas de compaciad media		19.00		
4	Roca sedimentaria meteorizada		21.00		
5	Relleno compactado		20.00		
6	Estructura de pavimento		21.00		

Soil parameters

Arenas y limos compacidad suelta

Unit weight : $\gamma = 17.00$ kN/m³

Stress-state : effective

Angle of internal friction : $\varphi_{ef} = 29.70$ °

Cohesion of soil : $c_{ef} = 10.00$ kPa

Saturated unit weight : $\gamma_{sat} = 18.00$ kN/m³

Arenas arcillosas y limos altas plasticidad consistencia media

Unit weight : $\gamma = 17.00$ kN/m³

Stress-state : effective

Angle of internal friction : $\varphi_{ef} = 17.00$ °

Cohesion of soil : $c_{ef} = 35.00$ kPa

Saturated unit weight : $\gamma_{sat} = 18.00$ kN/m³

Arenas limosas de compaciad media

Unit weight : $\gamma = 18.00$ kN/m³

Stress-state : effective

Angle of internal friction : $\varphi_{ef} = 38.60$ °

Cohesion of soil : c_{ef} = 10.00 kPa

Saturated unit weight : γ_{sat} = 19.00 kN/m³

Roca sedimentaria meteorizada

Unit weight : γ = 20.00 kN/m³

Stress-state : effective

Angle of internal friction : φ_{ef} = 32.00 °

Cohesion of soil : c_{ef} = 200.00 kPa

Saturated unit weight : γ_{sat} = 21.00 kN/m³

Relleno compactado

Unit weight : γ = 19.00 kN/m³

Stress-state : effective

Angle of internal friction : φ_{ef} = 35.00 °

Cohesion of soil : c_{ef} = 8.00 kPa

Saturated unit weight : γ_{sat} = 20.00 kN/m³

Estructura de pavimento

Unit weight : γ = 21.00 kN/m³

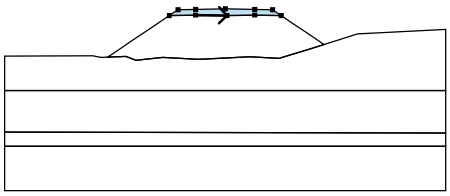
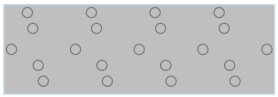
Stress-state : effective

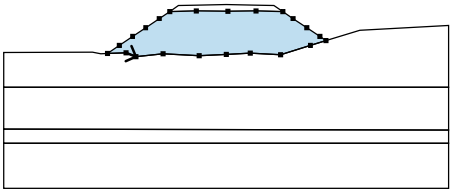
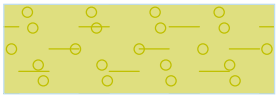
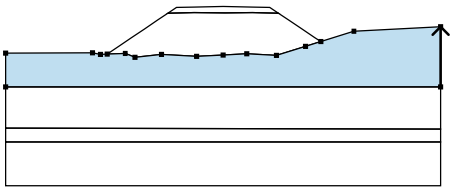
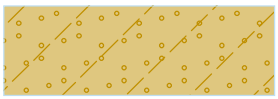
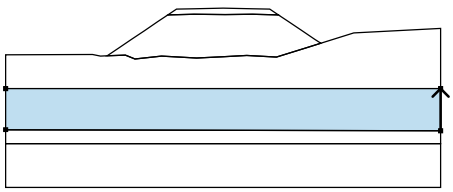
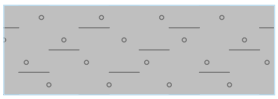
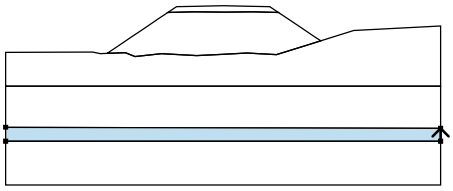
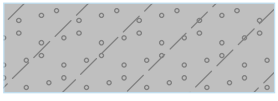
Angle of internal friction : φ_{ef} = 44.00 °

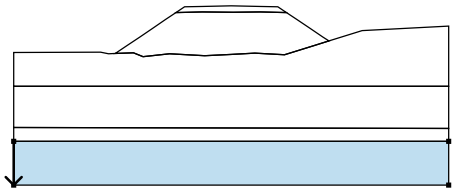
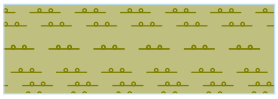
Cohesion of soil : c_{ef} = 50.00 kPa

Saturated unit weight : γ_{sat} = 21.00 kN/m³

Assigning and surfaces

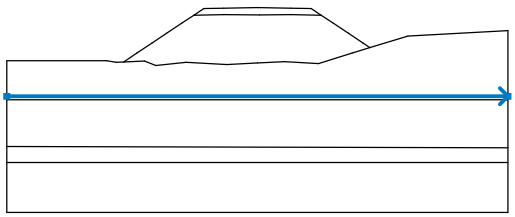
No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		21.62	14.73	25.17	14.69	Estructura de pavimento
		28.32	14.73	31.31	14.67	
		30.32	15.33	28.32	15.37	
		24.97	15.44	21.62	15.37	
		19.62	15.33	18.63	14.67	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
2		13.73	10.09	14.85	9.65	Relleno compactado
		17.88	9.96	21.92	9.74	
		24.97	9.90	27.68	10.05	
		31.07	9.86	34.42	10.89	
		36.17	11.43	35.48	11.89	
		34.01	12.87	32.48	13.89	
		31.31	14.67	28.32	14.73	
		25.17	14.69	21.62	14.73	
		18.63	14.67	17.46	13.89	
		15.93	12.87	14.46	11.89	
		12.96	10.89	11.65	10.00	
3		49.92	6.25	49.92	13.13	Arenas y limos compacidad suelta
		39.97	12.60	36.17	11.43	
		34.42	10.89	31.07	9.86	
		27.68	10.05	24.97	9.90	
		21.92	9.74	17.88	9.96	
		14.85	9.65	13.73	10.09	
		11.65	10.00	10.89	9.97	
		9.97	10.15	0.00	10.12	
		0.00	6.25			
4		49.92	1.47	49.92	6.25	Arenas arcillosas y limos altas plasticidad consistencia media
		0.00	6.25	0.00	1.59	
						
5		49.92	0.00	49.92	1.47	Arenas limosas de compaciad media
		0.00	1.59	0.00	0.00	
						

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
6		0.00	0.00	0.00	-5.00	Roca sedimentaria meteorizada
		49.92	-5.00	49.92	0.00	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	6.58	49.92	6.58		

Tensile crack

Tensile crack not input.

Earthquake

Earthquake not included.

Settings of the stage of construction

Design situation : Service I

Results (Stage of construction 1)

Analysis 1 (stage 1)

Circular slip surface

Slip surface parameters							
Center :	x =	12.29	[m]	Angles :	α_1 =	-6.63	[°]
	z =	20.15	[m]		α_2 =	62.14	[°]
Radius :	R =	10.24	[m]				
Slip surface after grid search.							

Slope stability verification (Morgenstern-Price)

Utilization : 66.7 %

CDR CDR: 1.498
Slope stability ACCEPTABLE
Slip surface grid search (Morgenstern-Price)

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
1	10.29	19.15	10.24	47.5 %	ACCEPTABLE
2	10.29	19.15	11.24	48.7 %	ACCEPTABLE
3	10.29	19.15	12.24	46.6 %	ACCEPTABLE
4	10.29	19.15	13.24	42.9 %	ACCEPTABLE
5	10.29	20.15	10.24	45.5 %	ACCEPTABLE
6	10.29	20.15	11.24	51.0 %	ACCEPTABLE
7	10.29	20.15	12.24	50.6 %	ACCEPTABLE
8	10.29	20.15	13.24	47.5 %	ACCEPTABLE
9	10.29	20.15	14.24	43.5 %	ACCEPTABLE
10	10.29	21.15	10.24	24.2 %	ACCEPTABLE
11	10.29	21.15	11.24	48.6 %	ACCEPTABLE
12	10.29	21.15	12.24	52.7 %	ACCEPTABLE
13	10.29	21.15	13.24	51.3 %	ACCEPTABLE
14	10.29	21.15	14.24	47.8 %	ACCEPTABLE
15	10.29	22.15	11.24	35.1 %	ACCEPTABLE
16	10.29	22.15	12.24	52.5 %	ACCEPTABLE
17	10.29	22.15	13.24	54.1 %	ACCEPTABLE
18	10.29	22.15	14.24	51.6 %	ACCEPTABLE
19	10.29	23.15	12.24	34.2 %	ACCEPTABLE
20	10.29	23.15	13.24	54.1 %	ACCEPTABLE
21	10.29	23.15	14.24	54.7 %	ACCEPTABLE
22	11.29	19.15	10.24	57.1 %	ACCEPTABLE
23	11.29	19.15	11.24	54.8 %	ACCEPTABLE
24	11.29	19.15	12.24	50.2 %	ACCEPTABLE
25	11.29	19.15	13.24	45.6 %	ACCEPTABLE
26	11.29	19.15	14.24	43.7 %	ACCEPTABLE
27	11.29	20.15	10.24	57.6 %	ACCEPTABLE
28	11.29	20.15	11.24	58.1 %	ACCEPTABLE

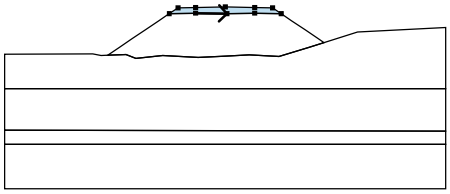
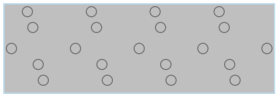
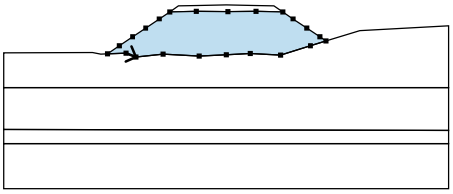
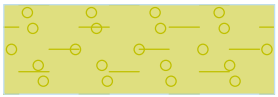
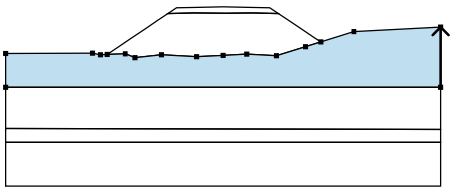
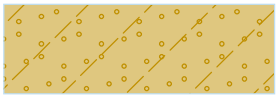
No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
29	11.29	20.15	12.24	55.1 %	**ACCEPTABLE**
30	11.29	20.15	13.24	50.3 %	**ACCEPTABLE**
31	11.29	20.15	14.24	46.0 %	**ACCEPTABLE**
32	11.29	21.15	10.24	43.2 %	**ACCEPTABLE**
33	11.29	21.15	11.24	60.0 %	**ACCEPTABLE**
34	11.29	21.15	12.24	58.2 %	**ACCEPTABLE**
35	11.29	21.15	13.24	54.7 %	**ACCEPTABLE**
36	11.29	21.15	14.24	50.3 %	**ACCEPTABLE**
37	11.29	22.15	11.24	49.3 %	**ACCEPTABLE**
38	11.29	22.15	12.24	60.7 %	**ACCEPTABLE**
39	11.29	22.15	13.24	58.6 %	**ACCEPTABLE**
40	11.29	22.15	14.24	54.5 %	**ACCEPTABLE**
41	11.29	23.15	12.24	53.1 %	**ACCEPTABLE**
42	11.29	23.15	13.24	60.2 %	**ACCEPTABLE**
43	11.29	23.15	14.24	57.9 %	**ACCEPTABLE**
44	12.29	19.15	10.24	62.6 %	**ACCEPTABLE**
45	12.29	19.15	11.24	57.4 %	**ACCEPTABLE**
46	12.29	19.15	12.24	52.2 %	**ACCEPTABLE**
47	12.29	19.15	13.24	47.6 %	**ACCEPTABLE**
48	12.29	19.15	14.24	45.5 %	**ACCEPTABLE**
49	12.29	20.15	10.24	66.7 %	**ACCEPTABLE**
50	12.29	20.15	11.24	62.1 %	**ACCEPTABLE**
51	12.29	20.15	12.24	57.4 %	**ACCEPTABLE**
52	12.29	20.15	13.24	52.0 %	**ACCEPTABLE**
53	12.29	20.15	14.24	47.5 %	**ACCEPTABLE**
54	12.29	21.15	11.24	66.0 %	**ACCEPTABLE**
55	12.29	21.15	12.24	61.0 %	**ACCEPTABLE**
56	12.29	21.15	13.24	56.5 %	**ACCEPTABLE**
57	12.29	21.15	14.24	51.6 %	**ACCEPTABLE**
58	12.29	22.15	10.24	29.8 %	**ACCEPTABLE**
59	12.29	22.15	11.24	58.5 %	**ACCEPTABLE**

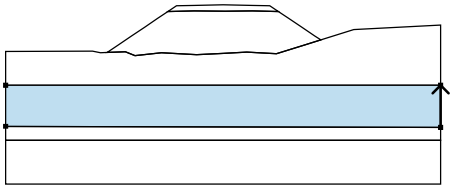
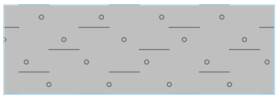
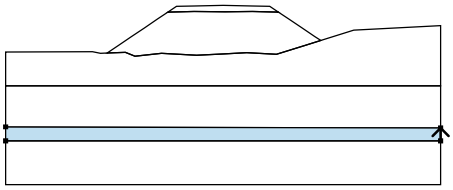
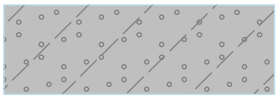
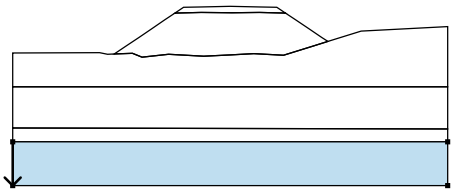
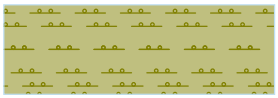
No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
60	12.29	22.15	12.24	65.2 %	**ACCEPTABLE**
61	12.29	22.15	13.24	59.9 %	**ACCEPTABLE**
62	12.29	22.15	14.24	55.9 %	**ACCEPTABLE**
63	12.29	23.15	11.24	35.9 %	**ACCEPTABLE**
64	12.29	23.15	12.24	58.2 %	**ACCEPTABLE**
65	12.29	23.15	13.24	63.7 %	**ACCEPTABLE**
66	12.29	23.15	14.24	59.1 %	**ACCEPTABLE**
67	13.29	19.15	10.24	63.7 %	**ACCEPTABLE**
68	13.29	19.15	11.24	58.4 %	**ACCEPTABLE**
69	13.29	19.15	12.24	53.1 %	**ACCEPTABLE**
70	13.29	19.15	13.24	48.7 %	**ACCEPTABLE**
71	13.29	19.15	14.24	46.7 %	**ACCEPTABLE**
72	13.29	20.15	10.24	65.7 %	**ACCEPTABLE**
73	13.29	20.15	11.24	62.6 %	**ACCEPTABLE**
74	13.29	20.15	12.24	57.9 %	**ACCEPTABLE**
75	13.29	20.15	13.24	52.5 %	**ACCEPTABLE**
76	13.29	20.15	14.24	48.5 %	**ACCEPTABLE**
77	13.29	21.15	10.24	60.2 %	**ACCEPTABLE**
78	13.29	21.15	11.24	64.3 %	**ACCEPTABLE**
79	13.29	21.15	12.24	61.4 %	**ACCEPTABLE**
80	13.29	21.15	13.24	57.2 %	**ACCEPTABLE**
81	13.29	21.15	14.24	51.9 %	**ACCEPTABLE**
82	13.29	22.15	10.24	45.9 %	**ACCEPTABLE**
83	13.29	22.15	11.24	59.1 %	**ACCEPTABLE**
84	13.29	22.15	12.24	63.1 %	**ACCEPTABLE**
85	13.29	22.15	13.24	60.4 %	**ACCEPTABLE**
86	13.29	22.15	14.24	56.1 %	**ACCEPTABLE**
87	13.29	23.15	11.24	46.7 %	**ACCEPTABLE**
88	13.29	23.15	12.24	58.1 %	**ACCEPTABLE**
89	13.29	23.15	13.24	61.4 %	**ACCEPTABLE**
90	13.29	23.15	14.24	59.0 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
91	14.29	19.15	10.24	62.6 %	**ACCEPTABLE**
92	14.29	19.15	11.24	57.8 %	**ACCEPTABLE**
93	14.29	19.15	12.24	52.7 %	**ACCEPTABLE**
94	14.29	19.15	13.24	49.0 %	**ACCEPTABLE**
95	14.29	19.15	14.24	47.2 %	**ACCEPTABLE**
96	14.29	20.15	10.24	61.2 %	**ACCEPTABLE**
97	14.29	20.15	11.24	61.0 %	**ACCEPTABLE**
98	14.29	20.15	12.24	56.9 %	**ACCEPTABLE**
99	14.29	20.15	13.24	52.2 %	**ACCEPTABLE**
100	14.29	20.15	14.24	48.7 %	**ACCEPTABLE**
101	14.29	21.15	10.24	58.1 %	**ACCEPTABLE**
102	14.29	21.15	11.24	59.8 %	**ACCEPTABLE**
103	14.29	21.15	12.24	59.6 %	**ACCEPTABLE**
104	14.29	21.15	13.24	56.1 %	**ACCEPTABLE**
105	14.29	21.15	14.24	51.6 %	**ACCEPTABLE**
106	14.29	22.15	10.24	49.8 %	**ACCEPTABLE**
107	14.29	22.15	11.24	56.6 %	**ACCEPTABLE**
108	14.29	22.15	12.24	58.6 %	**ACCEPTABLE**
109	14.29	22.15	13.24	58.8 %	**ACCEPTABLE**
110	14.29	22.15	14.24	55.3 %	**ACCEPTABLE**
111	14.29	23.15	10.24	28.7 %	**ACCEPTABLE**
112	14.29	23.15	11.24	49.0 %	**ACCEPTABLE**
113	14.29	23.15	12.24	55.0 %	**ACCEPTABLE**
114	14.29	23.15	13.24	57.0 %	**ACCEPTABLE**
115	14.29	23.15	14.24	57.4 %	**ACCEPTABLE**

Input data (Stage of construction 2)

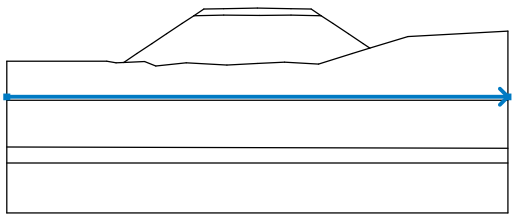
Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		21.62	14.73	25.17	14.69	Estructura de pavimento
		28.32	14.73	31.31	14.67	
		30.32	15.33	28.32	15.37	
		24.97	15.44	21.62	15.37	
		19.62	15.33	18.63	14.67	
2		13.73	10.09	14.85	9.65	Relleno compactado
		17.88	9.96	21.92	9.74	
		24.97	9.90	27.68	10.05	
		31.07	9.86	34.42	10.89	
		36.17	11.43	35.48	11.89	
		34.01	12.87	32.48	13.89	
		31.31	14.67	28.32	14.73	
		25.17	14.69	21.62	14.73	
		18.63	14.67	17.46	13.89	
		15.93	12.87	14.46	11.89	
		12.96	10.89	11.65	10.00	
3		49.92	6.25	49.92	13.13	Arenas y limos compacidad suelta
		39.97	12.60	36.17	11.43	
		34.42	10.89	31.07	9.86	
		27.68	10.05	24.97	9.90	
		21.92	9.74	17.88	9.96	
		14.85	9.65	13.73	10.09	
		11.65	10.00	10.89	9.97	
		9.97	10.15	0.00	10.12	
		0.00	6.25			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		49.92	1.47	49.92	6.25	Arenas arcillosas y limos altas plasticidad consistencia media
		0.00	6.25	0.00	1.59	
5		49.92	0.00	49.92	1.47	Arenas limosas de compaciad media
		0.00	1.59	0.00	0.00	
6		0.00	0.00	0.00	-5.00	Roca sedimentaria meteorizada
		49.92	-5.00	49.92	0.00	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	6.58	49.92	6.58		

Tensile crack

Tensile crack not input.

Earthquake

Horizontal seismic coefficient : K_h = 0.3000

Vertical seismic coefficient : K_v = 0.2000

Settings of the stage of construction

Design situation : Extreme I

Results (Stage of construction 2)

Analysis 1 (stage 2)

Circular slip surface

Slip surface parameters							
Center :	x =	13.29	[m]	Angles :	α_1 =	-35.12	[°]
	z =	20.15	[m]		α_2 =	67.33	[°]
Radius :	R =	12.24	[m]				
Slip surface after grid search.							

Slope stability verification (Morgenstern-Price)

Utilization : 85.8 %

CDR CDR: 1.166

Slope stability ACCEPTABLE

Slip surface grid search (Morgenstern-Price)

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
1	10.29	18.15	8.24	61.5 %	**ACCEPTABLE**
2	10.29	18.15	9.24	62.7 %	**ACCEPTABLE**
3	10.29	18.15	10.24	72.3 %	**ACCEPTABLE**
4	10.29	18.15	11.24	75.8 %	**ACCEPTABLE**
5	10.29	18.15	12.24	73.1 %	**ACCEPTABLE**
6	10.29	19.15	9.24	70.5 %	**ACCEPTABLE**
7	10.29	19.15	10.24	64.1 %	**ACCEPTABLE**
8	10.29	19.15	11.24	75.8 %	**ACCEPTABLE**
9	10.29	19.15	12.24	78.8 %	**ACCEPTABLE**
10	10.29	20.15	10.24	50.8 %	**ACCEPTABLE**
11	10.29	20.15	11.24	69.0 %	**ACCEPTABLE**
12	10.29	20.15	12.24	79.0 %	**ACCEPTABLE**
13	10.29	21.15	10.24	24.5 %	**ACCEPTABLE**
14	10.29	21.15	11.24	54.7 %	**ACCEPTABLE**
15	10.29	21.15	12.24	71.9 %	**ACCEPTABLE**
16	10.29	22.15	11.24	36.6 %	**ACCEPTABLE**
17	10.29	22.15	12.24	60.8 %	**ACCEPTABLE**

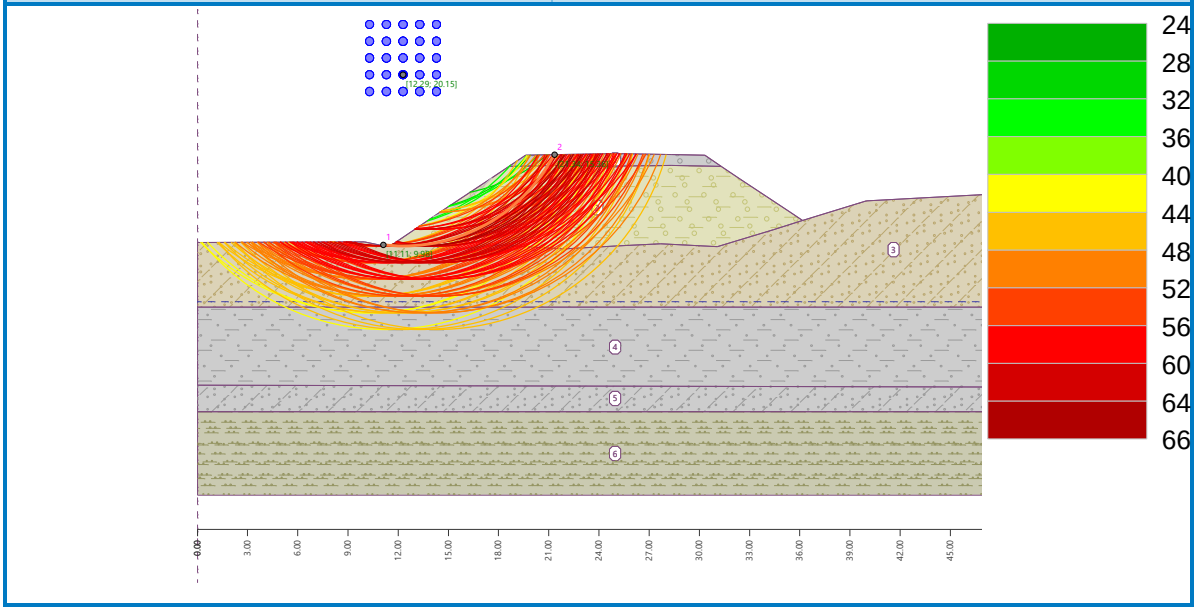
No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
18	11.29	18.15	8.24	66.0 %	**ACCEPTABLE**
19	11.29	18.15	9.24	71.3 %	**ACCEPTABLE**
20	11.29	18.15	10.24	78.6 %	**ACCEPTABLE**
21	11.29	18.15	11.24	79.3 %	**ACCEPTABLE**
22	11.29	18.15	12.24	76.2 %	**ACCEPTABLE**
23	11.29	19.15	8.24	43.4 %	**ACCEPTABLE**
24	11.29	19.15	9.24	61.4 %	**ACCEPTABLE**
25	11.29	19.15	10.24	74.9 %	**ACCEPTABLE**
26	11.29	19.15	11.24	82.0 %	**ACCEPTABLE**
27	11.29	19.15	12.24	81.5 %	**ACCEPTABLE**
28	11.29	20.15	9.24	49.0 %	**ACCEPTABLE**
29	11.29	20.15	10.24	68.4 %	**ACCEPTABLE**
30	11.29	20.15	11.24	77.1 %	**ACCEPTABLE**
31	11.29	20.15	12.24	83.1 %	**ACCEPTABLE**
32	11.29	21.15	10.24	47.9 %	**ACCEPTABLE**
33	11.29	21.15	11.24	70.4 %	**ACCEPTABLE**
34	11.29	21.15	12.24	78.4 %	**ACCEPTABLE**
35	11.29	22.15	11.24	55.2 %	**ACCEPTABLE**
36	11.29	22.15	12.24	72.8 %	**ACCEPTABLE**
37	12.29	18.15	8.24	76.7 %	**ACCEPTABLE**
38	12.29	18.15	9.24	78.0 %	**ACCEPTABLE**
39	12.29	18.15	10.24	82.9 %	**ACCEPTABLE**
40	12.29	18.15	11.24	80.9 %	**ACCEPTABLE**
41	12.29	18.15	12.24	77.3 %	**ACCEPTABLE**
42	12.29	19.15	8.24	56.5 %	**ACCEPTABLE**
43	12.29	19.15	9.24	81.1 %	**ACCEPTABLE**
44	12.29	19.15	10.24	81.4 %	**ACCEPTABLE**
45	12.29	19.15	11.24	83.6 %	**ACCEPTABLE**
46	12.29	19.15	12.24	82.7 %	**ACCEPTABLE**
47	12.29	20.15	8.24	18.6 %	**ACCEPTABLE**
48	12.29	20.15	9.24	63.0 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
49	12.29	20.15	10.24	81.9 %	**ACCEPTABLE**
50	12.29	20.15	11.24	82.2 %	**ACCEPTABLE**
51	12.29	20.15	12.24	85.3 %	**ACCEPTABLE**
52	12.29	21.15	9.24	23.0 %	**ACCEPTABLE**
53	12.29	21.15	10.24	69.7 %	**ACCEPTABLE**
54	12.29	21.15	11.24	82.6 %	**ACCEPTABLE**
55	12.29	21.15	12.24	82.0 %	**ACCEPTABLE**
56	12.29	22.15	10.24	31.2 %	**ACCEPTABLE**
57	12.29	22.15	11.24	68.8 %	**ACCEPTABLE**
58	12.29	22.15	12.24	83.3 %	**ACCEPTABLE**
59	13.29	18.15	8.24	84.1 %	**ACCEPTABLE**
60	13.29	18.15	9.24	82.3 %	**ACCEPTABLE**
61	13.29	18.15	10.24	83.6 %	**ACCEPTABLE**
62	13.29	18.15	11.24	81.6 %	**ACCEPTABLE**
63	13.29	18.15	12.24	78.3 %	**ACCEPTABLE**
64	13.29	19.15	8.24	71.2 %	**ACCEPTABLE**
65	13.29	19.15	9.24	83.4 %	**ACCEPTABLE**
66	13.29	19.15	10.24	83.1 %	**ACCEPTABLE**
67	13.29	19.15	11.24	84.8 %	**ACCEPTABLE**
68	13.29	19.15	12.24	83.2 %	**ACCEPTABLE**
69	13.29	20.15	8.24	42.3 %	**ACCEPTABLE**
70	13.29	20.15	9.24	71.7 %	**ACCEPTABLE**
71	13.29	20.15	10.24	84.4 %	**ACCEPTABLE**
72	13.29	20.15	11.24	83.5 %	**ACCEPTABLE**
73	13.29	20.15	12.24	85.8 %	**ACCEPTABLE**
74	13.29	21.15	9.24	48.2 %	**ACCEPTABLE**
75	13.29	21.15	10.24	73.8 %	**ACCEPTABLE**
76	13.29	21.15	11.24	84.1 %	**ACCEPTABLE**
77	13.29	21.15	12.24	83.4 %	**ACCEPTABLE**
78	13.29	22.15	10.24	51.3 %	**ACCEPTABLE**
79	13.29	22.15	11.24	71.0 %	**ACCEPTABLE**

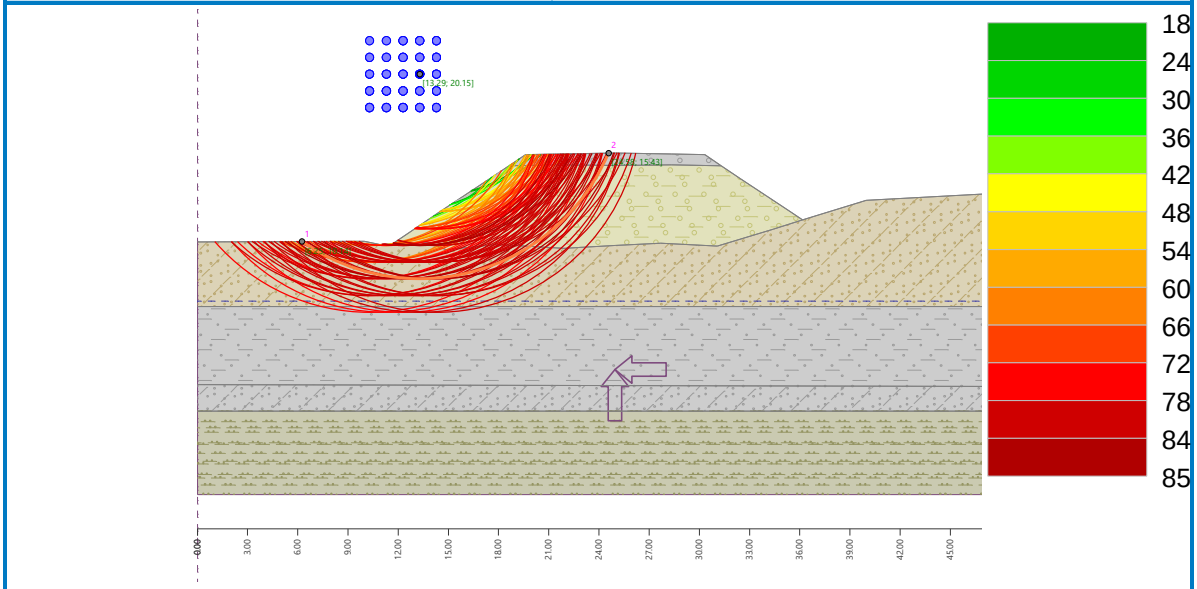
No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
80	14.29	18.15	8.24	82.5 %	**ACCEPTABLE**
81	14.29	18.15	9.24	82.8 %	**ACCEPTABLE**
82	14.29	18.15	10.24	83.5 %	**ACCEPTABLE**
83	14.29	18.15	11.24	81.3 %	**ACCEPTABLE**
84	14.29	18.15	12.24	78.8 %	**ACCEPTABLE**
85	14.29	19.15	8.24	74.7 %	**ACCEPTABLE**
86	14.29	19.15	9.24	82.8 %	**ACCEPTABLE**
87	14.29	19.15	10.24	83.4 %	**ACCEPTABLE**
88	14.29	19.15	11.24	84.5 %	**ACCEPTABLE**
89	14.29	19.15	12.24	82.8 %	**ACCEPTABLE**
90	14.29	20.15	8.24	57.4 %	**ACCEPTABLE**
91	14.29	20.15	9.24	74.9 %	**ACCEPTABLE**
92	14.29	20.15	11.24	83.1 %	**ACCEPTABLE**
93	14.29	20.15	12.24	81.9 %	**ACCEPTABLE**
94	14.29	21.15	8.24	19.7 %	**ACCEPTABLE**
95	14.29	21.15	9.24	56.9 %	**ACCEPTABLE**
96	14.29	21.15	10.24	72.4 %	**ACCEPTABLE**
97	14.29	21.15	12.24	83.0 %	**ACCEPTABLE**
98	14.29	22.15	9.24	23.2 %	**ACCEPTABLE**
99	14.29	22.15	10.24	57.8 %	**ACCEPTABLE**

Annexes

Name : Analysis	Stage - analysis : 1 - 1



Name : Analysis	Stage - analysis : 2 - 1



Slope stability analysis

Input data

Project

Task : Vía San Antonio - San Miguel

Part : Abscisa Km 7+305

Description : Talud de Terraplen

Author : P Ludeña

Date : 21/12/2022

Project ID : Ing. Marco Apunte Ordoñez

Settings

USA - LRFD

Stability analysis

Verification methodology : according to LRFD

Earthquake analysis : Standard

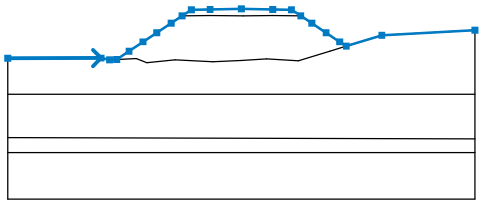
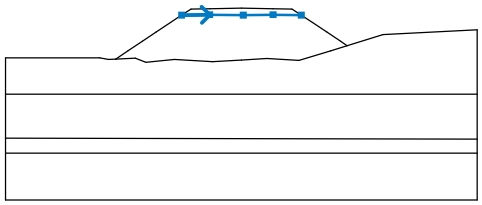
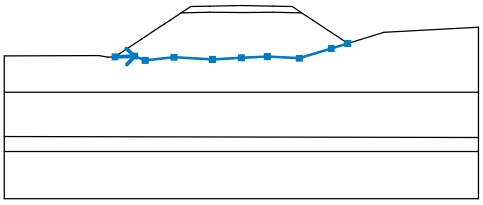
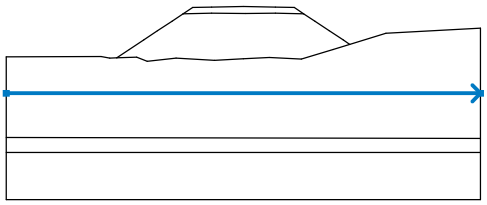
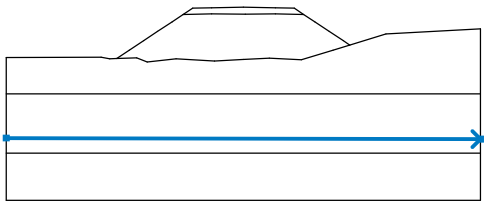
Load factors					
Design situation - Service I					
		Minimum		Maximum	
Earth surcharge load (permanent) :	ES =	1.00	[–]	1.00	[–]
Live load surcharge :	LL =	0.00	[–]	1.00	[–]

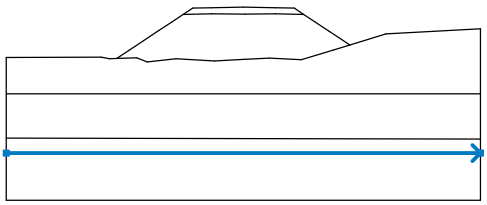
Resistance factors			
Design situation - Service I			
Resistance factor on stability :	ϕ_{SS} =	0.65	[–]

Load factors					
Design situation - Extreme I					
		Minimum		Maximum	
Earth surcharge load (permanent) :	ES =	0.75	[–]	1.50	[–]
Live load surcharge :	LL =	0.00	[–]	1.75	[–]

Resistance factors			
Design situation - Extreme I			
Resistance factor on stability :	ϕ_{SS} =	0.90	[–]

Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		0.00	10.12	9.97	10.15	10.89	9.97
		11.65	10.00	12.96	10.89	14.46	11.89
		15.93	12.87	17.46	13.89	18.63	14.67
		19.62	15.33	21.62	15.37	24.97	15.44
		28.32	15.37	30.32	15.33	31.31	14.67
		32.48	13.89	34.01	12.87	35.48	11.89
		36.17	11.43	39.97	12.60	49.92	13.13
2		18.63	14.67	21.62	14.73	25.17	14.69
		28.32	14.73	31.31	14.67		
3		11.65	10.00	13.73	10.09	14.85	9.65
		17.88	9.96	21.92	9.74	24.97	9.90
		27.68	10.05	31.07	9.86	34.42	10.89
		36.17	11.43				
4		0.00	6.25	49.92	6.25		
5		0.00	1.59	49.92	1.47		

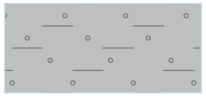
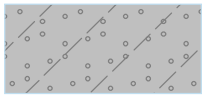
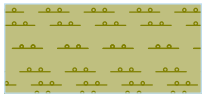
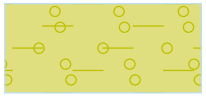
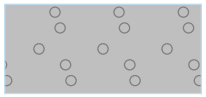
No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
6		0.00	0.00	49.92	0.00		

Soil parameters - effective stress state

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [kPa]	γ [kN/m³]
1	Arenas y limos compacidad suelta		29.70	10.00	17.00
2	Arenas arcillosas y limos altas plasticidad consistencia media		17.00	35.00	17.00
3	Arenas limosas de compaciad media		38.60	10.00	18.00
4	Roca sedimentaria meteorizada		32.00	10.00	20.00
5	Relleno compactado		35.00	8.00	19.00
6	Estructura de pavimento		44.00	50.00	21.00

Soil parameters - uplift

No.	Name	Pattern	γ_{sat} [kN/m³]	γ_s [kN/m³]	n [–]
1	Arenas y limos compacidad suelta		18.00		

No.	Name	Pattern	γ_{sat} [kN/m³]	γ_s [kN/m³]	n [–]
2	Arenas arcillosas y limos altas plasticidad consistencia media		18.00		
3	Arenas limosas de compaciad media		19.00		
4	Roca sedimentaria meteorizada		21.00		
5	Relleno compactado		20.00		
6	Estructura de pavimento		21.00		

Soil parameters

Arenas y limos compacidad suelta

Unit weight : γ = 17.00 kN/m³

Stress-state : effective

Angle of internal friction : φ_{ef} = 29.70 °

Cohesion of soil : c_{ef} = 10.00 kPa

Saturated unit weight : γ_{sat} = 18.00 kN/m³

Arenas arcillosas y limos altas plasticidad consistencia media

Unit weight : γ = 17.00 kN/m³

Stress-state : effective

Angle of internal friction : φ_{ef} = 17.00 °

Cohesion of soil : c_{ef} = 35.00 kPa

Saturated unit weight : γ_{sat} = 18.00 kN/m³

Arenas limosas de compaciad media

Unit weight : γ = 18.00 kN/m³

Stress-state : effective

Angle of internal friction : φ_{ef} = 38.60 °

Cohesion of soil : c_{ef} = 10.00 kPa

Saturated unit weight : γ_{sat} = 19.00 kN/m3

Roca sedimentaria meteorizada

Unit weight : γ = 20.00 kN/m3

Stress-state : effective

Angle of internal friction : φ_{ef} = 32.00 °

Cohesion of soil : c_{ef} = 10.00 kPa

Saturated unit weight : γ_{sat} = 21.00 kN/m3

Relleno compactado

Unit weight : γ = 19.00 kN/m3

Stress-state : effective

Angle of internal friction : φ_{ef} = 35.00 °

Cohesion of soil : c_{ef} = 8.00 kPa

Saturated unit weight : γ_{sat} = 20.00 kN/m3

Estructura de pavimento

Unit weight : γ = 21.00 kN/m3

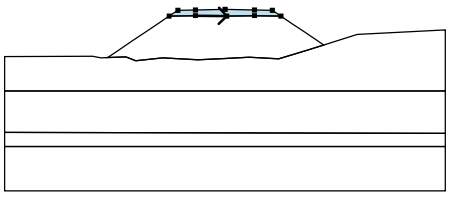
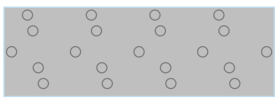
Stress-state : effective

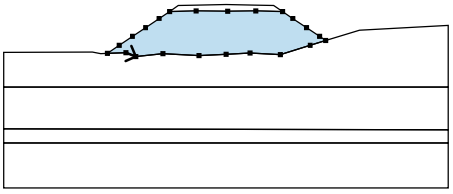
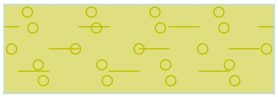
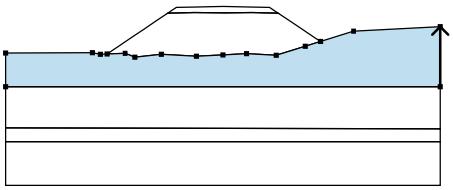
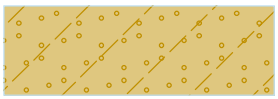
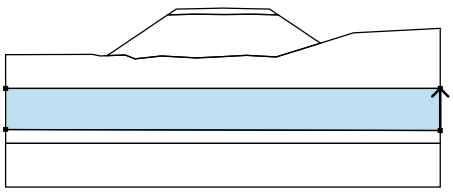
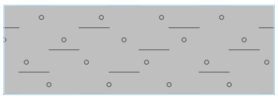
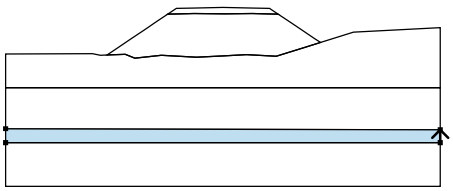
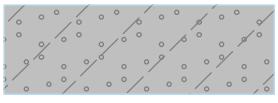
Angle of internal friction : φ_{ef} = 44.00 °

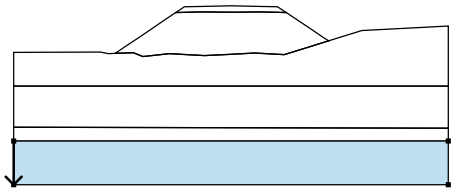
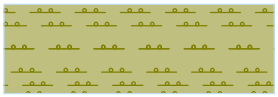
Cohesion of soil : c_{ef} = 50.00 kPa

Saturated unit weight : γ_{sat} = 21.00 kN/m3

Assigning and surfaces

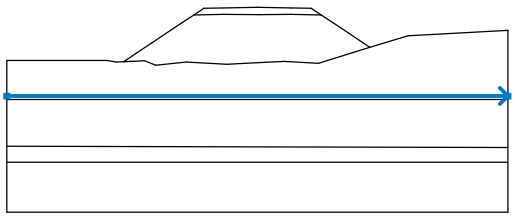
No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		21.62	14.73	25.17	14.69	Estructura de pavimento
		28.32	14.73	31.31	14.67	
		30.32	15.33	28.32	15.37	
		24.97	15.44	21.62	15.37	
		19.62	15.33	18.63	14.67	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
2		13.73	10.09	14.85	9.65	Relleno compactado
		17.88	9.96	21.92	9.74	
		24.97	9.90	27.68	10.05	
		31.07	9.86	34.42	10.89	
		36.17	11.43	35.48	11.89	
		34.01	12.87	32.48	13.89	
		31.31	14.67	28.32	14.73	
		25.17	14.69	21.62	14.73	
		18.63	14.67	17.46	13.89	
		15.93	12.87	14.46	11.89	
		12.96	10.89	11.65	10.00	
3		49.92	6.25	49.92	13.13	Arenas y limos compacidad suelta
		39.97	12.60	36.17	11.43	
		34.42	10.89	31.07	9.86	
		27.68	10.05	24.97	9.90	
		21.92	9.74	17.88	9.96	
		14.85	9.65	13.73	10.09	
		11.65	10.00	10.89	9.97	
		9.97	10.15	0.00	10.12	
		0.00	6.25			
4		49.92	1.47	49.92	6.25	Arenas arcillosas y limos altas plasticidad consistencia media
		0.00	6.25	0.00	1.59	
						
5		49.92	0.00	49.92	1.47	Arenas limosas de compaciad media
		0.00	1.59	0.00	0.00	
						

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
6		0.00	0.00	0.00	-5.00	Roca sedimentaria meteorizada
		49.92	-5.00	49.92	0.00	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	6.58	49.92	6.58		

Tensile crack

Tensile crack not input.

Earthquake

Earthquake not included.

Settings of the stage of construction

Design situation : Service I

Results (Stage of construction 1)

Analysis 1 (stage 1)

Circular slip surface

Slip surface parameters							
Center :	x =	12.29	[m]	Angles :	α_1 =	-6.63	[°]
	z =	20.15	[m]		α_2 =	62.14	[°]
Radius :	R =	10.24	[m]				
Slip surface after grid search.							

Slope stability verification (Morgenstern-Price)
Utilization : 66.7 %

CDR CDR: 1.498
Slope stability ACCEPTABLE
Slip surface grid search (Morgenstern-Price)

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
1	10.29	19.15	10.24	47.5 %	**ACCEPTABLE**
2	10.29	19.15	11.24	48.7 %	**ACCEPTABLE**
3	10.29	19.15	12.24	46.6 %	**ACCEPTABLE**
4	10.29	19.15	13.24	42.9 %	**ACCEPTABLE**
5	10.29	20.15	10.24	45.5 %	**ACCEPTABLE**
6	10.29	20.15	11.24	51.0 %	**ACCEPTABLE**
7	10.29	20.15	12.24	50.6 %	**ACCEPTABLE**
8	10.29	20.15	13.24	47.5 %	**ACCEPTABLE**
9	10.29	20.15	14.24	43.5 %	**ACCEPTABLE**
10	10.29	21.15	10.24	24.2 %	**ACCEPTABLE**
11	10.29	21.15	11.24	48.6 %	**ACCEPTABLE**
12	10.29	21.15	12.24	52.7 %	**ACCEPTABLE**
13	10.29	21.15	13.24	51.3 %	**ACCEPTABLE**
14	10.29	21.15	14.24	47.8 %	**ACCEPTABLE**
15	10.29	22.15	11.24	35.1 %	**ACCEPTABLE**
16	10.29	22.15	12.24	52.5 %	**ACCEPTABLE**
17	10.29	22.15	13.24	54.1 %	**ACCEPTABLE**
18	10.29	22.15	14.24	51.6 %	**ACCEPTABLE**
19	10.29	23.15	12.24	34.2 %	**ACCEPTABLE**
20	10.29	23.15	13.24	54.1 %	**ACCEPTABLE**
21	10.29	23.15	14.24	54.7 %	**ACCEPTABLE**
22	11.29	19.15	10.24	57.1 %	**ACCEPTABLE**
23	11.29	19.15	11.24	54.8 %	**ACCEPTABLE**
24	11.29	19.15	12.24	50.2 %	**ACCEPTABLE**
25	11.29	19.15	13.24	45.6 %	**ACCEPTABLE**
26	11.29	19.15	14.24	43.7 %	**ACCEPTABLE**
27	11.29	20.15	10.24	57.6 %	**ACCEPTABLE**

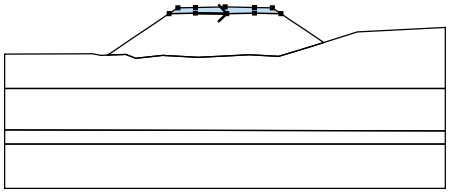
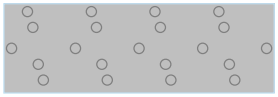
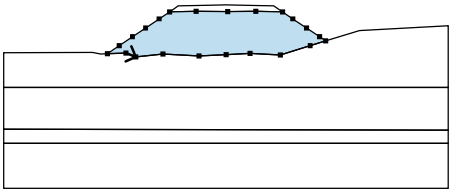
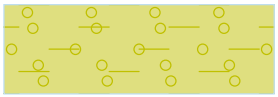
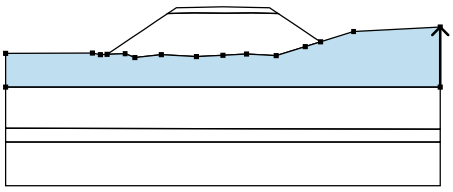
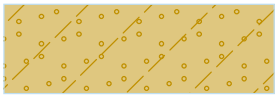
No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
28	11.29	20.15	11.24	58.1 %	**ACCEPTABLE**
29	11.29	20.15	12.24	55.1 %	**ACCEPTABLE**
30	11.29	20.15	13.24	50.3 %	**ACCEPTABLE**
31	11.29	20.15	14.24	46.0 %	**ACCEPTABLE**
32	11.29	21.15	10.24	43.2 %	**ACCEPTABLE**
33	11.29	21.15	11.24	60.0 %	**ACCEPTABLE**
34	11.29	21.15	12.24	58.2 %	**ACCEPTABLE**
35	11.29	21.15	13.24	54.7 %	**ACCEPTABLE**
36	11.29	21.15	14.24	50.3 %	**ACCEPTABLE**
37	11.29	22.15	11.24	49.3 %	**ACCEPTABLE**
38	11.29	22.15	12.24	60.7 %	**ACCEPTABLE**
39	11.29	22.15	13.24	58.6 %	**ACCEPTABLE**
40	11.29	22.15	14.24	54.5 %	**ACCEPTABLE**
41	11.29	23.15	12.24	53.1 %	**ACCEPTABLE**
42	11.29	23.15	13.24	60.2 %	**ACCEPTABLE**
43	11.29	23.15	14.24	57.9 %	**ACCEPTABLE**
44	12.29	19.15	10.24	62.6 %	**ACCEPTABLE**
45	12.29	19.15	11.24	57.4 %	**ACCEPTABLE**
46	12.29	19.15	12.24	52.2 %	**ACCEPTABLE**
47	12.29	19.15	13.24	47.6 %	**ACCEPTABLE**
48	12.29	19.15	14.24	45.5 %	**ACCEPTABLE**
49	12.29	20.15	10.24	66.7 %	**ACCEPTABLE**
50	12.29	20.15	11.24	62.1 %	**ACCEPTABLE**
51	12.29	20.15	12.24	57.4 %	**ACCEPTABLE**
52	12.29	20.15	13.24	52.0 %	**ACCEPTABLE**
53	12.29	20.15	14.24	47.5 %	**ACCEPTABLE**
54	12.29	21.15	11.24	66.0 %	**ACCEPTABLE**
55	12.29	21.15	12.24	61.0 %	**ACCEPTABLE**
56	12.29	21.15	13.24	56.5 %	**ACCEPTABLE**
57	12.29	21.15	14.24	51.6 %	**ACCEPTABLE**
58	12.29	22.15	10.24	29.8 %	**ACCEPTABLE**

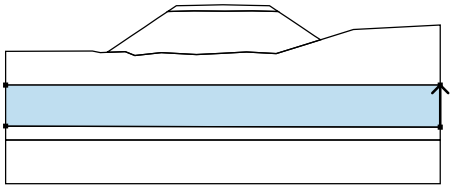
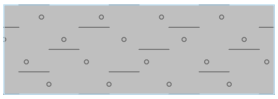
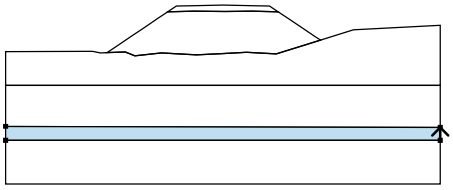
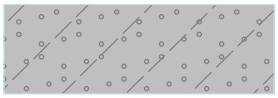
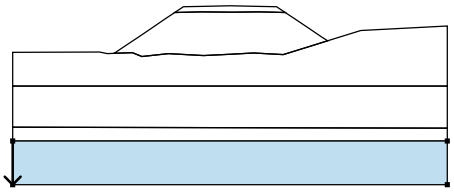
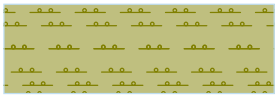
No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
59	12.29	22.15	11.24	58.5 %	**ACCEPTABLE**
60	12.29	22.15	12.24	65.2 %	**ACCEPTABLE**
61	12.29	22.15	13.24	59.9 %	**ACCEPTABLE**
62	12.29	22.15	14.24	55.9 %	**ACCEPTABLE**
63	12.29	23.15	11.24	35.9 %	**ACCEPTABLE**
64	12.29	23.15	12.24	58.2 %	**ACCEPTABLE**
65	12.29	23.15	13.24	63.7 %	**ACCEPTABLE**
66	12.29	23.15	14.24	59.1 %	**ACCEPTABLE**
67	13.29	19.15	10.24	63.7 %	**ACCEPTABLE**
68	13.29	19.15	11.24	58.4 %	**ACCEPTABLE**
69	13.29	19.15	12.24	53.1 %	**ACCEPTABLE**
70	13.29	19.15	13.24	48.7 %	**ACCEPTABLE**
71	13.29	19.15	14.24	46.7 %	**ACCEPTABLE**
72	13.29	20.15	10.24	65.7 %	**ACCEPTABLE**
73	13.29	20.15	11.24	62.6 %	**ACCEPTABLE**
74	13.29	20.15	12.24	57.9 %	**ACCEPTABLE**
75	13.29	20.15	13.24	52.5 %	**ACCEPTABLE**
76	13.29	20.15	14.24	48.5 %	**ACCEPTABLE**
77	13.29	21.15	10.24	60.2 %	**ACCEPTABLE**
78	13.29	21.15	11.24	64.3 %	**ACCEPTABLE**
79	13.29	21.15	12.24	61.4 %	**ACCEPTABLE**
80	13.29	21.15	13.24	57.2 %	**ACCEPTABLE**
81	13.29	21.15	14.24	51.9 %	**ACCEPTABLE**
82	13.29	22.15	10.24	45.9 %	**ACCEPTABLE**
83	13.29	22.15	11.24	59.1 %	**ACCEPTABLE**
84	13.29	22.15	12.24	63.1 %	**ACCEPTABLE**
85	13.29	22.15	13.24	60.4 %	**ACCEPTABLE**
86	13.29	22.15	14.24	56.1 %	**ACCEPTABLE**
87	13.29	23.15	11.24	46.7 %	**ACCEPTABLE**
88	13.29	23.15	12.24	58.1 %	**ACCEPTABLE**
89	13.29	23.15	13.24	61.4 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
90	13.29	23.15	14.24	59.0 %	**ACCEPTABLE**
91	14.29	19.15	10.24	62.6 %	**ACCEPTABLE**
92	14.29	19.15	11.24	57.8 %	**ACCEPTABLE**
93	14.29	19.15	12.24	52.7 %	**ACCEPTABLE**
94	14.29	19.15	13.24	49.0 %	**ACCEPTABLE**
95	14.29	19.15	14.24	47.2 %	**ACCEPTABLE**
96	14.29	20.15	10.24	61.2 %	**ACCEPTABLE**
97	14.29	20.15	11.24	61.0 %	**ACCEPTABLE**
98	14.29	20.15	12.24	56.9 %	**ACCEPTABLE**
99	14.29	20.15	13.24	52.2 %	**ACCEPTABLE**
100	14.29	20.15	14.24	48.7 %	**ACCEPTABLE**
101	14.29	21.15	10.24	58.1 %	**ACCEPTABLE**
102	14.29	21.15	11.24	59.8 %	**ACCEPTABLE**
103	14.29	21.15	12.24	59.6 %	**ACCEPTABLE**
104	14.29	21.15	13.24	56.1 %	**ACCEPTABLE**
105	14.29	21.15	14.24	51.6 %	**ACCEPTABLE**
106	14.29	22.15	10.24	49.8 %	**ACCEPTABLE**
107	14.29	22.15	11.24	56.6 %	**ACCEPTABLE**
108	14.29	22.15	12.24	58.6 %	**ACCEPTABLE**
109	14.29	22.15	13.24	58.8 %	**ACCEPTABLE**
110	14.29	22.15	14.24	55.3 %	**ACCEPTABLE**
111	14.29	23.15	10.24	28.7 %	**ACCEPTABLE**
112	14.29	23.15	11.24	49.0 %	**ACCEPTABLE**
113	14.29	23.15	12.24	55.0 %	**ACCEPTABLE**
114	14.29	23.15	13.24	57.0 %	**ACCEPTABLE**
115	14.29	23.15	14.24	57.4 %	**ACCEPTABLE**

Input data (Stage of construction 2)

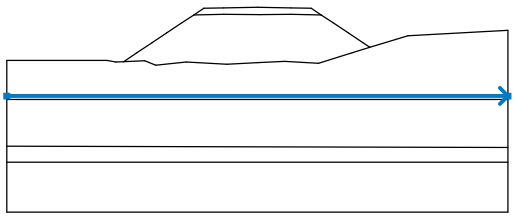
Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		21.62	14.73	25.17	14.69	Estructura de pavimento
		28.32	14.73	31.31	14.67	
		30.32	15.33	28.32	15.37	
		24.97	15.44	21.62	15.37	
		19.62	15.33	18.63	14.67	
2		13.73	10.09	14.85	9.65	Relleno compactado
		17.88	9.96	21.92	9.74	
		24.97	9.90	27.68	10.05	
		31.07	9.86	34.42	10.89	
		36.17	11.43	35.48	11.89	
		34.01	12.87	32.48	13.89	
		31.31	14.67	28.32	14.73	
		25.17	14.69	21.62	14.73	
		18.63	14.67	17.46	13.89	
		15.93	12.87	14.46	11.89	
		12.96	10.89	11.65	10.00	
3		49.92	6.25	49.92	13.13	Arenas y limos compacidad suelta
		39.97	12.60	36.17	11.43	
		34.42	10.89	31.07	9.86	
		27.68	10.05	24.97	9.90	
		21.92	9.74	17.88	9.96	
		14.85	9.65	13.73	10.09	
		11.65	10.00	10.89	9.97	
		9.97	10.15	0.00	10.12	
		0.00	6.25			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		49.92	1.47	49.92	6.25	Arenas arcillosas y limos altas plasticidad consistencia media
		0.00	6.25	0.00	1.59	
5		49.92	0.00	49.92	1.47	Arenas limosas de compaciad media
		0.00	1.59	0.00	0.00	
6		0.00	0.00	0.00	-5.00	Roca sedimentaria meteorizada
		49.92	-5.00	49.92	0.00	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		0.00	6.58	49.92	6.58		

Tensile crack

Tensile crack not input.

Earthquake

Horizontal seismic coefficient : K_h = 0.3000

Vertical seismic coefficient : K_v = 0.2000

Settings of the stage of construction

Design situation : Extreme I

Results (Stage of construction 2)

Analysis 1 (stage 2)

Circular slip surface

Slip surface parameters							
Center :	x =	13.29	[m]	Angles :	α_1 =	-35.12	[°]
	z =	20.15	[m]		α_2 =	67.33	[°]
Radius :	R =	12.24	[m]				
Slip surface after grid search.							

Slope stability verification (Morgenstern-Price)

Utilization : 85.8 %

CDR CDR: 1.166

Slope stability ACCEPTABLE

Slip surface grid search (Morgenstern-Price)

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
1	10.29	18.15	8.24	61.5 %	**ACCEPTABLE**
2	10.29	18.15	9.24	62.7 %	**ACCEPTABLE**
3	10.29	18.15	10.24	72.3 %	**ACCEPTABLE**
4	10.29	18.15	11.24	75.8 %	**ACCEPTABLE**
5	10.29	18.15	12.24	73.1 %	**ACCEPTABLE**
6	10.29	19.15	9.24	70.5 %	**ACCEPTABLE**
7	10.29	19.15	10.24	64.1 %	**ACCEPTABLE**
8	10.29	19.15	11.24	75.8 %	**ACCEPTABLE**
9	10.29	19.15	12.24	78.8 %	**ACCEPTABLE**
10	10.29	20.15	10.24	50.8 %	**ACCEPTABLE**
11	10.29	20.15	11.24	69.0 %	**ACCEPTABLE**
12	10.29	20.15	12.24	79.0 %	**ACCEPTABLE**
13	10.29	21.15	10.24	24.5 %	**ACCEPTABLE**
14	10.29	21.15	11.24	54.7 %	**ACCEPTABLE**
15	10.29	21.15	12.24	71.9 %	**ACCEPTABLE**
16	10.29	22.15	11.24	36.6 %	**ACCEPTABLE**
17	10.29	22.15	12.24	60.8 %	**ACCEPTABLE**

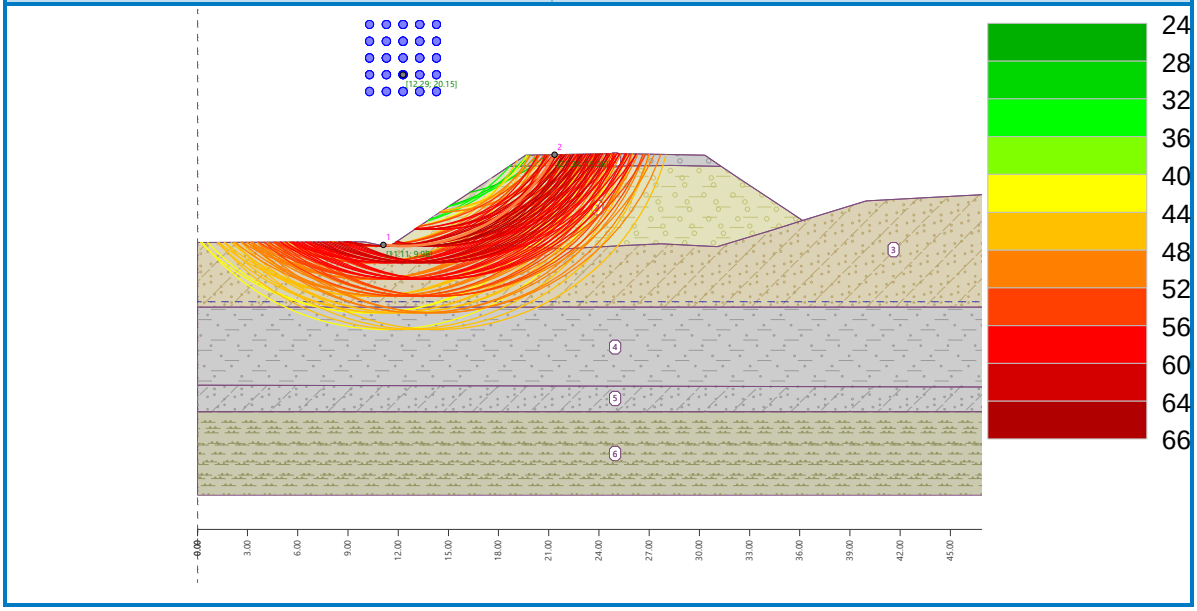
No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
18	11.29	18.15	8.24	66.0 %	**ACCEPTABLE**
19	11.29	18.15	9.24	71.3 %	**ACCEPTABLE**
20	11.29	18.15	10.24	78.6 %	**ACCEPTABLE**
21	11.29	18.15	11.24	79.3 %	**ACCEPTABLE**
22	11.29	18.15	12.24	76.2 %	**ACCEPTABLE**
23	11.29	19.15	8.24	43.4 %	**ACCEPTABLE**
24	11.29	19.15	9.24	61.4 %	**ACCEPTABLE**
25	11.29	19.15	10.24	74.9 %	**ACCEPTABLE**
26	11.29	19.15	11.24	82.0 %	**ACCEPTABLE**
27	11.29	19.15	12.24	81.5 %	**ACCEPTABLE**
28	11.29	20.15	9.24	49.0 %	**ACCEPTABLE**
29	11.29	20.15	10.24	68.4 %	**ACCEPTABLE**
30	11.29	20.15	11.24	77.1 %	**ACCEPTABLE**
31	11.29	20.15	12.24	83.1 %	**ACCEPTABLE**
32	11.29	21.15	10.24	47.9 %	**ACCEPTABLE**
33	11.29	21.15	11.24	70.4 %	**ACCEPTABLE**
34	11.29	21.15	12.24	78.4 %	**ACCEPTABLE**
35	11.29	22.15	11.24	55.2 %	**ACCEPTABLE**
36	11.29	22.15	12.24	72.8 %	**ACCEPTABLE**
37	12.29	18.15	8.24	76.7 %	**ACCEPTABLE**
38	12.29	18.15	9.24	78.0 %	**ACCEPTABLE**
39	12.29	18.15	10.24	82.9 %	**ACCEPTABLE**
40	12.29	18.15	11.24	80.9 %	**ACCEPTABLE**
41	12.29	18.15	12.24	77.3 %	**ACCEPTABLE**
42	12.29	19.15	8.24	56.5 %	**ACCEPTABLE**
43	12.29	19.15	9.24	81.1 %	**ACCEPTABLE**
44	12.29	19.15	10.24	81.4 %	**ACCEPTABLE**
45	12.29	19.15	11.24	83.6 %	**ACCEPTABLE**
46	12.29	19.15	12.24	82.7 %	**ACCEPTABLE**
47	12.29	20.15	8.24	18.6 %	**ACCEPTABLE**
48	12.29	20.15	9.24	63.0 %	**ACCEPTABLE**

No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
49	12.29	20.15	10.24	81.9 %	**ACCEPTABLE**
50	12.29	20.15	11.24	82.2 %	**ACCEPTABLE**
51	12.29	20.15	12.24	85.3 %	**ACCEPTABLE**
52	12.29	21.15	9.24	23.0 %	**ACCEPTABLE**
53	12.29	21.15	10.24	69.7 %	**ACCEPTABLE**
54	12.29	21.15	11.24	82.6 %	**ACCEPTABLE**
55	12.29	21.15	12.24	82.0 %	**ACCEPTABLE**
56	12.29	22.15	10.24	31.2 %	**ACCEPTABLE**
57	12.29	22.15	11.24	68.8 %	**ACCEPTABLE**
58	12.29	22.15	12.24	83.3 %	**ACCEPTABLE**
59	13.29	18.15	8.24	84.1 %	**ACCEPTABLE**
60	13.29	18.15	9.24	82.3 %	**ACCEPTABLE**
61	13.29	18.15	10.24	83.6 %	**ACCEPTABLE**
62	13.29	18.15	11.24	81.6 %	**ACCEPTABLE**
63	13.29	18.15	12.24	78.3 %	**ACCEPTABLE**
64	13.29	19.15	8.24	71.2 %	**ACCEPTABLE**
65	13.29	19.15	9.24	83.4 %	**ACCEPTABLE**
66	13.29	19.15	10.24	83.1 %	**ACCEPTABLE**
67	13.29	19.15	11.24	84.8 %	**ACCEPTABLE**
68	13.29	19.15	12.24	83.2 %	**ACCEPTABLE**
69	13.29	20.15	8.24	42.3 %	**ACCEPTABLE**
70	13.29	20.15	9.24	71.7 %	**ACCEPTABLE**
71	13.29	20.15	10.24	84.4 %	**ACCEPTABLE**
72	13.29	20.15	11.24	83.5 %	**ACCEPTABLE**
73	13.29	20.15	12.24	85.8 %	**ACCEPTABLE**
74	13.29	21.15	9.24	48.2 %	**ACCEPTABLE**
75	13.29	21.15	10.24	73.8 %	**ACCEPTABLE**
76	13.29	21.15	11.24	84.1 %	**ACCEPTABLE**
77	13.29	21.15	12.24	83.4 %	**ACCEPTABLE**
78	13.29	22.15	10.24	51.3 %	**ACCEPTABLE**
79	13.29	22.15	11.24	71.0 %	**ACCEPTABLE**

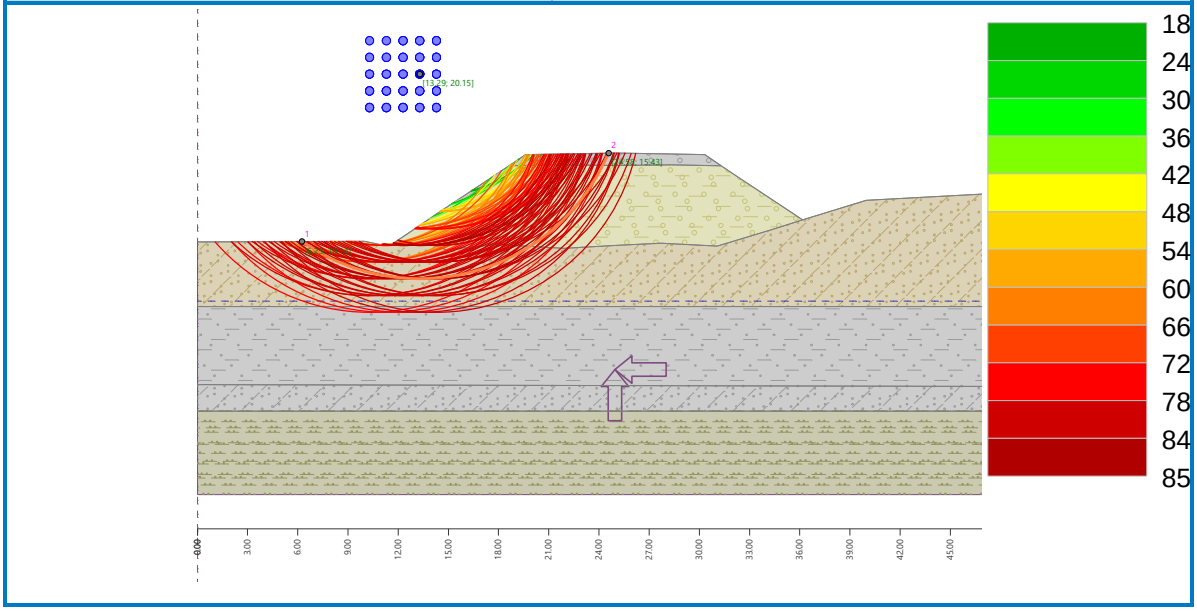
No.	Center		Radius	Utilization	Verification
	x [m]	z [m]	R [m]		
80	14.29	18.15	8.24	82.5 %	**ACCEPTABLE**
81	14.29	18.15	9.24	82.8 %	**ACCEPTABLE**
82	14.29	18.15	10.24	83.5 %	**ACCEPTABLE**
83	14.29	18.15	11.24	81.3 %	**ACCEPTABLE**
84	14.29	18.15	12.24	78.8 %	**ACCEPTABLE**
85	14.29	19.15	8.24	74.7 %	**ACCEPTABLE**
86	14.29	19.15	9.24	82.8 %	**ACCEPTABLE**
87	14.29	19.15	10.24	83.4 %	**ACCEPTABLE**
88	14.29	19.15	11.24	84.5 %	**ACCEPTABLE**
89	14.29	19.15	12.24	82.8 %	**ACCEPTABLE**
90	14.29	20.15	8.24	57.4 %	**ACCEPTABLE**
91	14.29	20.15	9.24	74.9 %	**ACCEPTABLE**
92	14.29	20.15	11.24	83.1 %	**ACCEPTABLE**
93	14.29	20.15	12.24	81.9 %	**ACCEPTABLE**
94	14.29	21.15	8.24	19.7 %	**ACCEPTABLE**
95	14.29	21.15	9.24	56.9 %	**ACCEPTABLE**
96	14.29	21.15	10.24	72.4 %	**ACCEPTABLE**
97	14.29	21.15	12.24	83.0 %	**ACCEPTABLE**
98	14.29	22.15	9.24	23.2 %	**ACCEPTABLE**
99	14.29	22.15	10.24	57.8 %	**ACCEPTABLE**

Annexes

Name : Analysis	Stage - analysis : 1 - 1



Name : Analysis	Stage - analysis : 2 - 1



ANEXO

CONSOLIDACION TERRAPLEN KM 7+305

Analysis of consolidation

Input data

Project

Task : Vía San Antonio - San Miguel
Description : Terraplen Abscisa Km 7+305
Author : PLudeña
Date : 20/12/2022
Project ID : Marco Apunte Ordoñez
Project number : Ingeniero Civil - Consultor

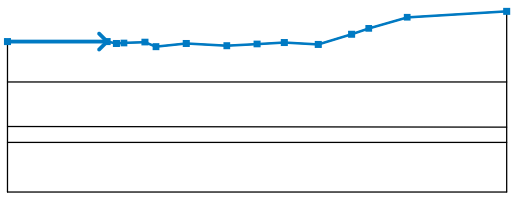
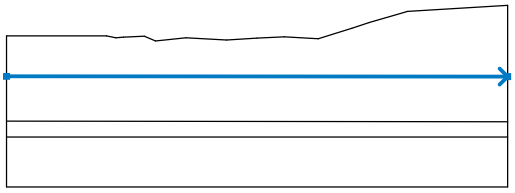
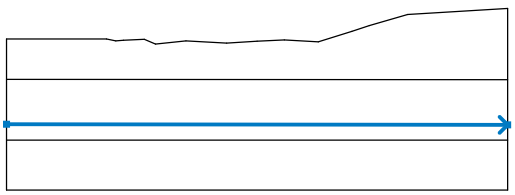
Settings

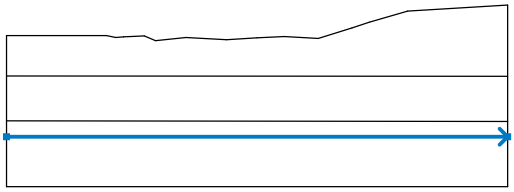
USA - LRFD

Settlement

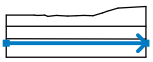
Analysis method : Analysis using oedometric modulus
Restriction of influence zone : by percentage of Sigma,Or
Coeff. of restriction of influence zone : 10.0 [%]

Interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		-24.97	6.69	-15.00	6.69	-14.08	6.51
		-13.32	6.55	-11.23	6.64	-10.12	6.19
		-7.08	6.51	-3.04	6.28	0.00	6.45
		2.71	6.59	6.10	6.41	9.45	7.44
		11.15	8.02	15.00	9.14	24.95	9.74
2		-24.97	2.62	24.95	2.61		
3		-24.97	-1.86	24.95	-1.94		

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
4		-24.97	-3.46	24.95	-3.46		

Incompressible subsoil

No.	Location of incompress.subsoil	Coordinates of points of incompress.subsoil [m]					
		x	z	x	z	x	z
1		-24.97	-3.46	24.95	-3.46		

Soil parameters

Arenas y limos de compacidad suelta

Unit weight : γ = 17.00 kN/m^3

Oedometric modulus : E_{oed} = 7.00 MPa

Saturated unit weight : γ_{sat} = 18.00 kN/m^3

Soil : consolidating, input k

Coefficient of permeability : k = 1.000E+01 m/day

Arenas arcillosas y limos alta plasticidad consistecia media

Unit weight : γ = 17.00 kN/m^3

Oedometric modulus : E_{oed} = 4.00 MPa

Saturated unit weight : γ_{sat} = 18.00 kN/m^3

Soil : consolidating, input k

Coefficient of permeability : k = 1.000E-04 m/day

Silty sand (SM)

Unit weight : γ = 18.00 kN/m^3

Oedometric modulus : E_{oed} = 20.00 MPa

Saturated unit weight : γ_{sat} = 19.00 kN/m^3

Soil : does not consolidate

Material de relleno clasicado Clayey gravel (GC)

Unit weight : γ = 19.50 kN/m^3

Oedometric modulus : E_{oed} = 67.50 MPa

Saturated unit weight : γ_{sat} = 19.50 kN/m^3

Soil : does not consolidate

Estructura de pavimento gravel (GM)

Unit weight : γ = 20.00 kN/m^3

Oedometric modulus : E_{oed} = 100.00 MPa

Saturated unit weight : γ_{sat} = 21.00 kN/m^3

Soil : does not consolidate

Clayey gravel (GC)

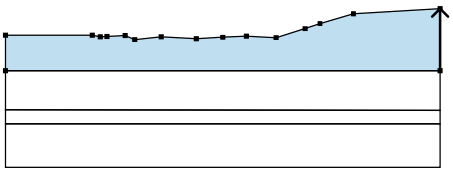
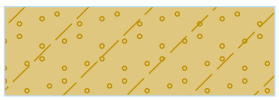
Unit weight : γ = 21.00 kN/m^3

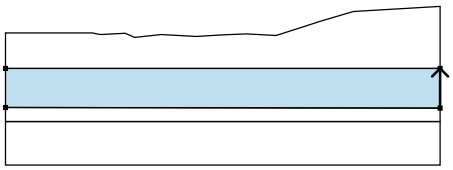
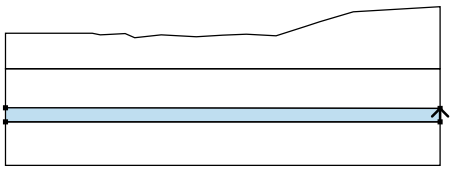
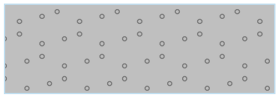
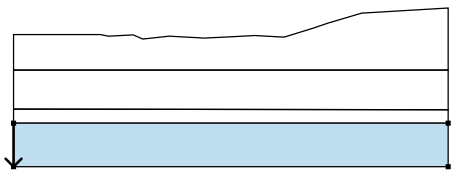
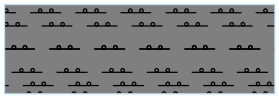
Oedometric modulus : E_{oed} = 100.00 MPa

Saturated unit weight : γ_{sat} = 22.00 kN/m^3

Soil : does not consolidate

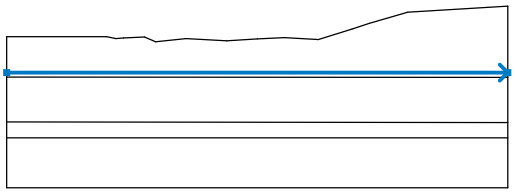
Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		24.95	2.61	24.95	9.74	Arenas y limos de compacidad suelta
		15.00	9.14	11.15	8.02	
		9.45	7.44	6.10	6.41	
		2.71	6.59	0.00	6.45	
		-3.04	6.28	-7.08	6.51	
		-10.12	6.19	-11.23	6.64	
		-13.32	6.55	-14.08	6.51	
		-15.00	6.69	-24.97	6.69	
		-24.97	2.62			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
2		24.95	-1.94	24.95	2.61	Arenas arcillosas y limos alta plasticidad consistencia media
		-24.97	2.62	-24.97	-1.86	
3		24.95	-3.46	24.95	-1.94	Silty sand (SM)
		-24.97	-1.86	-24.97	-3.46	
4		-24.97	-3.46	-24.97	-8.46	Clayey gravel (GC)
		24.95	-8.46	24.95	-3.46	

Water

Water type : GWT

No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		-24.97	3.09	24.95	3.09		

Holes layout

Layout and refinement of holes : standard

Horizontal layout

Layout pattern : exact

Add holes : by number of sections

Number of sections : 20

Vertical refinement

No.	From depth [m]	Refinement [m]
1	0.00	0.10
2	2.00	0.30
3	5.00	0.50
4	10.00	2.00
5	30.00	10.00

Consolidation parameters

Top interface of consolidated soil : Interface No. 1

Bottom interface of consolidated soil : Interface No. 3

Water outflow : Both downwards and upwards

Time of stage duration and load action

Stage	Time of stage duration [day]	Load action
2	5.0	load linearly increasing during the stage duration
3	5.0	whole loading introduced at the beginning of stage
4	5.0	whole loading introduced at the beginning of stage
5	5.0	whole loading introduced at the beginning of stage
6	5.0	whole loading introduced at the beginning of stage

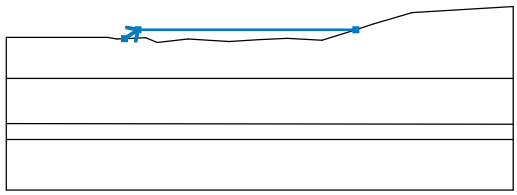
Results (Stage of construction 1)

Results

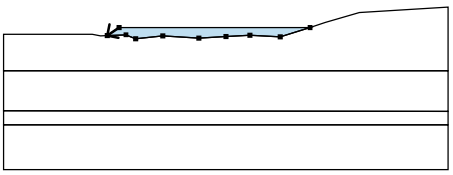
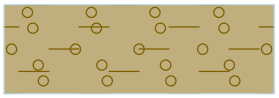
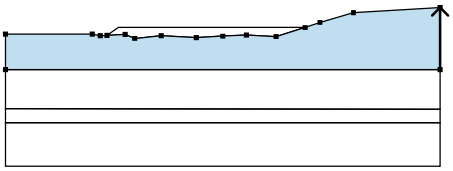
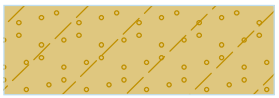
Analysis of geostatic stress was successfully completed

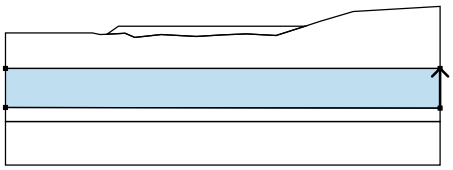
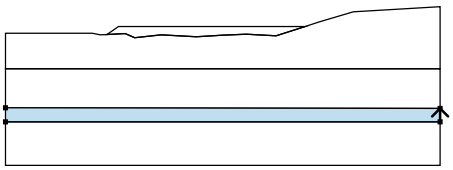
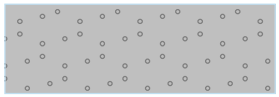
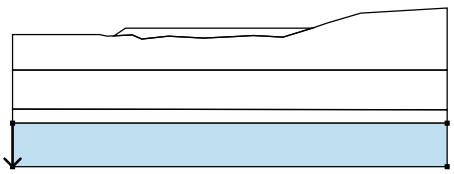
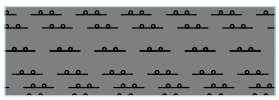
Input data (Stage of construction 2)

Embankment interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		-13.32	6.55	-12.01	7.44	9.45	7.44

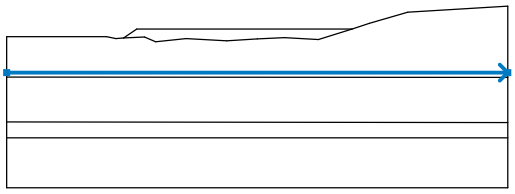
Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		-12.01	7.44	-13.32	6.55	Material de relleno clasicado Clayey gravel (GC)
		-11.23	6.64	-10.12	6.19	
		-7.08	6.51	-3.04	6.28	
		0.00	6.45	2.71	6.59	
		6.10	6.41	9.45	7.44	
2		24.95	2.61	24.95	9.74	Arenas y limos de compacidad suelta
		15.00	9.14	11.15	8.02	
		9.45	7.44	6.10	6.41	
		2.71	6.59	0.00	6.45	
		-3.04	6.28	-7.08	6.51	
		-10.12	6.19	-11.23	6.64	
		-13.32	6.55	-14.08	6.51	
		-15.00	6.69	-24.97	6.69	
		-24.97	2.62			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
3		24.95	-1.94	24.95	2.61	Arenas arcillosas y limos alta plasticidad consistecia media
		-24.97	2.62	-24.97	-1.86	
						
4		24.95	-3.46	24.95	-1.94	Silty sand (SM)
		-24.97	-1.86	-24.97	-3.46	
						
5		-24.97	-3.46	-24.97	-8.46	Clayey gravel (GC)
		24.95	-8.46	24.95	-3.46	
						

Water

Water type : GWT

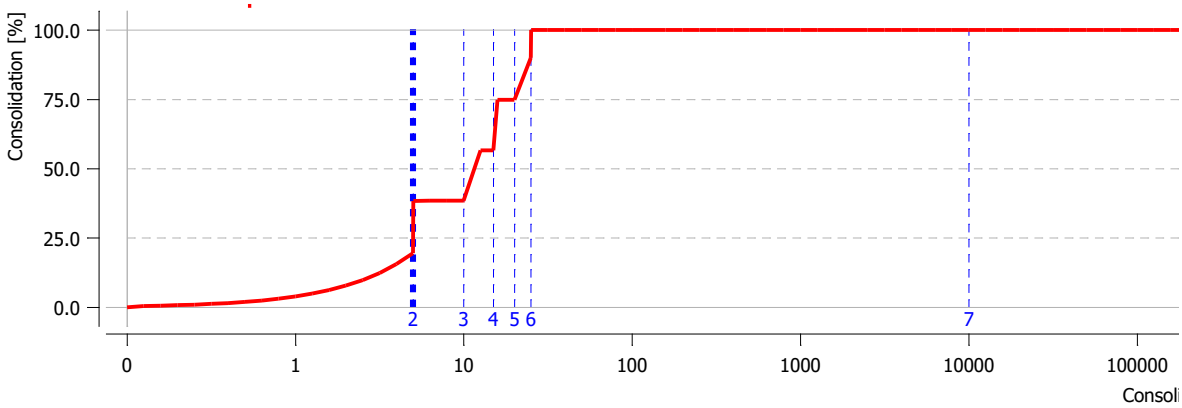
No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		-24.97	3.09	24.95	3.09		

Results (Stage of construction 2)

Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 12.5 mm
Maximum depth of influence zone = 10.05 m

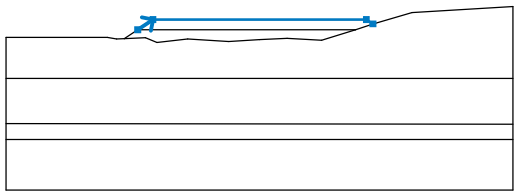
Graph of consolidation



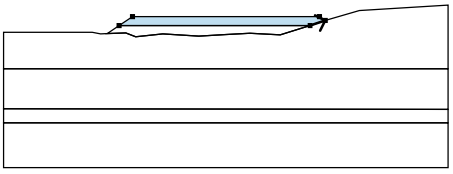
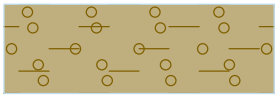
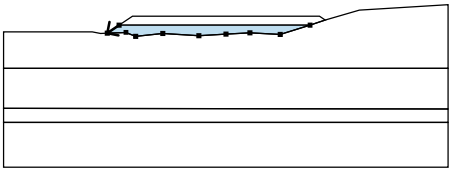
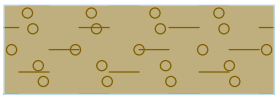
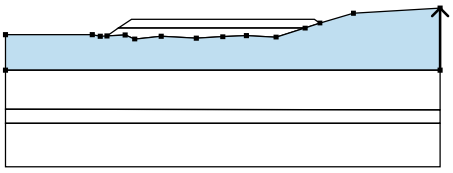
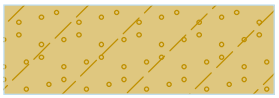
Graph of consolidation in the location of maximum settlement (X = -1.52 m)

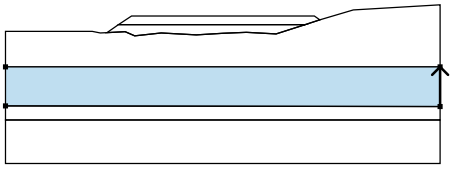
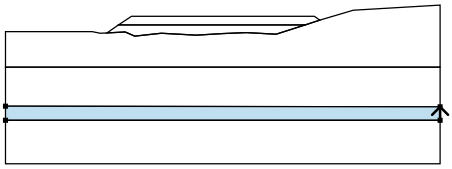
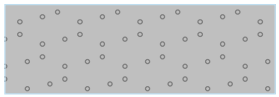
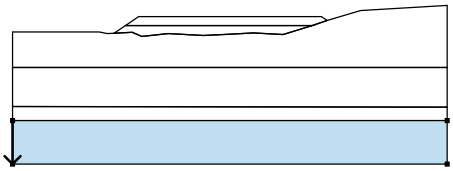
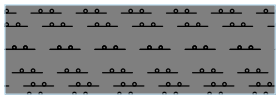
Input data (Stage of construction 3)

Embankment interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		-12.01	7.44	-10.50	8.44	10.51	8.44
		11.15	8.02				

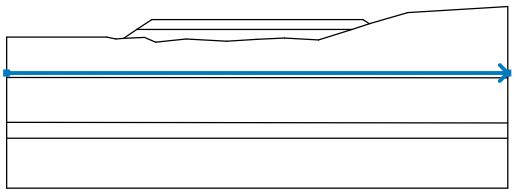
Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		9.45	7.44	11.15	8.02	Material de relleno clasicado Clayey gravel (GC)
		10.51	8.44	-10.50	8.44	
		-12.01	7.44			
2		-12.01	7.44	-13.32	6.55	Material de relleno clasicado Clayey gravel (GC)
		-11.23	6.64	-10.12	6.19	
		-7.08	6.51	-3.04	6.28	
		0.00	6.45	2.71	6.59	
		6.10	6.41	9.45	7.44	
3		24.95	2.61	24.95	9.74	Arenas y limos de compacidad suelta
		15.00	9.14	11.15	8.02	
		9.45	7.44	6.10	6.41	
		2.71	6.59	0.00	6.45	
		-3.04	6.28	-7.08	6.51	
		-10.12	6.19	-11.23	6.64	
		-13.32	6.55	-14.08	6.51	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
		-15.00	6.69	-24.97	6.69	
		-24.97	2.62			
4		24.95	-1.94	24.95	2.61	Arenas arcillosas y limos alta plasticidad consistecia media
		-24.97	2.62	-24.97	-1.86	
						
5		24.95	-3.46	24.95	-1.94	Silty sand (SM)
		-24.97	-1.86	-24.97	-3.46	
						
6		-24.97	-3.46	-24.97	-8.46	Clayey gravel (GC)
		24.95	-8.46	24.95	-3.46	
						

Water

Water type : GWT

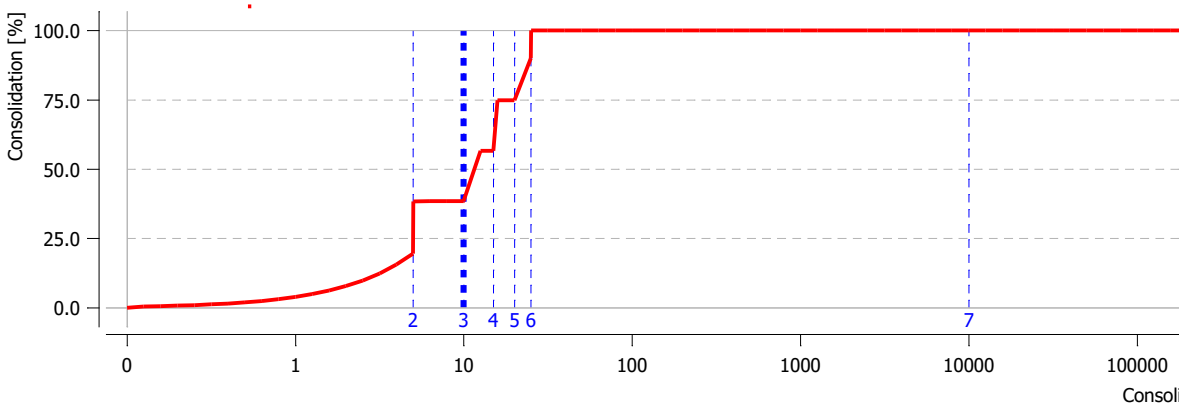
No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		-24.97	3.09	24.95	3.09		

Results (Stage of construction 3)

Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 39.1 mm
Maximum depth of influence zone = 11.48 m

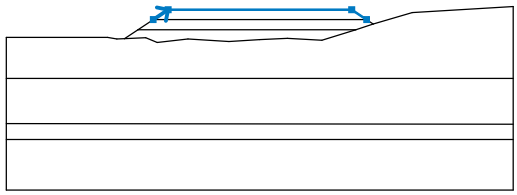
Graph of consolidation



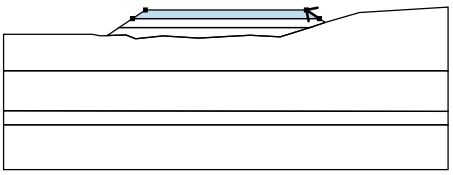
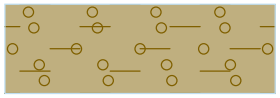
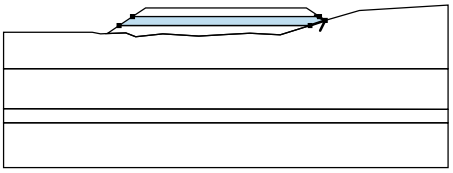
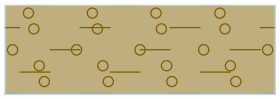
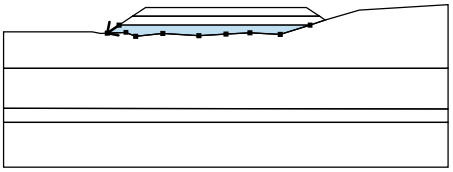
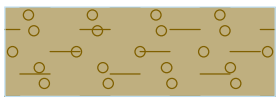
Graph of consolidation in the location of maximum settlement (X = -1.52 m)

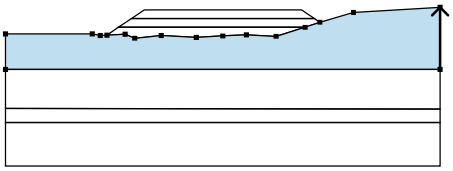
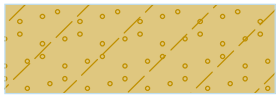
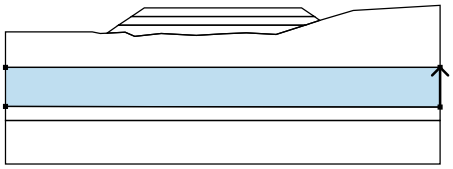
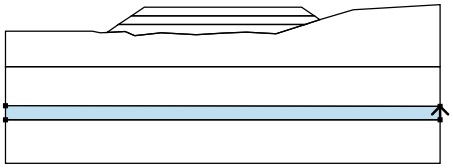
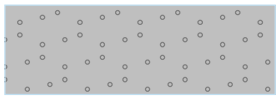
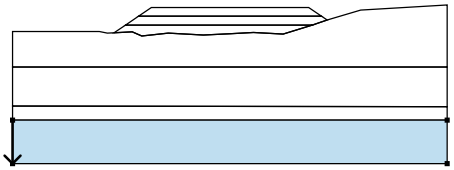
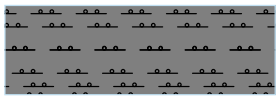
Input data (Stage of construction 4)

Embankment interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		-10.50	8.44	-9.04	9.42	9.04	9.42
		10.51	8.44				

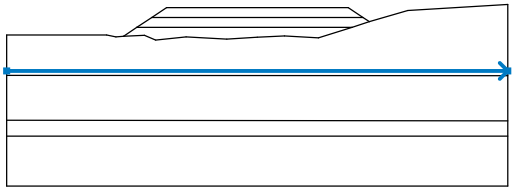
Assigning and surfaces

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		10.51	8.44	9.04	9.42	Material de relleno clasicado Clayey gravel (GC)
		-9.04	9.42	-10.50	8.44	
						
2		9.45	7.44	11.15	8.02	Material de relleno clasicado Clayey gravel (GC)
		10.51	8.44	-10.50	8.44	
		-12.01	7.44			
3		-12.01	7.44	-13.32	6.55	Material de relleno clasicado Clayey gravel (GC)
		-11.23	6.64	-10.12	6.19	
		-7.08	6.51	-3.04	6.28	
		0.00	6.45	2.71	6.59	
		6.10	6.41	9.45	7.44	

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		24.95	2.61	24.95	9.74	Arenas y limos de compacidad suelta
		15.00	9.14	11.15	8.02	
		9.45	7.44	6.10	6.41	
		2.71	6.59	0.00	6.45	
		-3.04	6.28	-7.08	6.51	
		-10.12	6.19	-11.23	6.64	
		-13.32	6.55	-14.08	6.51	
		-15.00	6.69	-24.97	6.69	
		-24.97	2.62			
5		24.95	-1.94	24.95	2.61	Arenas arcillosas y limos alta plasticidad consistecia media
		-24.97	2.62	-24.97	-1.86	
						
6		24.95	-3.46	24.95	-1.94	Silty sand (SM)
		-24.97	-1.86	-24.97	-3.46	
						
7		-24.97	-3.46	-24.97	-8.46	Clayey gravel (GC)
		24.95	-8.46	24.95	-3.46	
						

Water

Water type : GWT

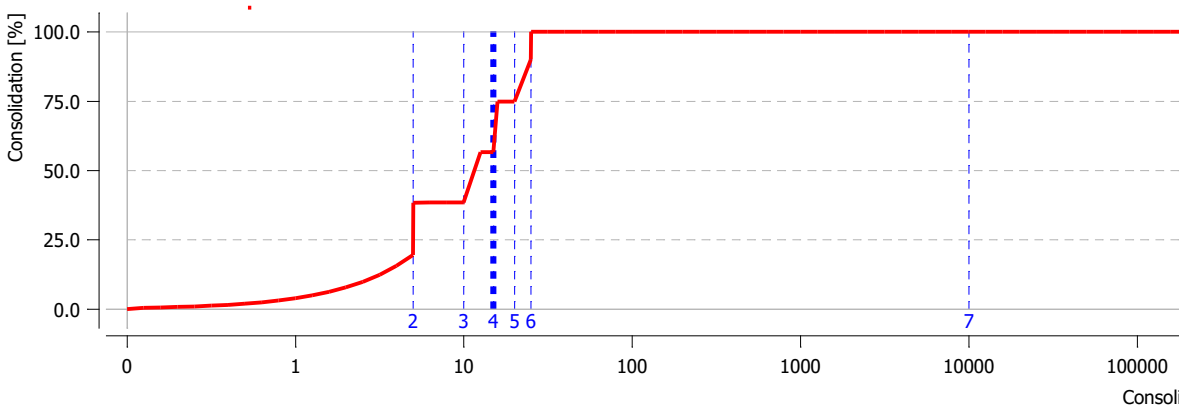
No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		-24.97	3.09	24.95	3.09		

Results (Stage of construction 4)

Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 68.8 mm
Maximum depth of influence zone = 12.04 m

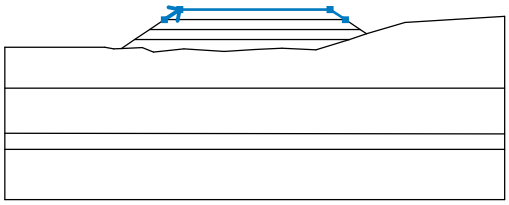
Graph of consolidation



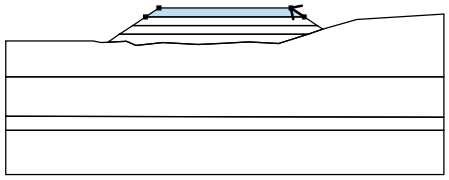
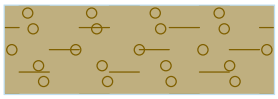
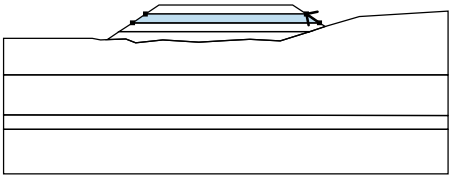
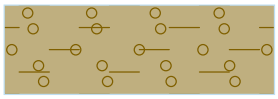
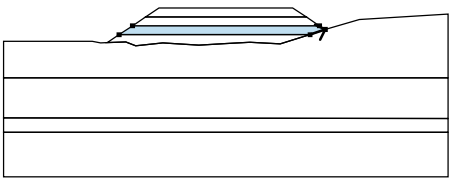
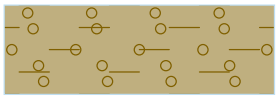
Graph of consolidation in the location of maximum settlement (X = -1.52 m)

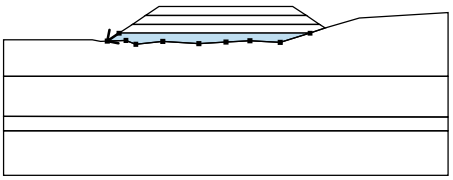
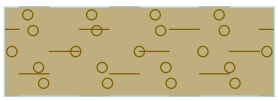
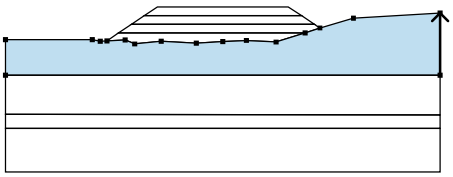
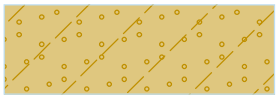
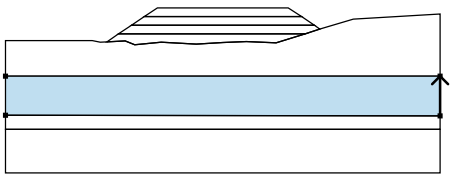
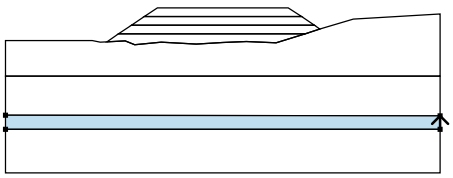
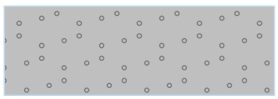
Input data (Stage of construction 5)

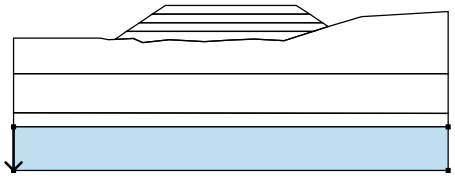
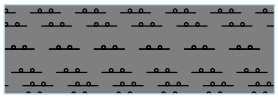
Embankment interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		-9.04	9.42	-7.51	10.43	7.51	10.43
		9.04	9.42				

Assigning and surfaces

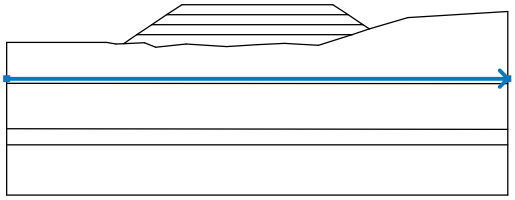
No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		9.04	9.42	7.51	10.43	Material de relleno clasicado Clayey gravel (GC)
		-7.51	10.43	-9.04	9.42	
						
2		10.51	8.44	9.04	9.42	Material de relleno clasicado Clayey gravel (GC)
		-9.04	9.42	-10.50	8.44	
						
3		9.45	7.44	11.15	8.02	Material de relleno clasicado Clayey gravel (GC)
		10.51	8.44	-10.50	8.44	
		-12.01	7.44			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		-12.01	7.44	-13.32	6.55	Material de relleno clasicado Clayey gravel (GC)
		-11.23	6.64	-10.12	6.19	
		-7.08	6.51	-3.04	6.28	
		0.00	6.45	2.71	6.59	
		6.10	6.41	9.45	7.44	
5		24.95	2.61	24.95	9.74	Arenas y limos de compacidad suelta
		15.00	9.14	11.15	8.02	
		9.45	7.44	6.10	6.41	
		2.71	6.59	0.00	6.45	
		-3.04	6.28	-7.08	6.51	
		-10.12	6.19	-11.23	6.64	
		-13.32	6.55	-14.08	6.51	
		-15.00	6.69	-24.97	6.69	
		-24.97	2.62			
6		24.95	-1.94	24.95	2.61	Arenas arcillosas y limos alta plasticidad consistecia media
		-24.97	2.62	-24.97	-1.86	
						
7		24.95	-3.46	24.95	-1.94	Silty sand (SM)
		-24.97	-1.86	-24.97	-3.46	
						

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
8		-24.97	-3.46	-24.97	-8.46	Clayey gravel (GC)
		24.95	-8.46	24.95	-3.46	

Water

Water type : GWT

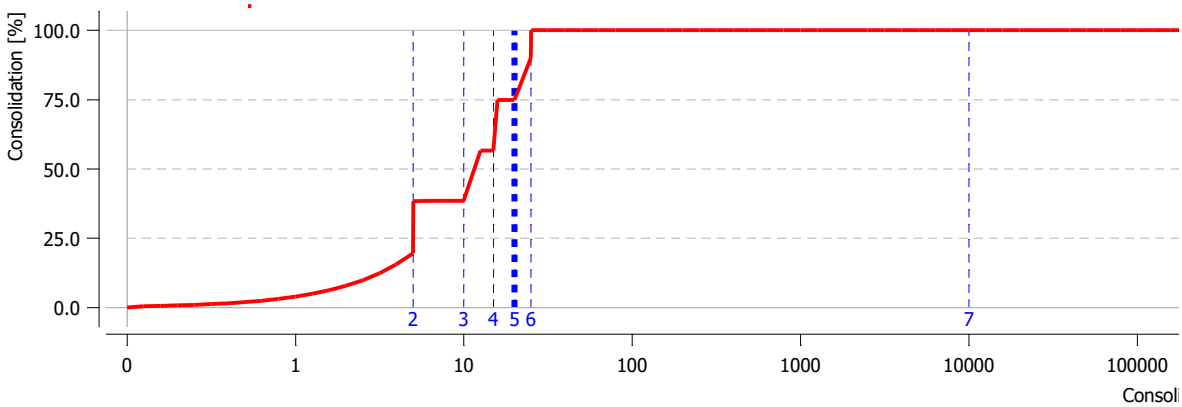
No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		-24.97	3.09	24.95	3.09		

Results (Stage of construction 5)

Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 102.3 mm
Maximum depth of influence zone = 12.04 m

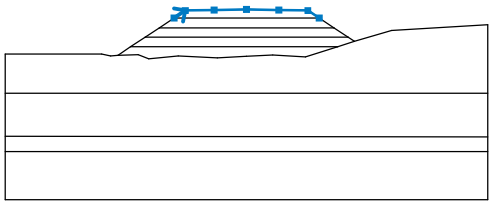
Graph of consolidation



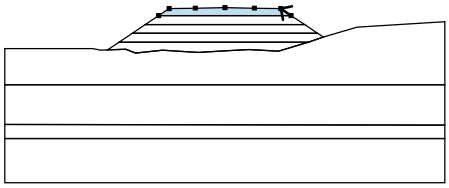
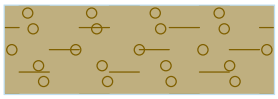
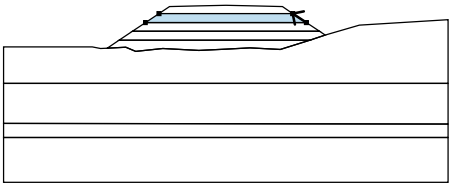
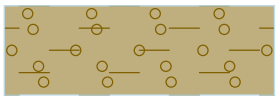
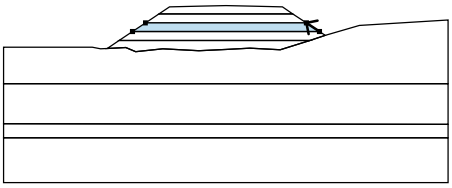
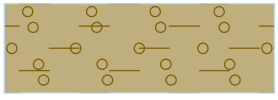
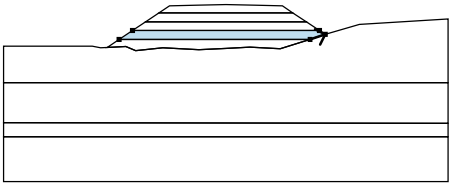
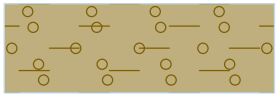
Graph of consolidation in the location of maximum settlement (X = -1.52 m)

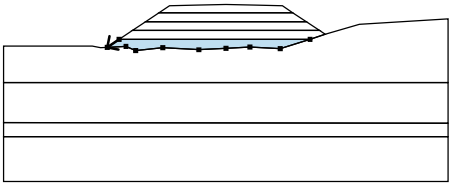
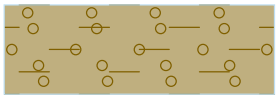
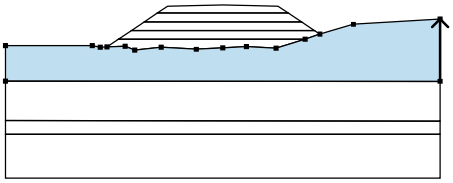
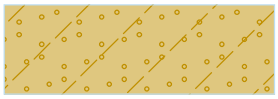
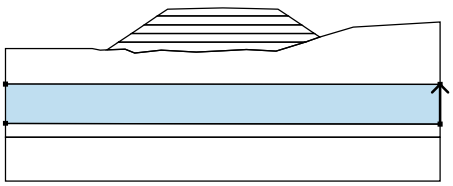
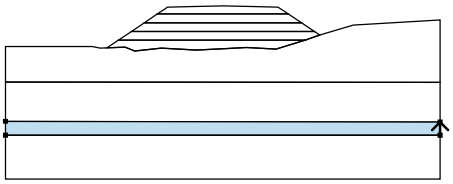
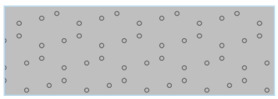
Input data (Stage of construction 6)

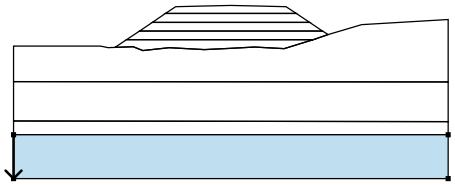
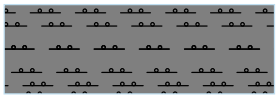
Embankment interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		-7.51	10.43	-6.34	11.22	-3.35	11.28
		0.00	11.34	3.35	11.28	6.34	11.22
		7.51	10.43				

Assigning and surfaces

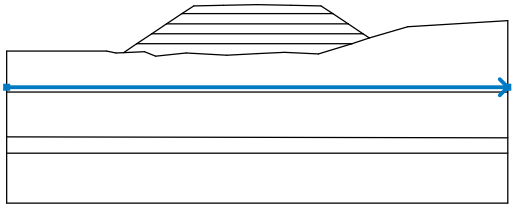
No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		7.51	10.43	6.34	11.22	Material de relleno clasicado Clayey gravel (GC)
		3.35	11.28	0.00	11.34	
		-3.35	11.28	-6.34	11.22	
		-7.51	10.43			
2		9.04	9.42	7.51	10.43	Material de relleno clasicado Clayey gravel (GC)
		-7.51	10.43	-9.04	9.42	
						
3		10.51	8.44	9.04	9.42	Material de relleno clasicado Clayey gravel (GC)
		-9.04	9.42	-10.50	8.44	
						
4		9.45	7.44	11.15	8.02	Material de relleno clasicado Clayey gravel (GC)
		10.51	8.44	-10.50	8.44	
		-12.01	7.44			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
5		-12.01	7.44	-13.32	6.55	Material de relleno clasicado Clayey gravel (GC)
		-11.23	6.64	-10.12	6.19	
		-7.08	6.51	-3.04	6.28	
		0.00	6.45	2.71	6.59	
		6.10	6.41	9.45	7.44	
6		24.95	2.61	24.95	9.74	Arenas y limos de compacidad suelta
		15.00	9.14	11.15	8.02	
		9.45	7.44	6.10	6.41	
		2.71	6.59	0.00	6.45	
		-3.04	6.28	-7.08	6.51	
		-10.12	6.19	-11.23	6.64	
		-13.32	6.55	-14.08	6.51	
		-15.00	6.69	-24.97	6.69	
		-24.97	2.62			
7		24.95	-1.94	24.95	2.61	Arenas arcillosas y limos alta plasticidad consistecia media
		-24.97	2.62	-24.97	-1.86	
						
8		24.95	-3.46	24.95	-1.94	Silty sand (SM)
		-24.97	-1.86	-24.97	-3.46	
						

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
9		-24.97	-3.46	-24.97	-8.46	Clayey gravel (GC)
		24.95	-8.46	24.95	-3.46	

Water

Water type : GWT

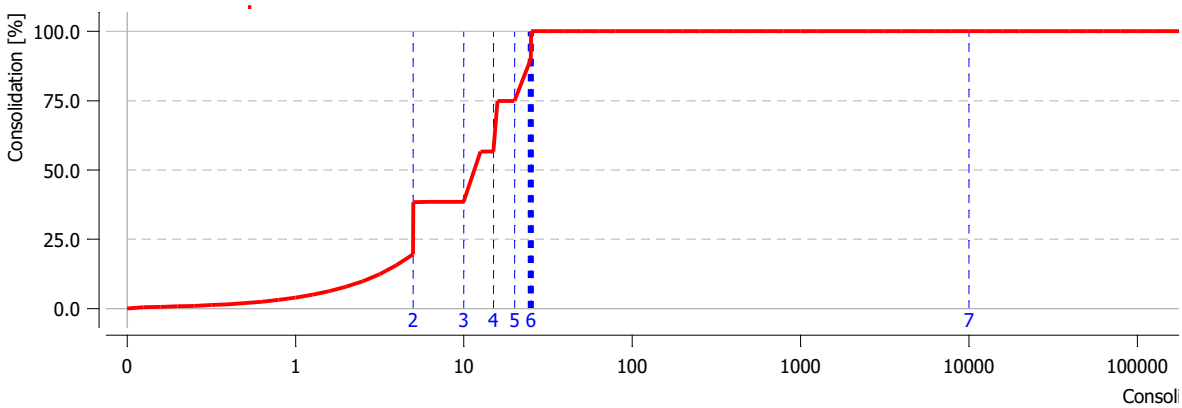
No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		-24.97	3.09	24.95	3.09		

Results (Stage of construction 6)

Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 142.0 mm
Maximum depth of influence zone = 12.60 m

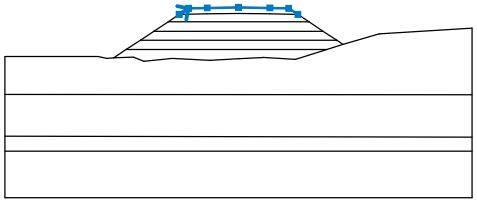
Graph of consolidation



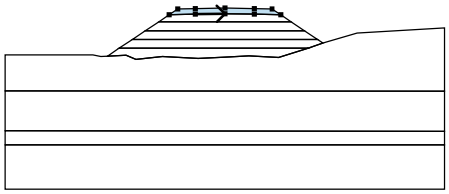
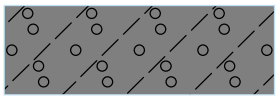
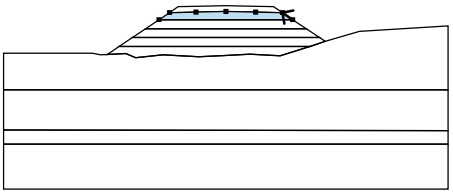
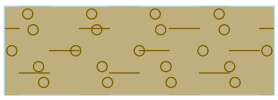
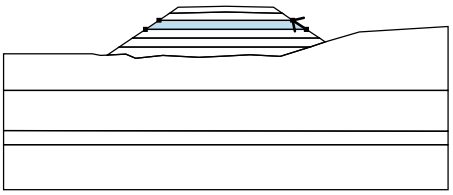
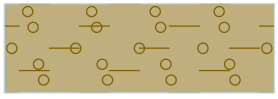
Graph of consolidation in the location of maximum settlement (X = -1.52 m)

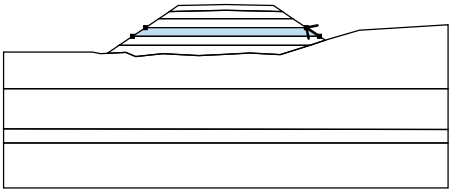
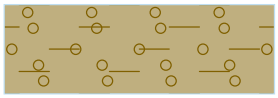
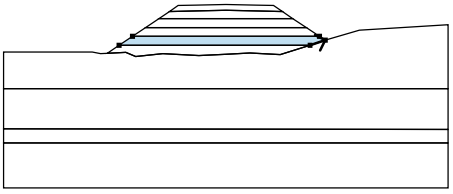
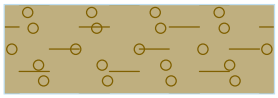
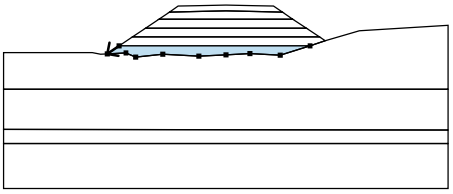
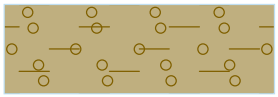
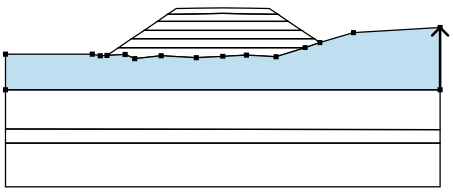
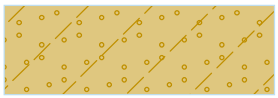
Input data (Stage of construction 7)

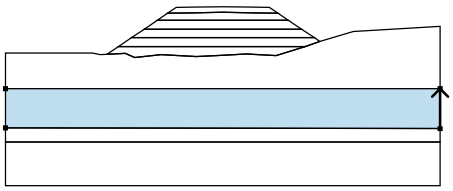
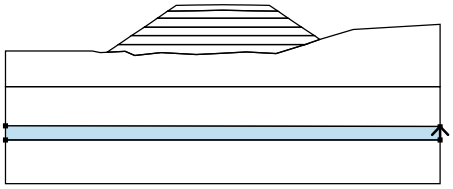
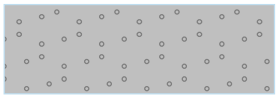
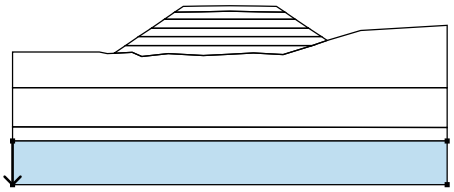
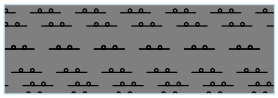
Embankment interface

No.	Interface location	Coordinates of interface points [m]					
		x	z	x	z	x	z
1		-6.34	11.22	-5.35	11.88	-3.35	11.92
		0.00	11.98	3.35	11.92	5.35	11.88
		6.34	11.22				

Assigning and surfaces

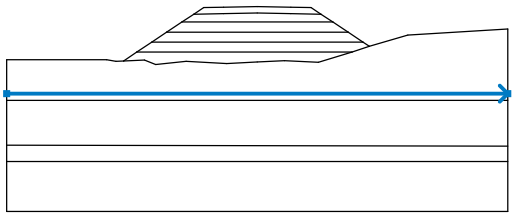
No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
1		-3.35	11.28	0.00	11.34	Estructura de pavimento gravel (GM)
		3.35	11.28	6.34	11.22	
		5.35	11.88	3.35	11.92	
		0.00	11.98	-3.35	11.92	
		-5.35	11.88	-6.34	11.22	
2		7.51	10.43	6.34	11.22	Material de relleno clasicado Clayey gravel (GC)
		3.35	11.28	0.00	11.34	
		-3.35	11.28	-6.34	11.22	
		-7.51	10.43			
3		9.04	9.42	7.51	10.43	Material de relleno clasicado Clayey gravel (GC)
		-7.51	10.43	-9.04	9.42	
						

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
4		10.51	8.44	9.04	9.42	Material de relleno clasicado Clayey gravel (GC)
		-9.04	9.42	-10.50	8.44	
5		9.45	7.44	11.15	8.02	Material de relleno clasicado Clayey gravel (GC)
		10.51	8.44	-10.50	8.44	
		-12.01	7.44			
6		-12.01	7.44	-13.32	6.55	Material de relleno clasicado Clayey gravel (GC)
		-11.23	6.64	-10.12	6.19	
		-7.08	6.51	-3.04	6.28	
		0.00	6.45	2.71	6.59	
		6.10	6.41	9.45	7.44	
7		24.95	2.61	24.95	9.74	Arenas y limos de compacidad suelta
		15.00	9.14	11.15	8.02	
		9.45	7.44	6.10	6.41	
		2.71	6.59	0.00	6.45	
		-3.04	6.28	-7.08	6.51	
		-10.12	6.19	-11.23	6.64	
		-13.32	6.55	-14.08	6.51	
		-15.00	6.69	-24.97	6.69	
		-24.97	2.62			

No.	Surface position	Coordinates of surface points [m]				Assigned soil
		x	z	x	z	
8		24.95	-1.94	24.95	2.61	Arenas arcillosas y limos alta plasticidad consistecia media
		-24.97	2.62	-24.97	-1.86	
9		24.95	-3.46	24.95	-1.94	Silty sand (SM)
		-24.97	-1.86	-24.97	-3.46	
10		-24.97	-3.46	-24.97	-8.46	Clayey gravel (GC)
		24.95	-8.46	24.95	-3.46	

Water

Water type : GWT

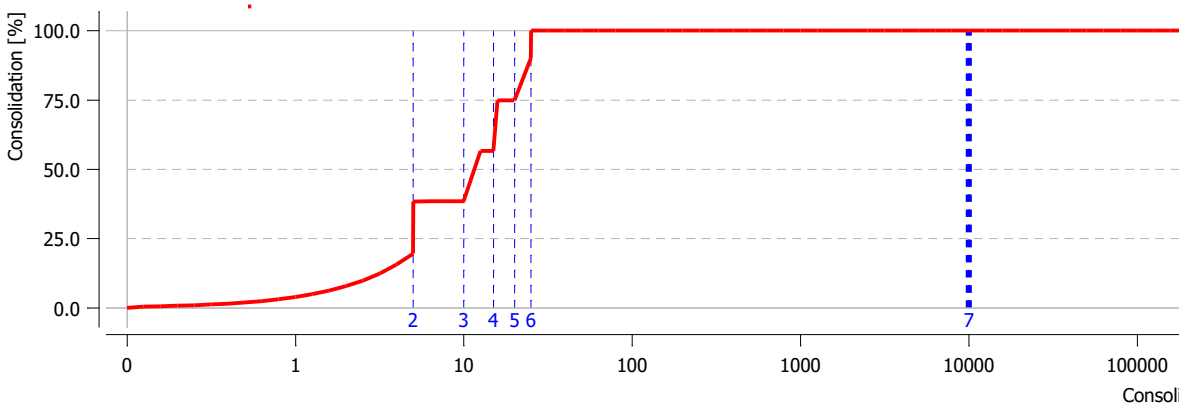
No.	GWT location	Coordinates of GWT points [m]					
		x	z	x	z	x	z
1		-24.97	3.30	24.95	3.30		

Results (Stage of construction 7)

Results

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 173.8 mm
Maximum depth of influence zone = 12.04 m

Graph of consolidation



Graph of consolidation in the location of maximum settlement (X = -1.52 m)

Analysis performed, method Analysis using oedometric modulus
Maximum settlement = 173.8 mm
Maximum depth of influence zone = 12.04 m

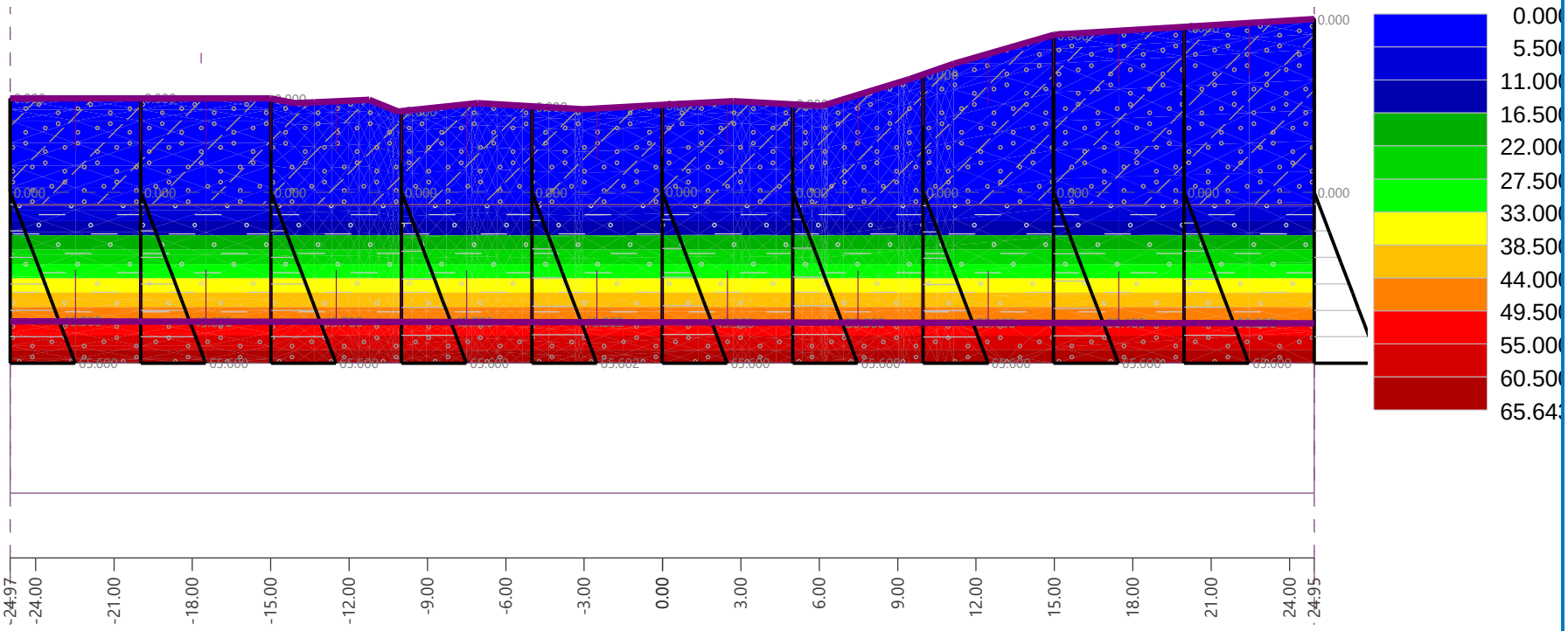
Consolidation table

Consolidation time [day]	Consolidation [%]
0.0	0.0
1.0	3.9
2.0	7.8
3.0	11.7
7.0	38.4
14.0	56.6
30.0	100.0

Annexes

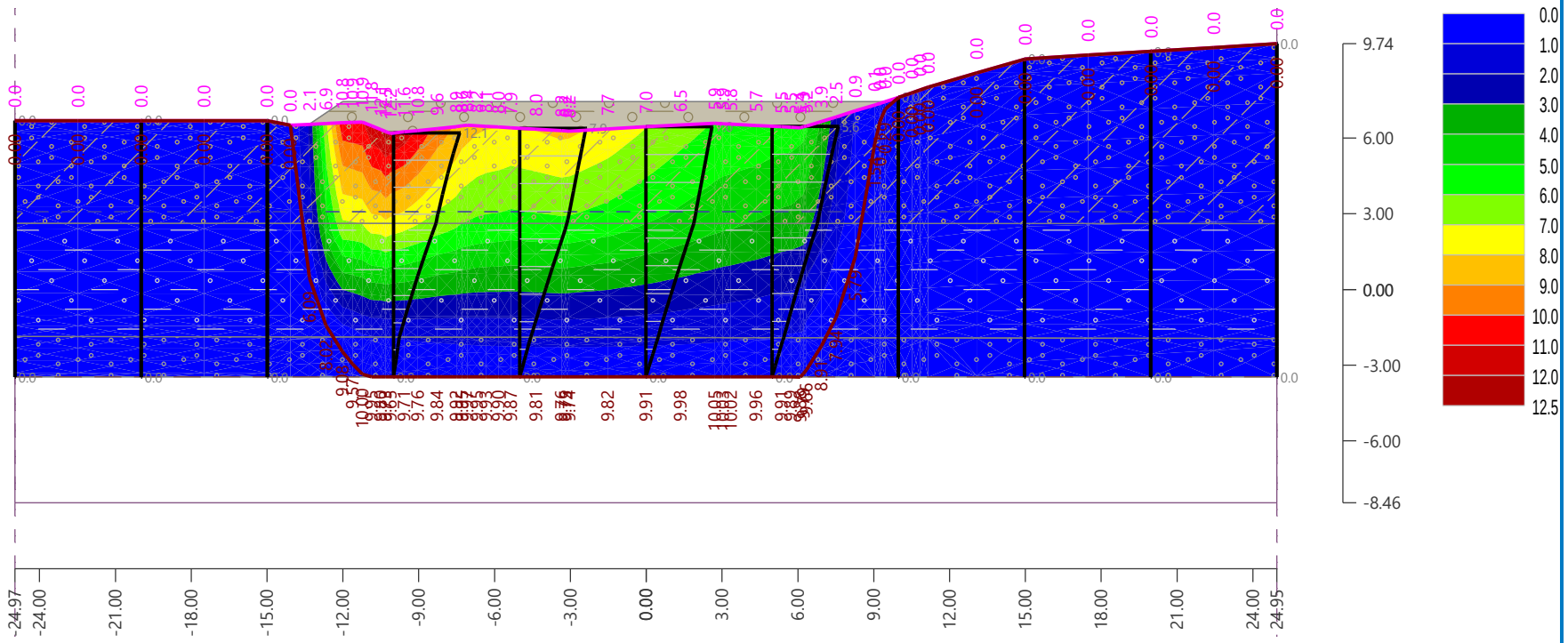
Name : Analysis	Stage : 1

Results : overall; variable : Pore pressure; range : <0.000; 65.643> kPa



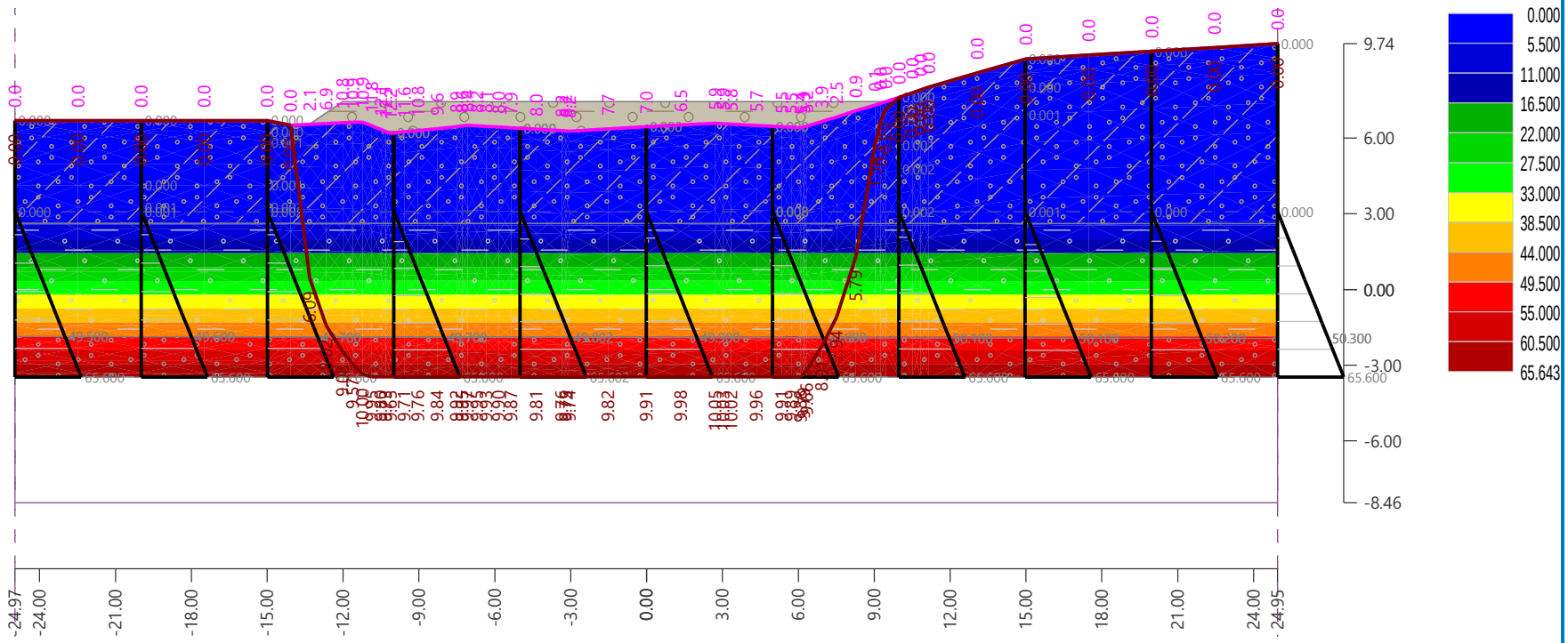
Name : Analysis	**Stage : 2**

Results : overall; variable : Settlement; range : <0.0; 12.5> mm



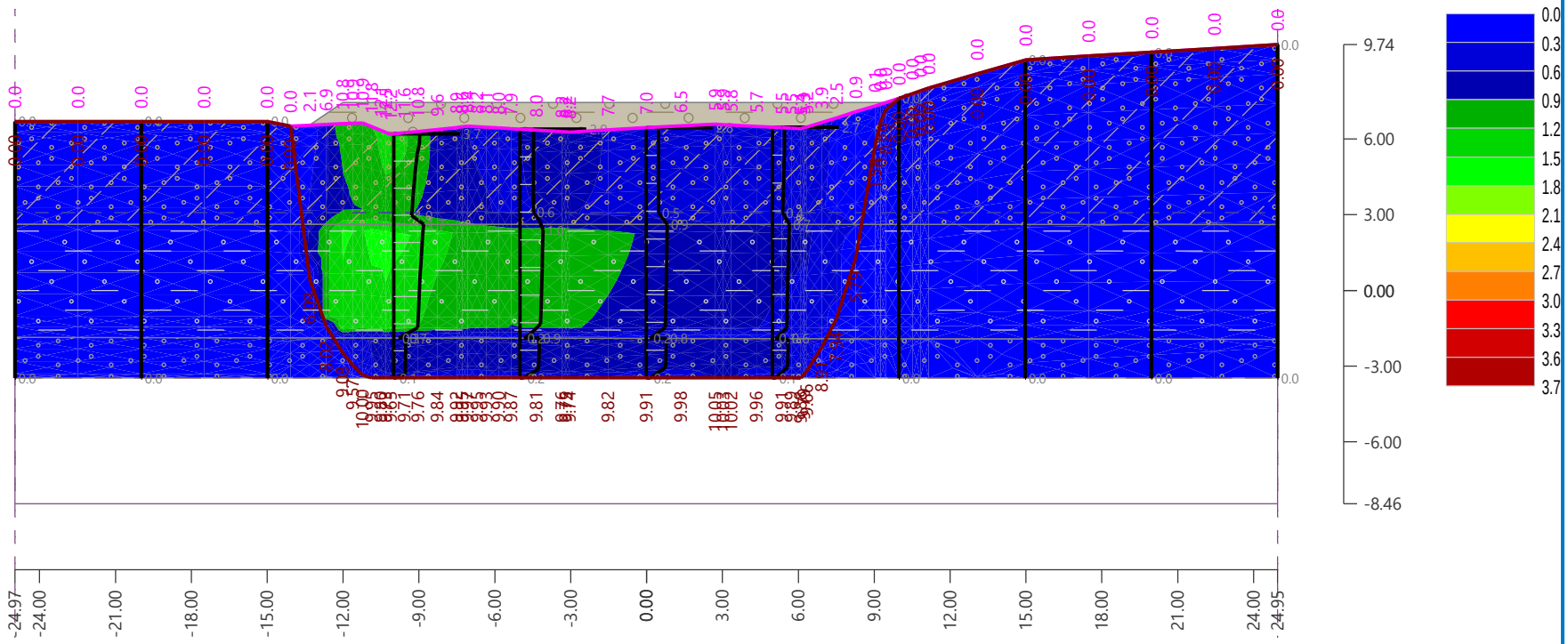
Name : Analysis	**Stage : 2**

Results : overall; variable : Pore pressure; range : <0.000; 65.643> kPa



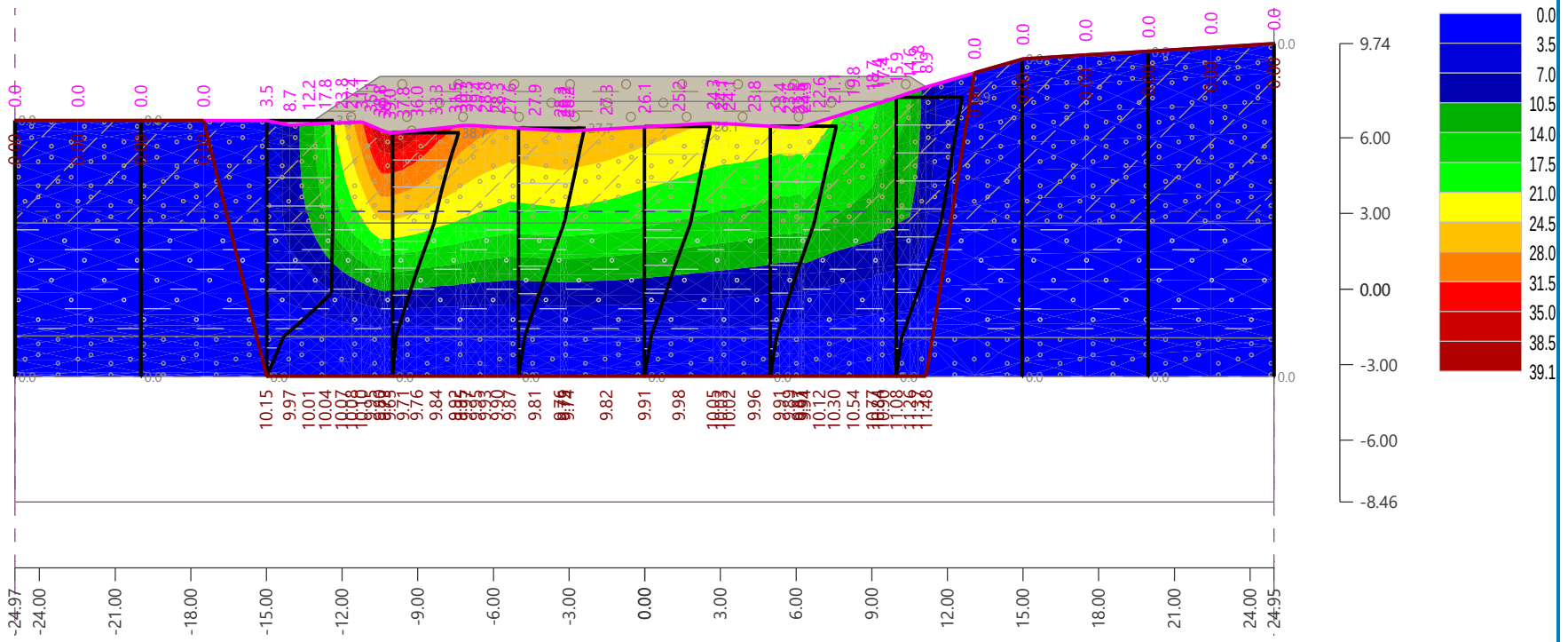
Name : Analysis	**Stage : 2**

Results : overall; variable : Strain; range : <0.0; 3.7> mm/m



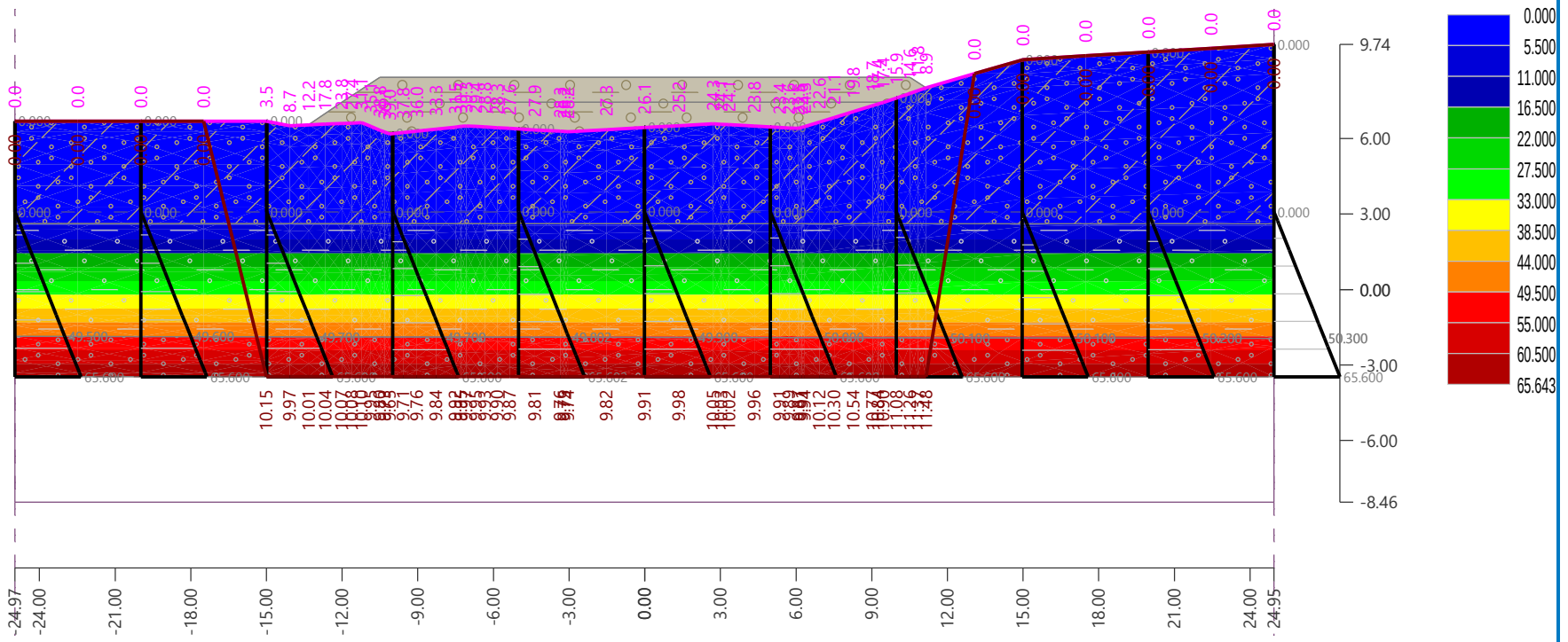
Name : Analysis	**Stage : 3**

Results : overall; variable : Settlement; range : <0.0; 39.1> mm



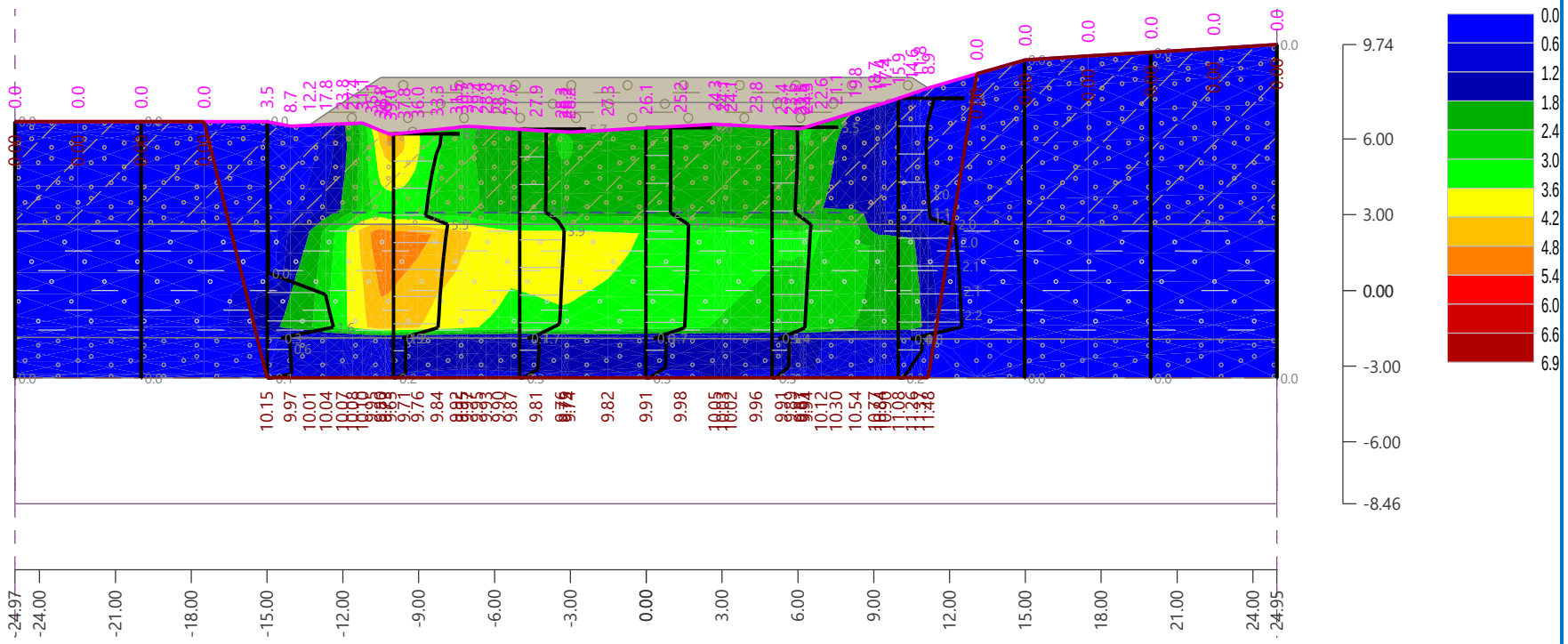
Name : Analysis	**Stage : 3**

Results : overall; variable : Pore pressure; range : <0.000; 65.643> kPa



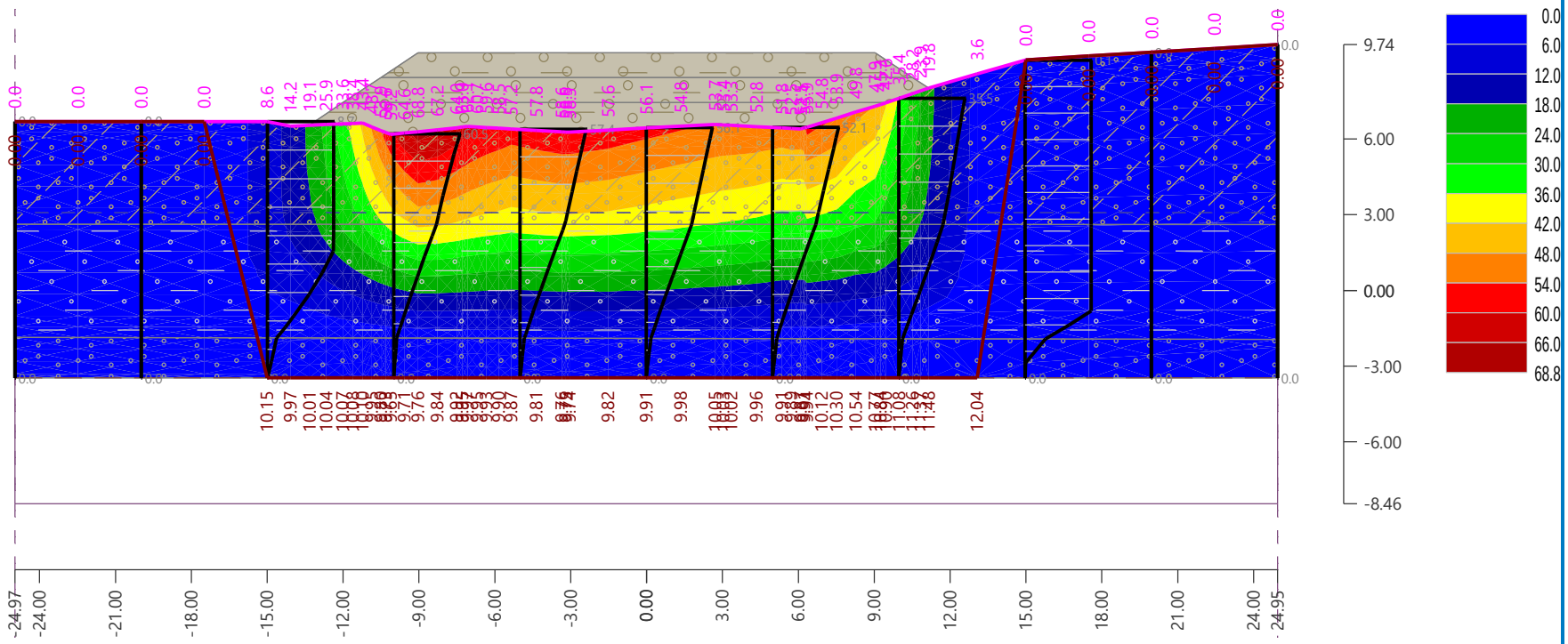
Name : Analysis	**Stage : 3**

Results : overall; variable : Strain; range : <0.0; 6.9> mm/m



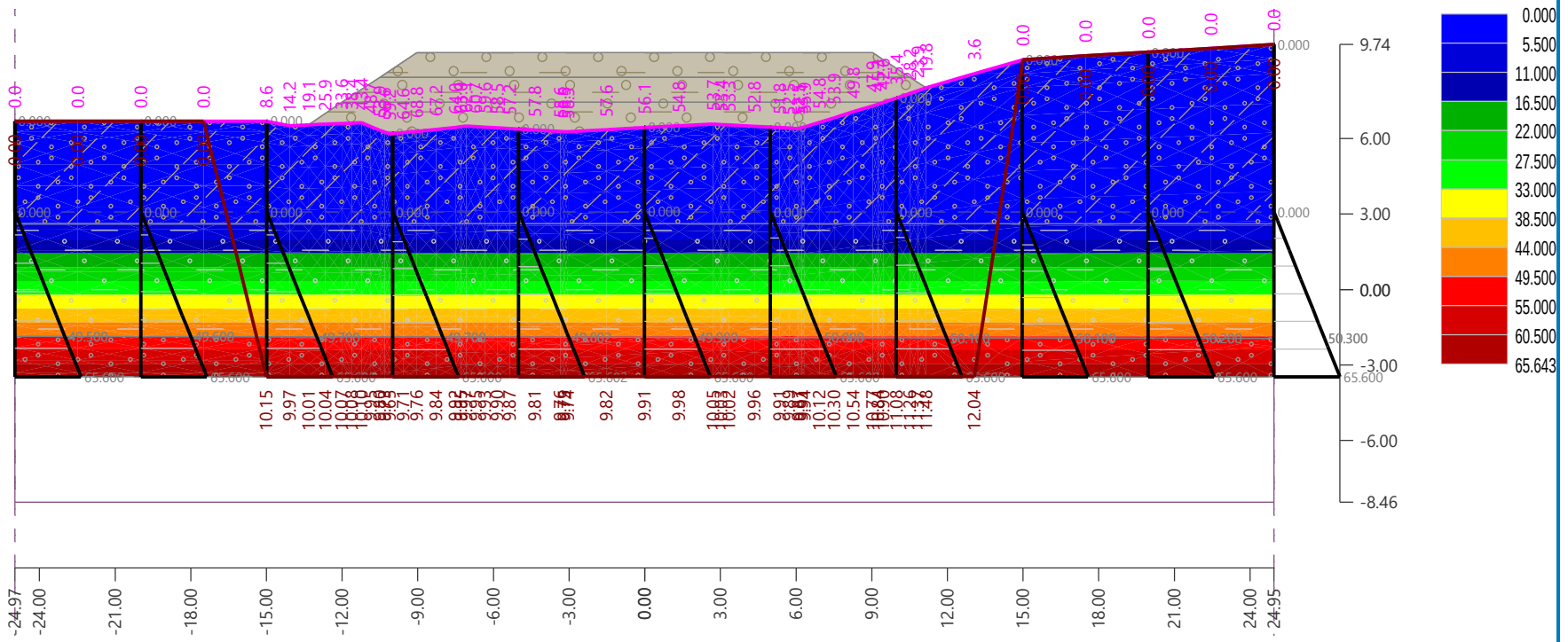
Name : Analysis	**Stage : 4**

Results : overall; variable : Settlement; range : <0.0; 68.8> mm



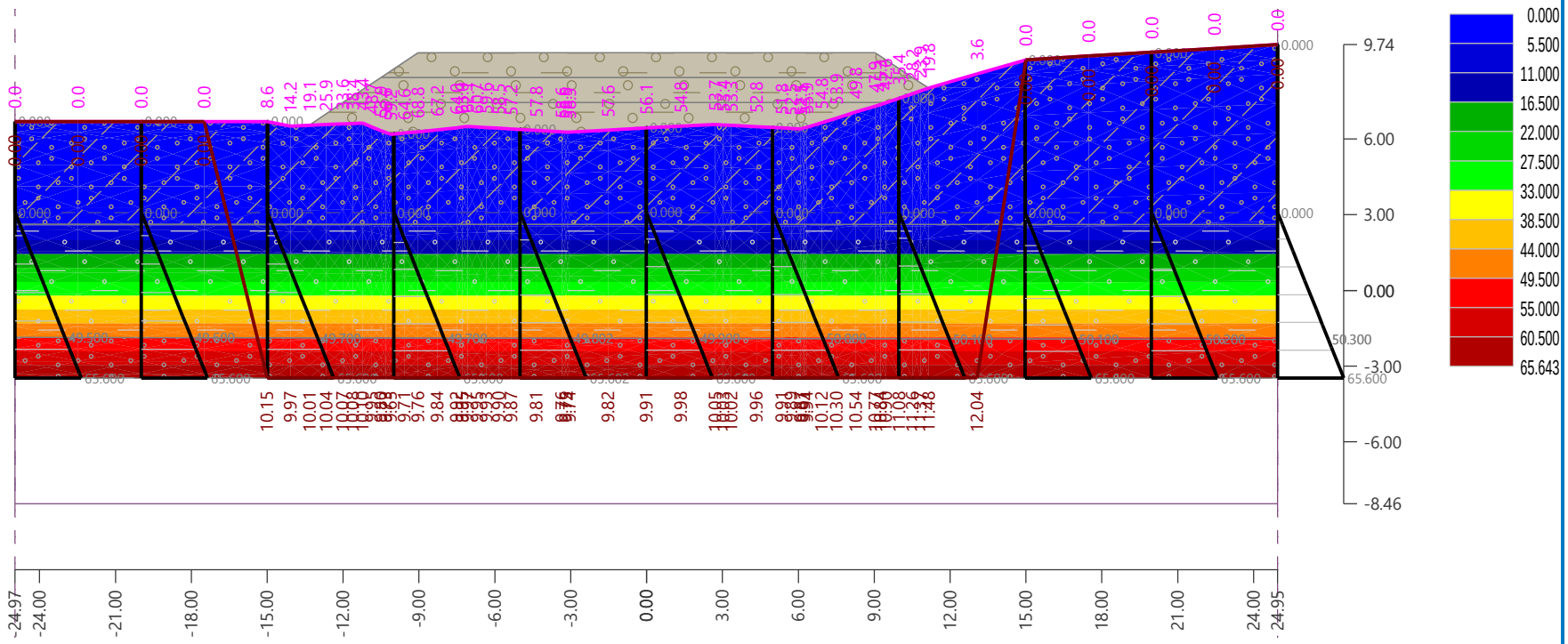
Name : Analysis	**Stage : 4**

Results : overall; variable : Pore pressure; range : <0.000; 65.643> kPa



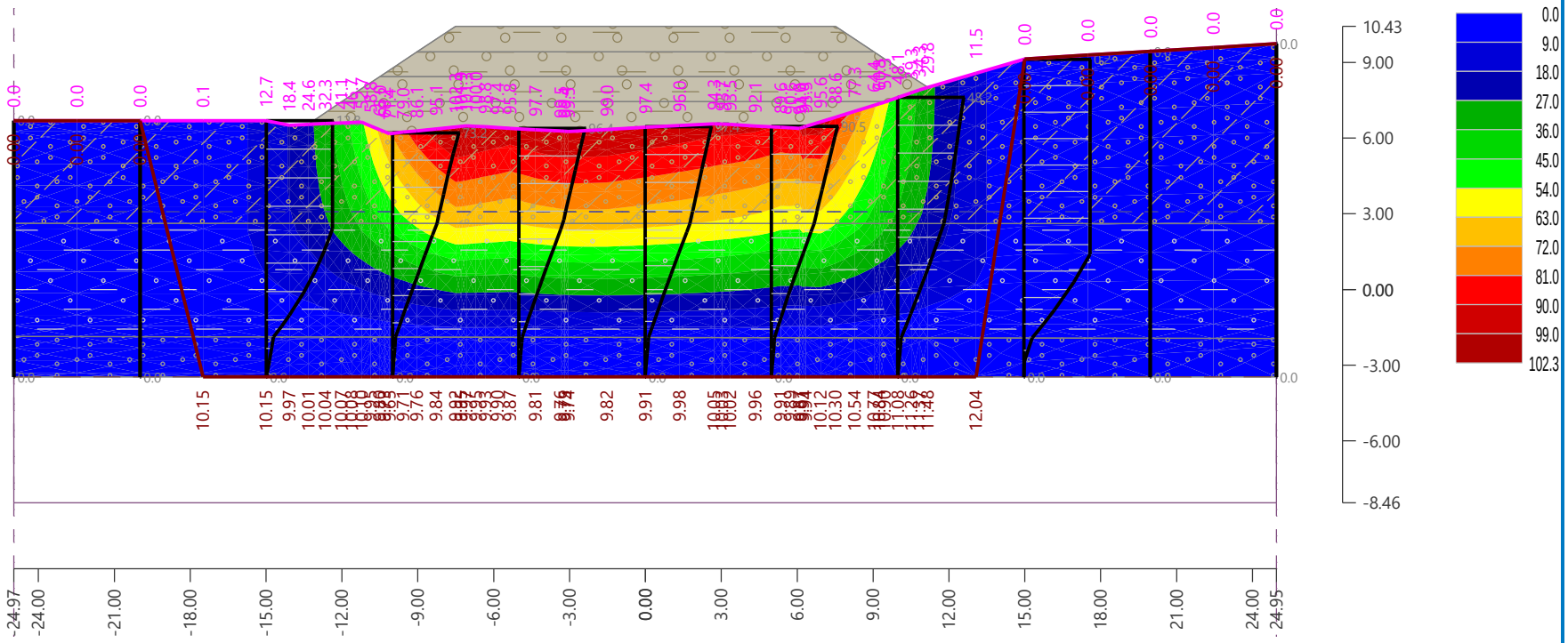
Name : Analysis	**Stage : 4**

Results : overall; variable : Pore pressure; range : <0.000; 65.643> kPa



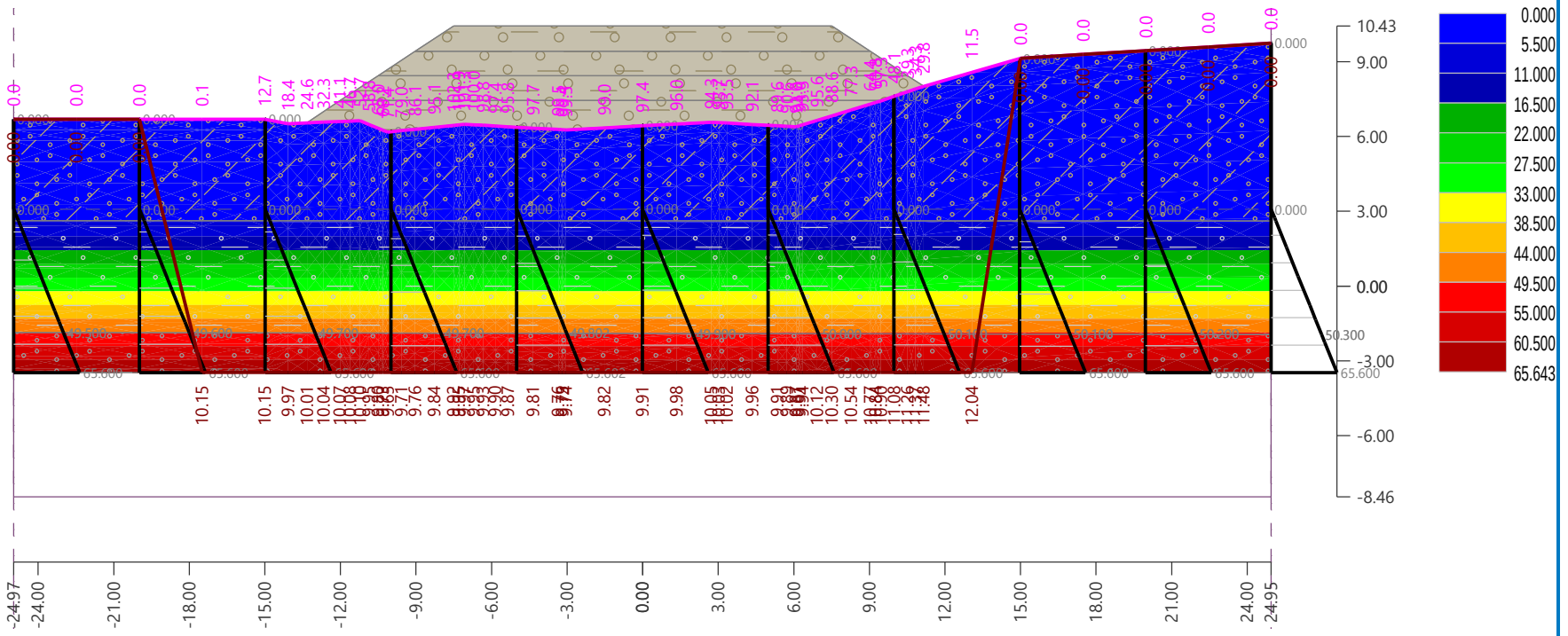
Name : Analysis	**Stage : 5**

Results : overall; variable : Settlement; range : <0.0; 102.3> mm



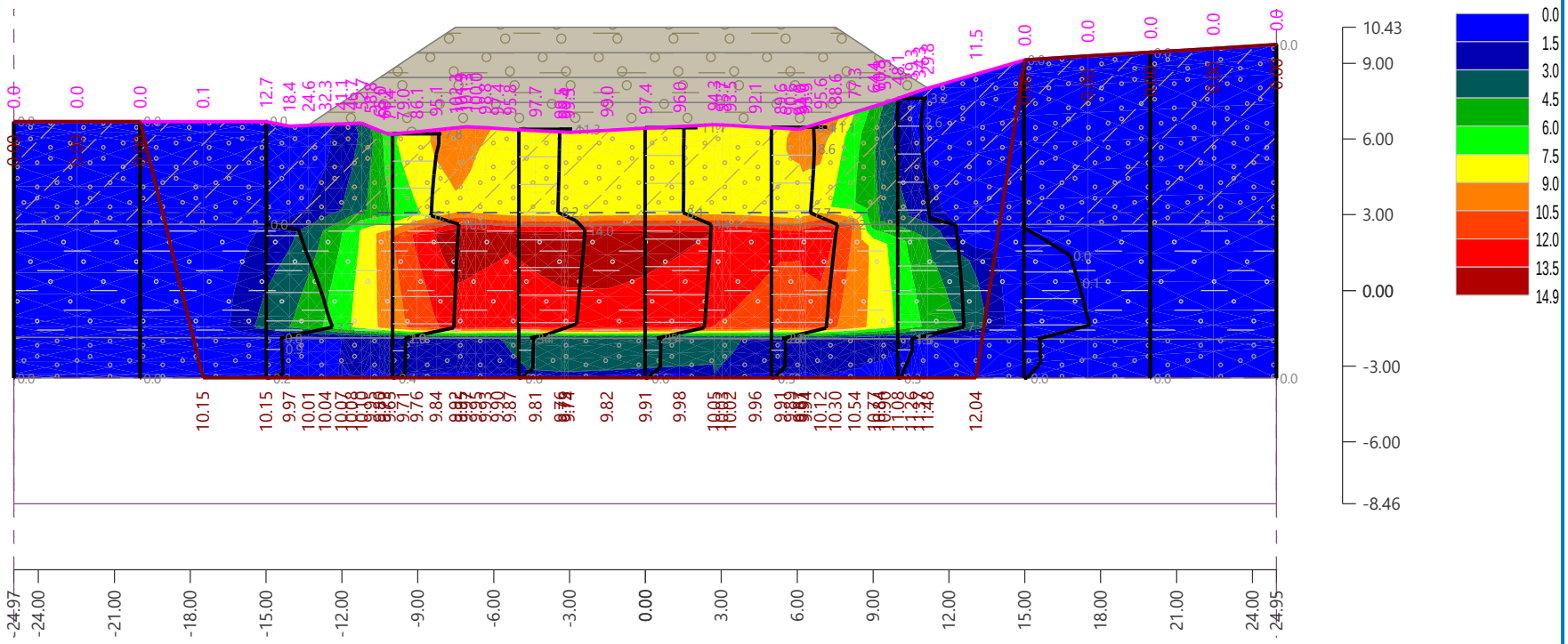
Name : Analysis	**Stage : 5**

Results : overall; variable : Pore pressure; range : <0.000; 65.643> kPa



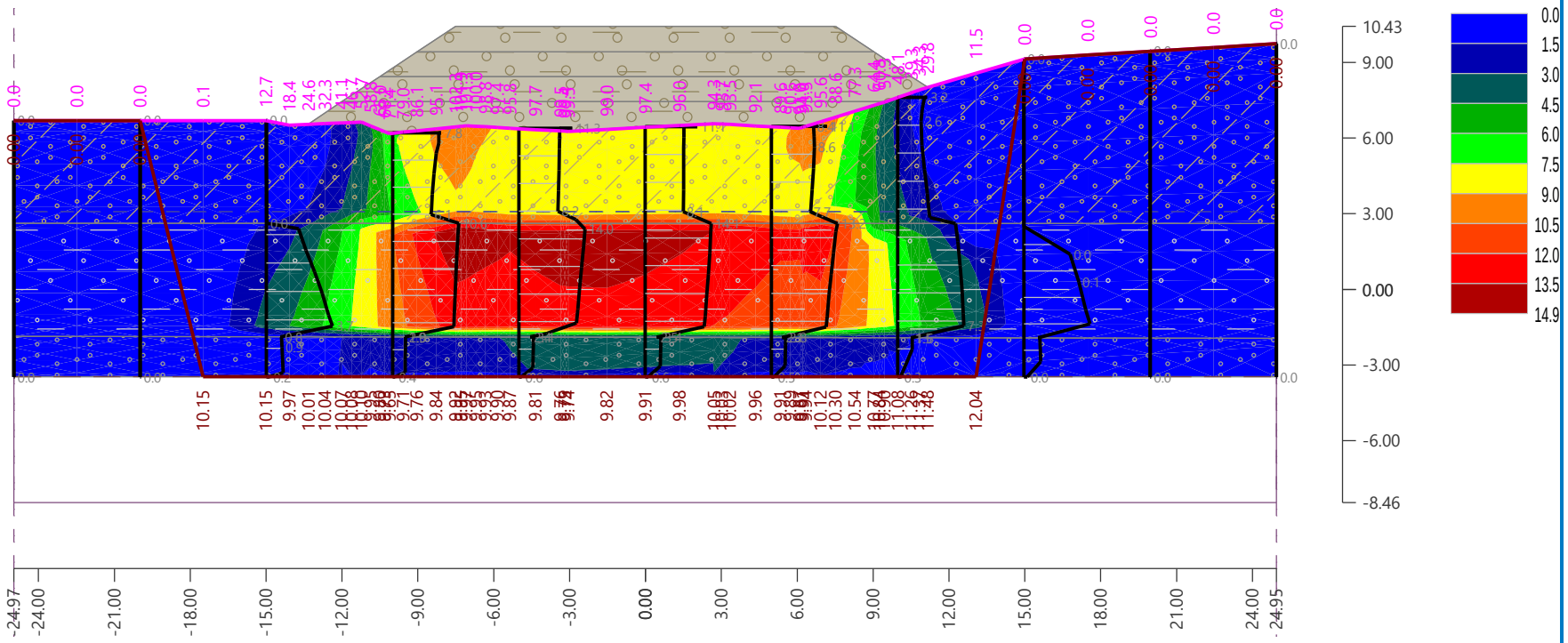
Name : Analysis	**Stage : 5**

Results : overall; variable : Strain; range : <0.0; 14.9> mm/m



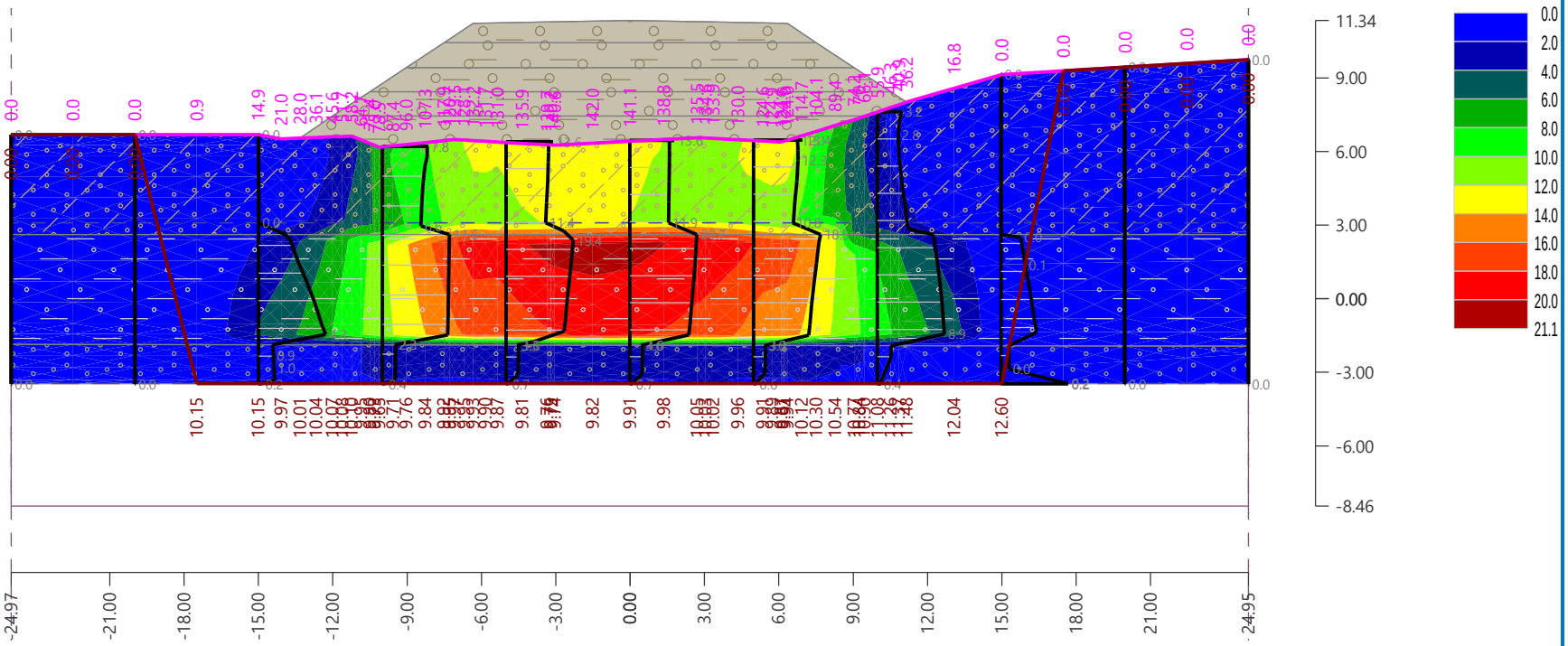
Name : Analysis	**Stage : 5**

Results : overall; variable : Strain; range : <0.0; 14.9> mm/m



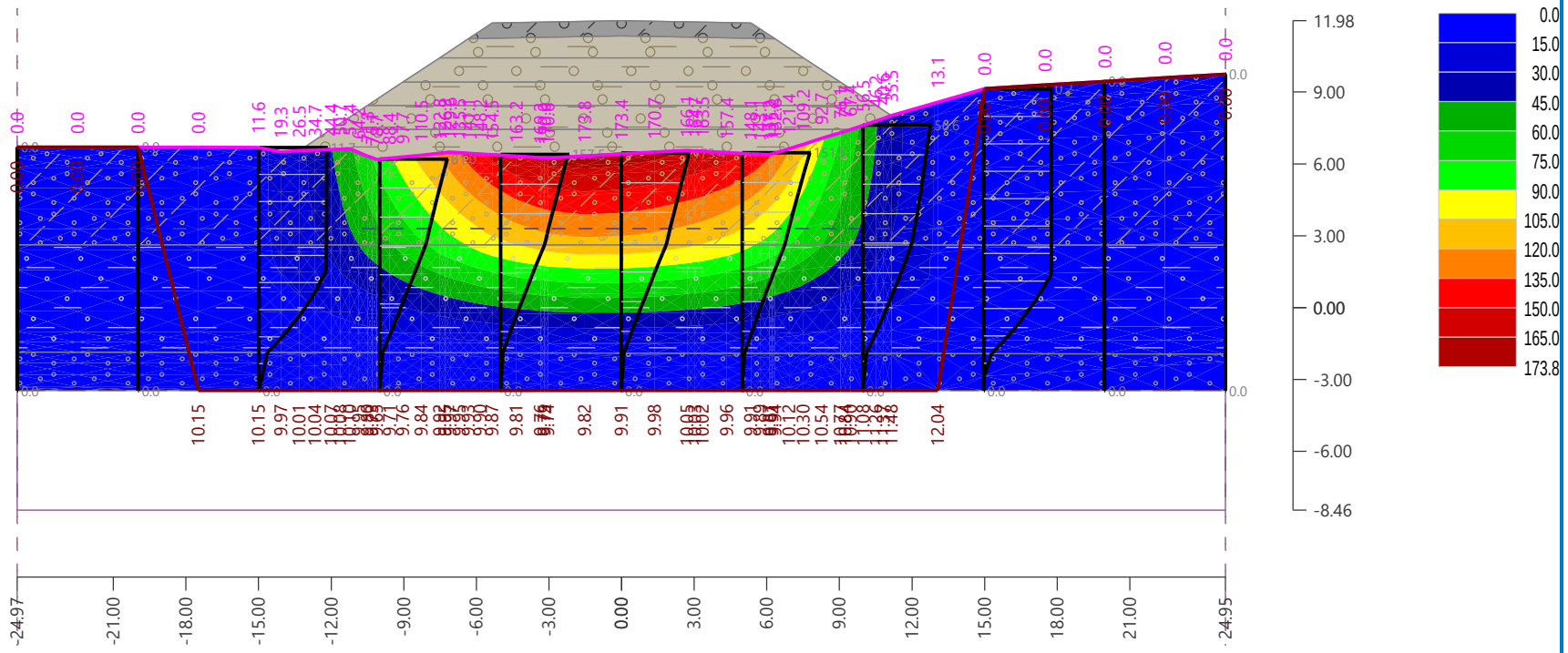
Name : Analysis	**Stage : 6**

Results : overall; variable : Strain; range : <0.0; 21.1> mm/m



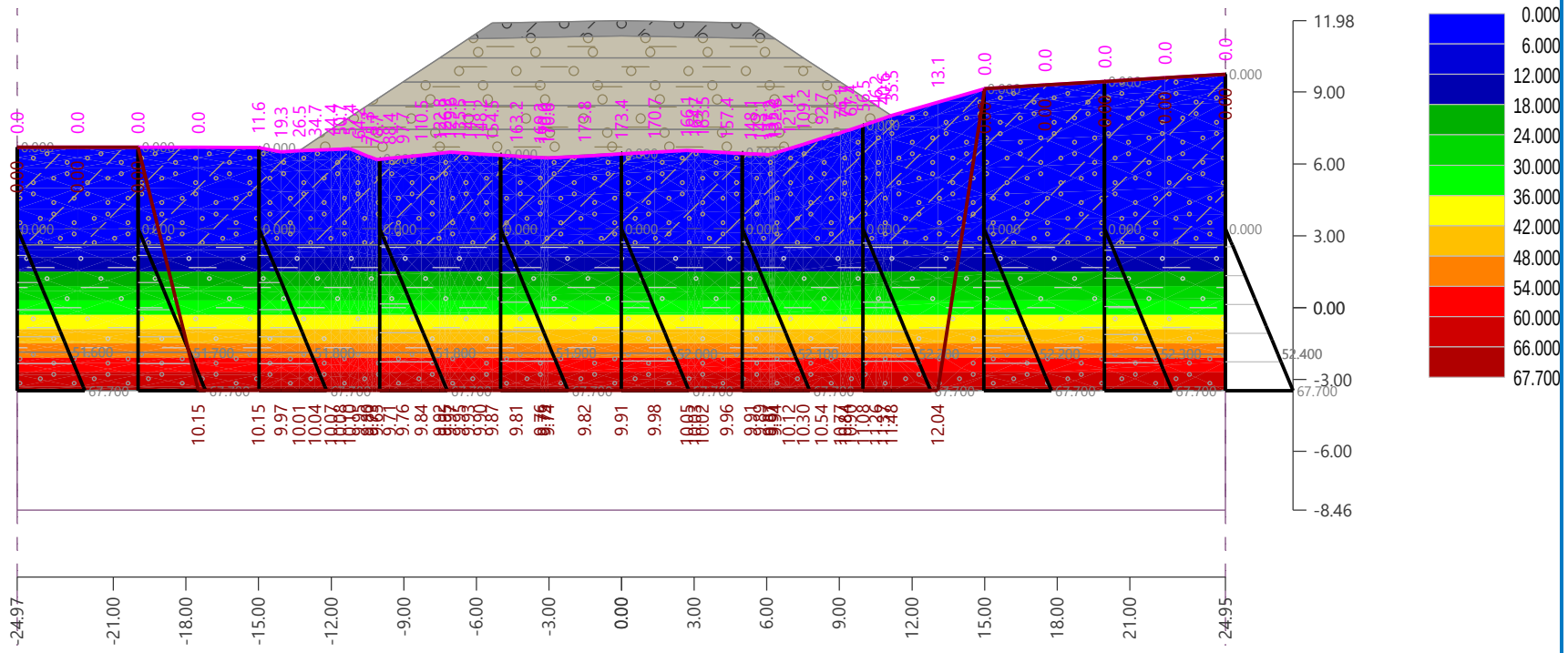
Name : Analysis	**Stage : 7**

Results : overall; variable : Settlement; range : <0.0; 173.8> mm



Name : Analysis	**Stage : 7**

Results : overall; variable : Pore pressure; range : <0.000; 67.700> kPa



Name : Analysis	**Stage : 7**

Results : overall; variable : Strain; range : <0.0; 25.9> mm/m