

## ERRICHTUNG DES NEUEN SPEICHERBECKENS "BODENSEE" FÜR DIE TECHNISCHE BESCHNEIUNG AM KRONPLATZ

## REALIZZAZIONE DEL NUOVO BACINO "BODENSEE" PER L'INNEVAMENTO PROGRAMMATO SUL PLAN DE CORONES

### INHALT / CONTENUTO

## GEOTECHNISCHER BERICHT

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### AUFTRAGGEBER / COMMITTENTE

## KRONPLATZ SEILBAHN GMBH

Reischach, Seilbahnstraße 10  
39031 Bruneck

### PROJEKTANT / PROGETTISTA



**Engineering**  
Dott. Ing. Markus Pescollderung  
Dott. Ing. Udo Mall  
I-39031 Bruneck, Gilmplatz 2 / Brunico, piazza gilm 2  
Tel.: 0474/050005 - E-Mail: info@ipm.bz - Web: www.ipm.bz

### ARBEITSGRUPPE / GRUPPO DI LAVORO

## Jesacher

Geologiebüro - Studio di geologia  
I-39031 Bruneck/Brunico, Via Carl-Toldt-Straße 11  
t. 0474/409376 f. 0474/831093 info@jesacher.bz



## TRIFOLIUM

Dr. Kurt Kußstatscher  
I-39050 Jenesien - Afingerweg 40  
Tel. 3355346470 www.trifolium.net



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# **1 VORWORT - ANLASS ZUM ENTWURF**

Die Kronplatz Seilbahn GmbH beabsichtigen die Errichtung eines offenen Speicherbeckens nahe es bereits vorhandenen Speicherbeckens „Pracken“ am Kronplatz.

Das Becken soll in etwa 250.000 m<sup>3</sup> für die Beschneigung der Skipisten zur Verfügung stellen.

## **2 GRUNDLAGEN**

### **2.1 GESETZLICHE GRUNDLAGEN**

Sämtliche Berechnung und Nachweisen erfolgen gemäß geltender gesetzlicher Vorgaben:

- DECRETO MINISTERIALE 26 giugno 2014: „Norme tecniche per la progettazione e la costruzione degli sbarramenti di ritenuta (dighe e traverse)“
- DECRETO MINISTERIALE 17 gennaio 2018: Aggiornamento delle "Norme tecniche per le costruzioni"

### **Allgemeine Richtlinien und Bestimmungen**

Die Sicherheit eines Dammes wird vor allem bestimmt durch:

- Standfestigkeit bei statischer, hydraulischer und gegebenenfalls bei dynamischer Beanspruchung
- Wirksamkeit der Dichtung
- Gründung des Dammfußes
- Schadloose Ableitung des Drainagewassers sowie des Oberflächenwassers
- Richtige Formgebung

### **Grenzzustände**

Im Allgemeinen muss für die Bewertung der Sicherheit von Speichern auf folgende Bedingungen Bezug genommen werden:

- Normalbetrieb
- reparable Schäden, keine unkontrollierte Freisetzung von Wasser
- irreparable Schäden, keine unkontrollierte Freisetzung von Wasser

- Schäden, welche eine unkontrollierte Freisetzung von Wasser oder haben oder wodurch Menschenleben gefährdet werden.
- Versagen der Struktur

Die "Norme tecniche delle costruzioni – NTC" definieren 4 zu überprüfende Grenzzustände:

- Grenzzustände der Gebrauchstauglichkeit SLS (stati limite di esercizio)
  - Grenzzustand mit sofortigem Handlungsbedarf (SLO, Stato Limite di immediata Operatività)
  - Grenzzustand mit Schäden (SLD, Stato Limite di danno)
- Grenzzustände der Tragfähigkeit ULS (stati limite di ultimi)
  - Grenzzustand Schutz von Menschenleben (SLV, Stato Limite di Salvaguardia della Vita)
  - Grenzzustand Strukturversagen (SLC, Stato Limite di Collasso)

Gemäss DM 26 giugno 2014 Pkt. E.3 müssen für Erdschüttdämme (dighe di materiali sciolti) mindestens die folgenden Szenarien berücksichtigt werden, welche einem Grenzzustand der Tragfähigkeit mit unkontrolliertem Wasseraustritt entsprechen:

- Instabilität des Dammkörpers und der Dammgründung
- Gleiten vom Dammkörper, auch nur teilweise, oder lokale Versagensmechanismen
- Schäden durch innere Erosion, Risse im Dammkörper, Schäden in der Abdichtung oder in Kontaktstellen, welche eine unkontrollierte Infiltration des Dammkörpers verursachen
- Verformung des Dammkörpers, welche Schäden am Damm verursachen oder zum Überlauf führen
- Instabilität der Böschungen, welche strukturelle Schäden am Dammkörper oder einen Überlauf verursachen
- Beschädigung oder Versagen der Regelorgane für den Grundablass und Überlauf, sowie anderen Armaturen, welche den Abfluss aus dem Speicher regeln
- Voll Füllung des Speichers mit Überlauf über die Krone, was zu schweren Schäden am Dammkörper oder zum Versagen des Dammes führt.

Die wichtigsten Nachweise des Grenzzustandes der Gebrauchstauglichkeit sind folgende:

- Übermäßig große Spannungen oder Verformungen im Dammkörper oder in der Dammgründung
- Schäden am Grundablass oder Überlauf
- Schäden an den Entnahgebauwerken
- Schäden an den Mess- und Regelsystemen

## **Belastungen**

Im Allgemeinen müssen folgende Belastungen berücksichtigt werden:

- Eigengewicht
- hydrostatischer Druck
- Zwang aufgrund thermischer Einwirkungen oder Schwinden
- Auftrieb
- Belastung durch Eis bzw. Eisplatten
- Belastung aufgrund Verlandung
- Erdbeben

## **Kombinationen**

Die einzelnen Belastungen müssen so kombiniert werden, dass sämtliche auftretenden Zustände während der Bauphase und in der Betriebsphase abgedeckt werden.

In jedem Fall müssen folgende Situationen betrachtet werden:

- während der Bauphase
- Endzustand in leerem Zustand
- Füllung bis Stauziel und wenn maßgebend auch mit halber Füllung
- Vollfüllung bis maximalen Wasserstand
- Notentleerung (kann entfallen bei Betondämmen und Dämmen mit bergseitiger Abdichtung, insofern diese mit einer effizienten Drainage verbunden ist)
- Erdbeben mit Füllung bis zum Stauziel und wenn maßgebend auch mit halber Füllung

Zur Überprüfung der Grenzzustände werden in Anlehnung an die NTC die folgenden Kombinationen definiert:

- grundlegende Kombinationen (Normalbetrieb, Bauphase, Endzustand, Notentleerung) (ULS)

$$\gamma_{G1} * G_1 + \gamma_{G2} * G_2 + \gamma_{Q1} * Q_{k1} + \gamma_{Q2} * \psi_{02} * Q_{k2} + \dots$$

- außergewöhnliche Kombination (maximaler Wasserstand) (ULS)

$$G_1 + G_2 + A_d + \psi_{21} * Q_{k1} + \psi_{22} * Q_{k2} + \dots$$

- seismische Kombination (Erdbeben) (ULS und SLS)

$$E + G_1 + G_2 + \psi_{21} * Q_{k1} + \psi_{22} * Q_{k2} + \dots$$

- seltene Kombination (irreparabel) (SLS)

$$G_1 + G_2 + Q_{k1} + \psi_{02} * Q_{k2} + \dots$$

- häufige Kombination (reparabel) (SLS)

$$G_1 + G_2 + \psi_{11} * Q_{k1} + \psi_{22} * Q_{k2} + \dots$$

- quasi ständige Kombination (langfristige Einwirkungen) (SLS)

$$G_1 + G_2 + \psi_{21} * Q_{k1} + \psi_{22} * Q_{k2} + \dots$$

Somit ergeben sich folgende Lastkombinationen (gemäss DM 26 giugno 2014 Tab. C6)

|                                                                          | Grundlegend |                      |                    |                    | Außerge-<br>wöhnlich     | Erdbeben          |                   |
|--------------------------------------------------------------------------|-------------|----------------------|--------------------|--------------------|--------------------------|-------------------|-------------------|
|                                                                          | Bauphase    | Endzu-<br>stand leer | Notent-<br>leerung | Normal-<br>betrieb | Max.<br>Wasser-<br>stand | SLS               | ULS               |
| Eigengewicht                                                             | X           | X                    | X                  | X                  | X                        | X                 | X                 |
| hydrostatischer Druck                                                    |             |                      |                    | X <sup>(1)</sup>   | X <sup>(2)</sup>         | X <sup>(1)</sup>  | X <sup>(1)</sup>  |
| Auftrieb                                                                 |             |                      | X                  | X                  | X                        | X                 | X                 |
| Zwang aufgrund<br>thermischer<br>Einwirkungen oder<br>Schwinden          | X           | X                    | X                  | X                  | X                        | X                 | X                 |
| Belastung durch Eis<br>bzw. Eisplatten                                   |             |                      |                    | wenn<br>anwendbar  |                          |                   |                   |
| Belastung aufgrund<br>Verlandung                                         |             |                      |                    | wenn<br>anwendbar  | wenn<br>anwendbar        | wenn<br>anwendbar | wenn<br>anwendbar |
| Erdbeben                                                                 |             |                      |                    |                    |                          | X                 | X                 |
| <sup>(1)</sup> Füllung bis Stauziel <sup>(2)</sup> Maximaler Wasserstand |             |                      |                    |                    |                          |                   |                   |

**Tabelle 1: Lastkombinationen**

Gemäss DM 26 giugno 2014 Tab. C7 werden für die Kombination der einzelnen Belastungen die folgenden Kombinationsbeiwerte angenommen:

| Belastung                                        | Kombinationsbeiwerte |            |            |
|--------------------------------------------------|----------------------|------------|------------|
|                                                  | $\gamma_0$           | $\gamma_1$ | $\gamma_2$ |
| Zwang aufgrund externer thermischer Einwirkungen | 0,6                  | 0,6        | 0,5        |
| Belastung durch Eis bzw. Eisplatten              | 0,7                  | 0,5        | 0,2        |

***Tabelle 2: Kombinationsbeiwerte***

## **2.2 VERWENDETE DATENGRUNDLAGEN UND DURCHGEFÜHRTE UNTERSUCHUNGEN**

Für die Ausarbeitung des vorliegenden Gutachtens wurden folgende Unterlagen verwendet:

- Geologischer Bericht vom April 2024 von Dott. Geol. Michael Jesacher
- 4 Geognostische Bohrungen
- digitale Unterlagen aus dem Südtiroler Bürgernetz ([www.provinz.bz.it](http://www.provinz.bz.it)).

## **3 STANDORT**

### **3.1 BESCHREIBUNG DES BEREICHS**

Als bestmöglicher Standort wurde ein etwas flacher ausgebildeter Bereich direkt angrenzend an die bestehende Skipiste Ried, genau gegenüber dem bereits bestehenden Speicherbecken „Pracken“, ausgemacht. Der betroffene Bereich befindet sich im Waldgebiet auf etwa 1.860 m ü.M. angrenzend an die Skipiste, wobei dieser Bereich in den letzten Jahren bereits stark durch Wind- und Schneedruck sowie darauffolgend durch den Borkenkäfer in Mitleidenschaft gezogen wurde und nur mehr ein kleiner Bruchteil der Bewaldung vorhanden ist. Der Standort liegt nahe der bereits bestehenden Pumpstation PS300, welche direkt von der Haupt-Zubringerleitung mit Wasser vom Olinger Stausee versorgt wird. Somit können die bereits bestehenden Infrastrukturen bestmöglich genutzt werden.

Beim gegenständlichen Speicherbecken handelt es sich um ein Speicherbecken im Nebenschluss, welches sich durch Abtrag und Aufschüttung des Erdreichs und durch Erstellen eines Erddamms natürlich in das bestehende Gelände einfügt; durch die Positionierung inmitten von Waldgebiet ist dieses auch nur beschränkt einsichtig.

Grundbesitzer eingeholt. Die Zufahrt zum Speicherbecken erfolgt über die bereits vorhandenen Forststraße.

### **3.2 HYDROGEOLOGISCHE GEFAHREN**

Die Gefahrenbewertung wurde bereits im Zuge der Eintragung des Sondernutzungsgebiets im Gemeindeplan für Raum und Landschaft von Geologie Michael Jesacher durchgeführt.

Für das Speicherbecken konnte keine Naturgefahr festgestellt werden, womit die Zone als „untersucht und nicht H4-H2 gefährlich“ klassifiziert wurde.

## **4 HYDROLOGIE UND HYDROGEOLOGIE**

**(Auszug aus dem geol. Bericht von Dott. Geol. Michael Jesacher)**

### *Durchlässigkeit des Untergrundes*

Im Festgestein wird zwischen Gesteinsdurchlässigkeit (Porendurchlässigkeit) und Trennflächendurchlässigkeit unterschieden. Beide zusammen ergeben die Gebirgsdurchlässigkeit. Bei Lockergesteinen spricht man hingegen von der Porendurchlässigkeit.

Bei geklüfteten Festgesteinen spricht man im Allgemeinen von „Geringleitern“ ( $k_f = 10^{-7} - 10^{-9} \text{ m/s}$ ). Je nach Öffnungsweite der Klüfte und Zerlegungsgrad des Gesteines kann sich die Durchlässigkeit jedoch nennenswert erhöhen.

Bei Lockergesteinen ist die Bandbreite der hydraulischen Durchlässigkeit sehr groß (etwa  $k_f = 10^{-1} - 10^{-9} \text{ m/s}$ ). Grob- und gemischtkörnige Lockergesteine werden als „Leiter“ bis „Geringleiter“ bezeichnet ( $k_f = 10^{-1} - 10^{-5} \text{ m/s}$ ). Feinkörnige Böden wie Schluffe oder Tone stellen dagegen „Nichtleiter“ oder „Wasserstauer“ dar und haben Durchlässigkeitsbeiwerte von etwa  $10^{-7} - >10^{-9} \text{ m/s}$ .



Die im Untersuchungsgebiet auftretenden Locker- und Festgesteine sind durch eine unterschiedliche Wasserdurchlässigkeit gekennzeichnet, die auf primäre (Porenhohlräume) oder sekundäre (Kluft-) Durchlässigkeit zurückzuführen ist. In Anlehnung an die DIN 18130 kann die Wasserdurchlässigkeit der im Projektgebiet auftretenden Locker- und Festgesteine folgendermaßen klassifiziert werden:

- stark durchlässig ( $k_f = 10^{-3} - 10^{-4} \text{ m/s}$ ): Aufschüttungen, Hang- und Verwitterungsschutt
- durchlässig ( $k_f = 10^{-4} - 10^{-6} \text{ m/s}$ ): Kataklastit
- schwach durchlässig ( $k_f = 10^{-6} - 10^{-8} \text{ m/s}$ ): geklüfteter Fels, Kakirit

## 5 DURCHGEFÜHRTE UNTERSUCHUNGEN UND ERGEBNISSE

**(Auszug aus dem geol. Bericht von Dott. Geol. Michael Jesacher)**

Im Bereich des geplanten Speicherbeckens wurden vier Erkundungsbohrungen abgeteuft. Als Bohrlochversuche wurden SPT-Versuche mit geschlossener Spitze durchgeführt. Die Bohrkernaufnahme erfolgte durch unser Büro.

Nachfolgend werden die Ergebnisse der Erkundungsbohrungen kurz beschrieben. Die Bohrprofile und die Fotodokumentation der gewonnenen Bohrkerns liegen dem Geologischen Bericht als Anhang bei.

### Erkundungsbohrung S1:

In der Erkundungsbohrung S1 wurden unterhalb einer 1,5 m mächtigen Mutterbodenschicht bis in eine Tiefe von 10,5 m stark schluffige Kiese bis Sande mit einem geringen Steinanteil durchörtert. Laut durchgeführten SPT-Versuchen besitzen diese Ablagerungen eine mittlere bis hohe Lagerungsdichte ( $30 < \text{NSPT} < 50$ ). Bei den Komponenten der Kies- bis Steinfraction handelt es sich ausschließlich um eckige Quarzphyllite. Darunter folgt bis in eine Tiefe von 20 m eine Abfolge aus dem kataklastischem bis kakiritischem Quarzphyllituntergrund.

### Erkundungsbohrung S2:

In der Erkundungsbohrung S2 wurde unterhalb einer 0,4 m mächtigen Mutterbodenschicht bis in eine Tiefe von 3 m schluffig, sandige Kiese mit einem hohen

Steinanteil durchörtert. Darunter folgt bis zur Endteufe in 15 m Tiefe der stark zerlegte Festgesteinsuntergrund mit bis zu 1,4 m mächtigen kakiritischen bis kataklastischen Zwischenlagen.

#### Erkundungsbohrung S3:

Erkundungsbohrung S3 verlief unterhalb einer 0,5 m mächtigen Mutterbodenschicht und 3 m mächtigen Schicht aus stark steinigen Sanden und Kiesen bis zur Endteufe in 21 m Tiefe im stark zerlegten Festgesteinsuntergrund mit kakiritischem und kataklastischem Gefüge.

#### Erkundungsbohrung S4:

Wie auch die vorherig beschriebenen Erkundungsbohrungen verlief Erkundungsbohrung S4 unterhalb einer 3 m mächtigen Lockergesteinsbedeckung im Festgesteinsuntergrund mit kakiritischem bis kataklastischem Gefüge. Zwischen 11,5 m und der Endteufe in 15 m Tiefe verlief die Bohrung im stark zerlegten Quarzphyllit mit hohem Graphitanteil (Graphitschiefer).

## **6 TECHNISCHE DATEN DES SPEICHERBECKENS UND DER BAUWERKE**

Die wichtigsten technischen Daten vom Speicherbecken "Rotwand" werden in folgender Tabelle aufgelistet:

|                                                     |                                                                                             |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------|
| Speicherart:                                        | Becken im Nebenanschluss (kein natürlicher Zufluss)                                         |
| Absperrbauwerk:                                     | homogener Erdschüttdamm                                                                     |
| Abdichtung:                                         | Oberflächenabdichtung mittels Kunststoffbahn inkl. Drainage, Abdeckung und Leckagekontrolle |
| Speichertyp:                                        | diga di materiali sciolti (terra) con dispositivo di tenuta a monte (manto artificiale)     |
| Neigung der wasserseitigen Böschung:                | 1:2                                                                                         |
| Neigung der luftseitigen Böschung:                  | 4:7                                                                                         |
| Max. Dammhöhe vom natürlichen Gelände aus gemessen: | 14,8 m                                                                                      |

|                                          |                                                                       |
|------------------------------------------|-----------------------------------------------------------------------|
| Breite Dammkrone:                        | 4,0 m                                                                 |
| Breite umlaufende Straße:                | 2,5 m                                                                 |
| Höhenquote Dammkrone:                    | 1.862,50 m ü.M.                                                       |
| Höhenquote Stauziel:                     | 1.860,69 m ü.M.                                                       |
| Höhenquote Absenkziel:                   | 1.847,60 m ü.M.                                                       |
| Höhe zwischen Beckenboden und Dammkrone: | 14,9 m                                                                |
| Maximale Wassertiefe:                    | 13,09 m                                                               |
| Freibord:                                | 1,81 m                                                                |
| max. Wasseroberfläche:                   | ca. 15.360 m <sup>2</sup>                                             |
| max. Speichervolumen:                    | ca. 125.000 m <sup>3</sup>                                            |
| Notüberlauf:                             | seitlich bzw. außerhalb des Dammkörpers                               |
| Grundablass:                             | mittels Rorhleitung und offenem Graben in Kaserbach (C.300)           |
| Zulauf bzw. Füllung:                     | mittels Fülleitung durch Entnahmebauwerk                              |
| Kontrolle Drainage- Leckagewasser:       | mittels getrennter Leitungen und Messüberfall für die einzelnen Zonen |

*Tabelle 3: Technische Merkmale*

## 7 GEOTECHNISCHES MODELL

(Auszug aus dem geol. Bericht von Dott. Geol. Michael Jesacher)

### 7.1 GEOTECHNISCHE EINHEITEN – BODENMECHANISCHE BESCHREIBUNG UND KENNWERTE

Laut geologischem Modell kann im Bereich des Speichers von einem Zweischnittmodell ausgegangen werden. Dieses besteht oberflächlich aus Hang- und Verwitterungsschutt bzw. dem kataklastischen Festgesteinsuntergrund. Darunter nimmt der Zerlegungsgrad deutlich zu und es tritt der Festgesteinsuntergrund mit kakiritischem Gefüge auf. Die für den Speicherbau relevanten lithologischen Einheiten können somit zu folgenden zwei geotechnischen Einheiten zusammengefasst werden:

- GE 1 – Sand, kiesig bzw. Kies, sandig (Hang- und Verwitterungsschutt, Kataklastit)
- GE 2 – Schluff, sandig, tonig, kiesig (Kakirit)

Die wesentlichen Grundlagen zur Ermittlung der für die erdstatischen Berechnungen erforderlichen Bodenkennwerte bilden die Bodenansprache und -klassifizierung in den Bohraufschlüssen sowie der im Nahbereich des Speichers kartierten Aufschlüsse. Die Bodenkennwerte wurden durch Vergleich mit versuchstechnisch bestimmten Boden- und Felskennwerten in vergleichbaren geologischen Formationen sowie Empfehlungen aus der einschlägigen Fachliteratur und Normen ermittelt.

| Geotechn. Einheit                   | Charakteristische bodenmechanische / geotechnische Kennwerte |               |                         |               |
|-------------------------------------|--------------------------------------------------------------|---------------|-------------------------|---------------|
|                                     | $\gamma$ [kN/m <sup>3</sup> ]                                | $\varphi$ [°] | C' [kN/m <sup>2</sup> ] | E [MPa]       |
| GE 1: Sand, kiesig bis Kies, sandig | 19-20                                                        | 34-36         | 0,5                     | 40.000-50.000 |
| GE 2: Schluff, sandig tonig, kiesig | 19-20                                                        | 32-35         | 5-3                     | 40.000-50.000 |

**Tabelle 4:** Charakteristische Bodenkennwerte (vergleiche Geotechnischer Bericht von Dott. Geol. Michael Jesacher)

Die geologischen Verhältnisse im Projektgebiet sowie Aussagen zu Baugrundbeschaffenheit und -eigenschaften sind im geologischen Bericht und den zugehörigen Anlagen detailliert beschrieben.

### Geotechnische Parameter des Erddamms

Das Material für die Realisierung der Dämme soll die folgenden geotechnischen Parameter aufweisen:

| Klassifizierung des Bodens     | Trockendichte laut Proctor-Versuch [%] | $\gamma$ [kN/m <sup>3</sup> ] | $\varphi$ [°] | C' [kN/m <sup>2</sup> ] |
|--------------------------------|----------------------------------------|-------------------------------|---------------|-------------------------|
| Sand und Kies leicht schluffig | 95                                     | 19-21                         | 34-36         | 5-0                     |

**Tabelle 5:** Erforderliche geotechnische Parameter Erddamm

### Verwendbarkeit des Aushubmaterials

(Auszug aus dem geol. Bericht von Dott. Geol. Michael Jesacher)

Ein Teil des anfallenden Aushubmaterial ist aufgrund des hohen Schlämmkornanteils (GE 2) für die Dammschüttung ohne entsprechende Aufbereitung nicht geeignet. Im Sinne einer nachhaltigen Nutzung der natürlichen Ressourcen sollte für die Dammschüttung das

Aushubmaterial weitestgehend verwendet werden. Allerdings muss das Aushubmaterial hierfür entsprechend aufbereitet werden.

Im Folgenden werden zwei mögliche Varianten der Materialverbesserung angeführt, die im Zuge der weiteren Planung auf jeden Fall vertiefend auf Grundlage von entsprechenden Labor- und Feldversuchen zu bewerten sind:

- Kalk- und Zementstabilisierung: Mit Hilfe dieses Verfahrens können die mechanischen Eigenschaften des Bodens so verbessert werden, dass gegenüber dem unbehandelten Boden eine dauerhafte Wasser- und Frostbeständigkeit sowie wesentlich größere Druck-, Scher- und Zugfestigkeiten beim Dammkörper erreicht werden können. Das Mischungsverhältnis muss auf jeden Fall auf Grundlage von detaillierten Untersuchungen festgelegt werden.
- Mischen der GE 1 mit der GE 2: Mischend er beiden geotechnischen Einheiten in einem auf Grundlage von entsprechenden Feld- und Laborversuchen noch zu bestimmenden Massenverhältnis.

## **8 GEOTECHNISCHE BERECHNUNGEN UND NACHWEISE**

Die Sicherheitsnachweise werden für die Böschungen im Stauraumbereich, sowie für den gesamten Dammkörper durchgeführt.

### **8.1 SICKERLINIE**

Bei Versagen der Abdichtung muss die Sickerlinie innerhalb des Dammkörpers verlaufen; dies wird mittels Einbau des Filterkörpers am Dammfuß gewährleistet.

### **8.2 ERDBEBEN - SEISMISCHE KLASSIFIZIERUNG**

#### **Seismische Klassifizierung**

Die Erdbebenlast für das Projektgebiet wird mit folgenden Koordinaten ermittelt:

Beim geplanten Speicherbecken handelt es sich um einen Damm vom Typ C – normale Wichtigkeit (diga di importanza normale).

Zur Durchführung der Erdbebenberechnung gelten daher folgende Anfangsparameter:

- vita nominale: 50 Jahre
- classe d'uso: II (entspricht den geforderten Wiederkehrzeiten)

### **Baugrundklasse**

Die Ermittlung der Baugrundklasse erfolgt ohne spezifische Untersuchungen durchgeführt zu haben auf Grundlage des Baugrundmodells.

Laut geologischem Modell und gem. Vorgaben der NTC 2018 (Tabelle 3.2.II) wird daher einheitlich die Baugrundklasse C ausgewiesen. Für die Ermittlung des stratigraphischen Korrekturfaktors SS und CC sind entsprechend die Gleichungen gem. Tab. 3.2.IV der NTC anzusetzen.

### **Topografische Kategorie und topografischer Verstärkungskoeffizient**

Das Untersuchungsgebiet ist durch die topografische Kategorie T3 (vgl. Tabelle 3.2.III Kap. 3.2.2 der NTC) modellierbar; der topografische Verstärkungskoeffizient ST kann mit 1,2 gleichgesetzt werden, wie in der Tabelle 3.2.V Kap. 3.2.3.2.1 der NTC angegeben.

### **Ermittlung der Erdbebenlast**

Gemäß NTC 2018 §7.11.3.5.2 kann für den Nachweis der Stabilität von Böschungen ein **pseudostatisches Verfahren** angewandt werden:

horizontale Ersatzkraft:  $F_h = k_h * W$

vertikale Ersatzkraft:  $F_v = k_v * W$

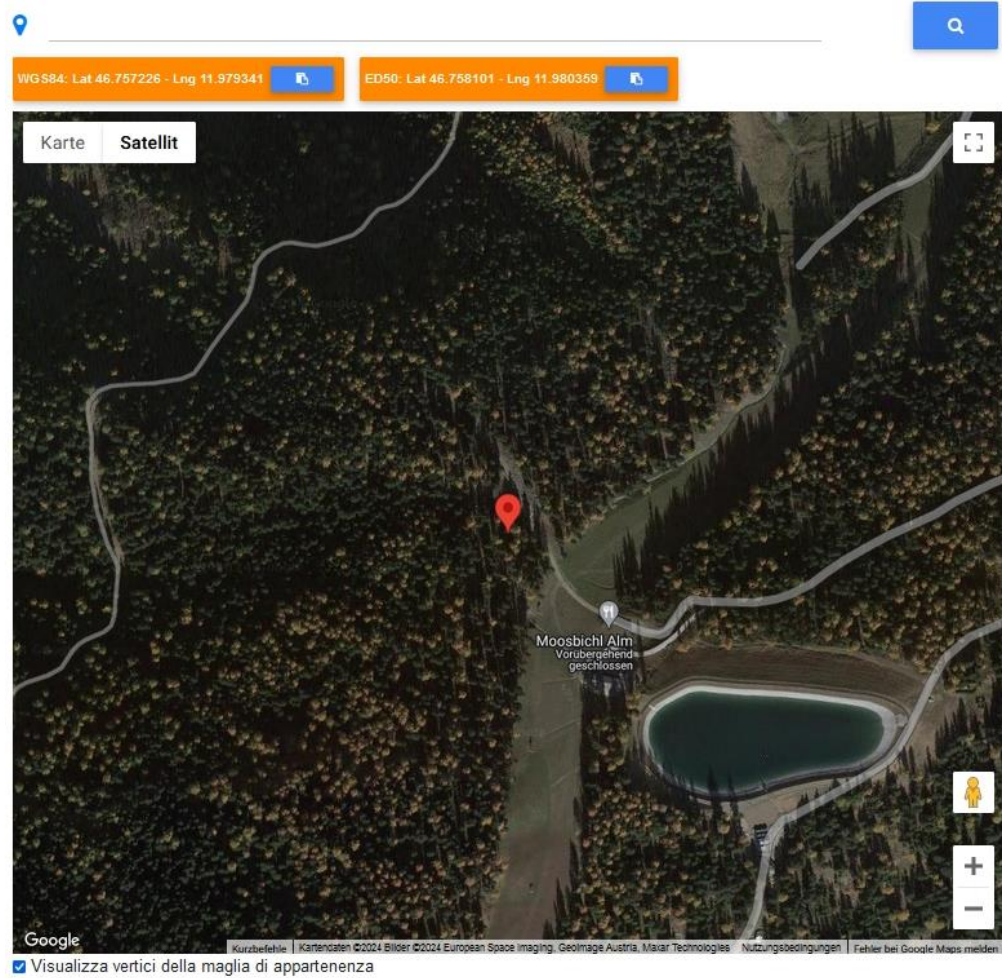
wobei:

$$k_h = \beta_s * \frac{a_{max}}{g} \quad \text{mit} \quad \beta_s = 0,38 \text{ (§7.11.4)}$$

$$k_v = \pm 0,5 * k_h$$

Die Berechnung erfolgt mit der Web-Anwendung geoapp:

(<http://geoapp.eu/parametrisismici2018>)



### Stati limite

Classe Edificio

Il. Affollamento normale, Assenza di funz. pubbliche e sociali...

Vita Nominale 50

Interpolazione Media ponderata

**CU = 1**

| Stato Limite                                 | Tr [anni] | $a_g$ [g] | $F_0$ | $T_c^*$ [s] |
|----------------------------------------------|-----------|-----------|-------|-------------|
| Operatività (SLO)                            | 30        | 0.019     | 2.485 | 0.160       |
| Danno (SLD)                                  | 50        | 0.025     | 2.474 | 0.190       |
| Salvaguardia vita (SLV)                      | 475       | 0.056     | 2.552 | 0.362       |
| Prevenzione collasso (SLC)                   | 975       | 0.070     | 2.616 | 0.393       |
| Periodo di riferimento per l'azione sismica: | 50        |           |       |             |



### Coefficienti sismici

**Tipo** Fronti di scavo e rilevati

☐ Muri di sostegno che non sono in grado di subire spostamenti.

**H (m)** 1 **us (m)** 0.1

**Cat. Sottosuolo** C

**Cat. Topografica** T3

|                                 | SLO  | SLD  | SLV  | SLC  |
|---------------------------------|------|------|------|------|
| SS Amplificazione stratigrafica | 1,50 | 1,50 | 1,50 | 1,50 |
| CC Coeff. funz. categoria       | 1,92 | 1,82 | 1,47 | 1,43 |
| ST Amplificazione topografica   | 1,20 | 1,20 | 1,20 | 1,20 |

☐ Acc.ne massima attesa al sito [m/s<sup>2</sup>] 0.6

| Coefficienti             | SLO   | SLD   | SLV   | SLC   |
|--------------------------|-------|-------|-------|-------|
| kh                       | 0.000 | 0.021 | 0.038 | 0.000 |
| kv                       | –     | 0.011 | 0.019 | –     |
| Amax [m/s <sup>2</sup> ] | 0.343 | 0.442 | 0.990 | 1.230 |
| Beta                     | –     | 0.470 | 0.380 | –     |

## 8.3 STANDSICHERHEITSNACHWEISE

Die Nachweise werden gemäß NTC (2018) §6.8.2 mit dem Nachweiskonzept 1 (approccio 1) und Kombination 2 durchgeführt:

$$(A2 + M2 + R2)$$

Die entsprechenden Teilsicherheitsbeiwerte können den Tabellen 6.2.I, 6.2.II und 6.8.I entnommen werden:

**Tab. 6.2.I – Coefficienti parziali per le azioni o per l'effetto delle azioni**

|                                | Effetto     | Coefficiente Parziale<br>$\gamma_F$ (o $\gamma_E$ ) | EQU | (A1) | (A2) |
|--------------------------------|-------------|-----------------------------------------------------|-----|------|------|
| Carichi permanenti $G_1$       | Favorevole  | $\gamma_{G1}$                                       | 0,9 | 1,0  | 1,0  |
|                                | Sfavorevole |                                                     | 1,1 | 1,3  | 1,0  |
| Carichi permanenti $G_2^{(1)}$ | Favorevole  | $\gamma_{G2}$                                       | 0,8 | 0,8  | 0,8  |
|                                | Sfavorevole |                                                     | 1,5 | 1,5  | 1,3  |
| Azioni variabili Q             | Favorevole  | $\gamma_{Q8}$                                       | 0,0 | 0,0  | 0,0  |
|                                | Sfavorevole |                                                     | 1,5 | 1,5  | 1,3  |

<sup>(1)</sup> Per i carichi permanenti  $G_2$  si applica quanto indicato alla Tabella 2.6.I. Per la spinta delle terre si fa riferimento ai coefficienti  $\gamma_{G1}$



Tab. 6.2.II – Coefficienti parziali per i parametri geotecnici del terreno

| Parametro                                    | Grandezza alla quale applicare il coefficiente parziale | Coefficiente parziale $\gamma_M$ | (M1) | (M2) |
|----------------------------------------------|---------------------------------------------------------|----------------------------------|------|------|
| Tangente dell'angolo di resistenza al taglio | $\tan \varphi'_k$                                       | $\gamma_{\varphi'}$              | 1,0  | 1,25 |
| Coesione efficace                            | $c'_k$                                                  | $\gamma_{c'}$                    | 1,0  | 1,25 |
| Resistenza non drenata                       | $c_{uk}$                                                | $\gamma_{cu}$                    | 1,0  | 1,4  |
| Peso dell'unità di volume                    | $\gamma_\gamma$                                         | $\gamma_\gamma$                  | 1,0  | 1,0  |

Tab. 6.8.I - Coefficienti parziali per le verifiche di sicurezza di opere di materiali sciolti e di fronti di scavo

| COEFFICIENTE | R2  |
|--------------|-----|
| $\gamma_R$   | 1,1 |

Für den Lastfall Maximalwasserstand wird gemäß DM vom 26.06.2014 §E.5.1 ein  $\gamma_R$  von 1,2 angenommen.

Die Standsicherheitsnachweise wurden für die maßgebenden Querschnitte für folgende Lastfallkombinationen untersucht:

#### Grundlegende (fondamentale):

- **LFK1 - Endzustand leer:** ohne Wasserinhalt, mit Verkehrslast auf Dammkrone (5,0 kN/m<sup>3</sup>), ohne Erdbeben
- **LFK2 - Normalbetrieb:** mit Wasserinhalt bis Stauziel, mit Verkehrslast auf Dammkrone (5,0 kN/m<sup>3</sup>), ohne Erdbeben

#### Außergewöhnlich (eccenzional)

- **LFK3 - Maximalwasserstand (Versagen Notüberlauf):** mit Wasserinhalt bis zur Dammkrone, mit Verkehrslast auf Dammkrone (5,0 kN/m<sup>3</sup>), ohne Erdbeben

#### Erdbeben (sismica)

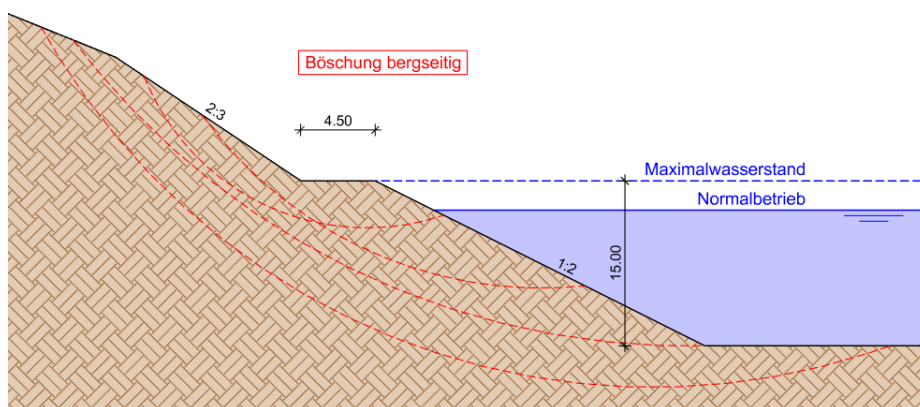
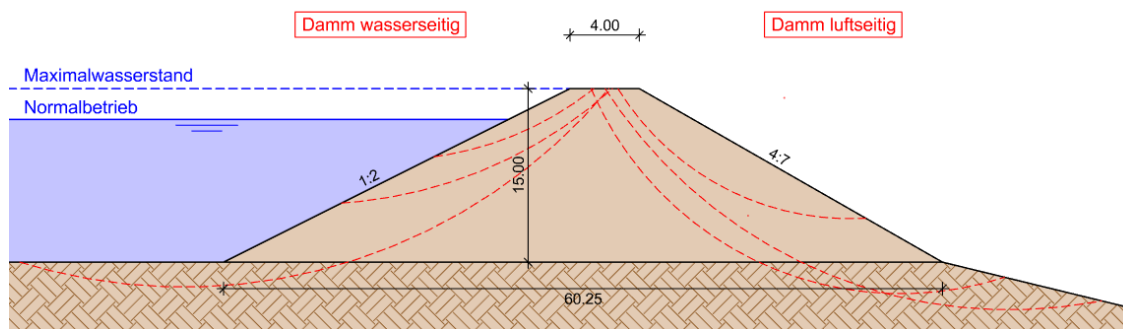
- **LFK4 - Erdbeben:** mit Wasserinhalt bis Stauziel, mit Verkehrslast auf Dammkrone (5,0 kN/m<sup>3</sup>), mit Erdbeben

#### Versagen der Abdichtung

- **LFK5 - Erdbeben:** mit Wasserinhalt bis Stauziel, mit Verkehrslast auf Dammkrone (5,0 kN/m<sup>3</sup>)

Auf den Nachweis einer schnellen Wasserspiegelsenkung kann aufgrund der innenliegenden Dammbabdichtung verzichtet werden.

Zur Berechnung und Nachweisführung wurde die Software DC-Böschung der DC-Software Doster & Christmann GmbH verwendet. Die Software führt dabei einen Gleitkreisnachweis nach Krey-Bishop.

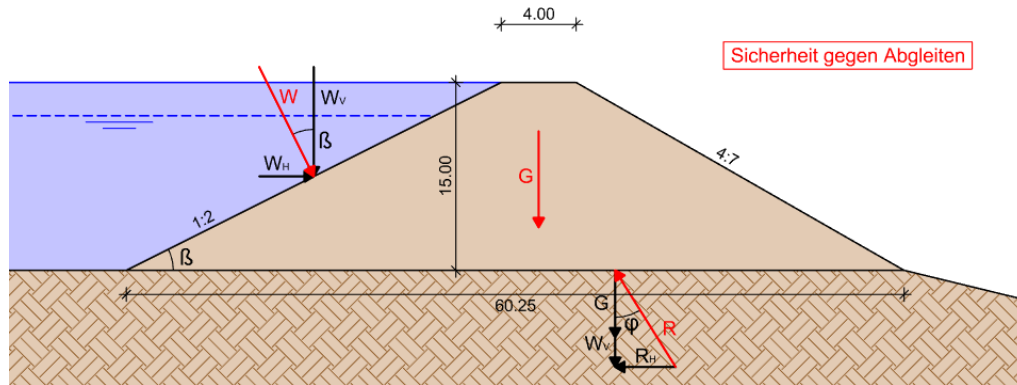


Die detaillierten Berechnungen werden im Anhang angeführt. Für die oben genannten Lastfallkombinationen wurden folgende Standsicherheiten berechnet:

| Lastfallkombination        |          | Damm                  |                     | Böschung<br>bergseitig<br>(BB) |
|----------------------------|----------|-----------------------|---------------------|--------------------------------|
|                            |          | wasserseitig<br>(D-w) | luftseitig<br>(D-l) |                                |
| LFK1 – Endzustand leer     |          | 0,82                  | 0,89                | 0,80                           |
| LFK2 - Normalbetrieb       |          | 0,48                  | 0,89                |                                |
| LFK3 - Maximalwasserstand  |          | 0,31                  | 0,99                |                                |
| LFK4 - Erdbeben            | leer     | 0,76                  | 0,83                | 0,75                           |
|                            | Stauziel | 0,42                  |                     |                                |
| LFK5 – Versagen Abdichtung |          | -                     | 0,90                | -                              |

**Tabelle 6:** Nachweise Standsicherheit

## 8.4 SICHERHEIT GEGEN ABGLEITEN



$$\gamma_d = \frac{\gamma_k}{\gamma_\gamma} = \frac{19}{1,0} = 19,0 \frac{kN}{m^3}, \quad \varphi_d = \frac{\varphi_k}{\gamma_\varphi} = \frac{35}{1,25} = 28^\circ$$

$$G = \gamma * A = 19,0 * 481,9 = 9.156,1 \text{ kN/m}$$

$$W_H = 0,5 * \gamma_w * H_w^2 = 0,5 * 10 * 15^2 = 1.125 \text{ kN/m}$$

$$W_V = \frac{W_H}{\tan(\beta)} = \frac{1.125}{\tan(26,57)} = 2.249,5 \text{ kN/m}$$

$$E_d = \gamma_Q * W_H = 1,3 * 1.125 = 1.462,5 \text{ kN/m}$$

$$R_d = \frac{1}{\gamma_R} * R_H = (G + W_V) * \tan(\varphi_d) = \frac{1}{1,2} * (9.156,1 + 2.249,5) * \tan(28) \\ = 5.053,7 \text{ kN/m}$$

$$\frac{E_d}{R_d} = \frac{1.462,5}{5.053,7} = 0,29 < 1$$

Damit ist die Sicherheit gegen Abgleiten nachgewiesen.

## 8.5 DAMMSETZUNG

### Setzungen Untergrund (s<sub>1</sub>)

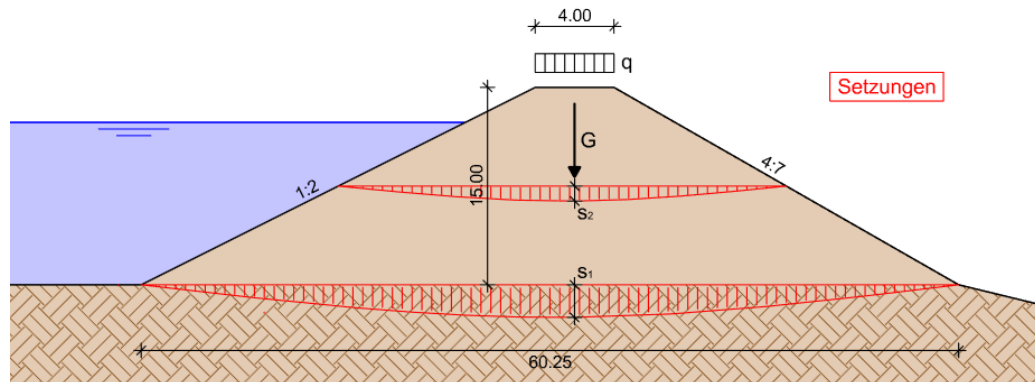
Die Setzungen des Untergrundes setzen sich zusammen aus:

- Primäre bzw. unmittelbare Setzungen durch Belastung ( $s = G * z / E_s$ )
- Sekundäre bzw. langzeitige Setzungen durch Umlagerung, usw.

## Setzungen Dammkörper / Eigensetzung ( $s_2$ )

Die Setzungen des Dammkörpers setzen sich zusammen aus:

- Setzung / Verformung während der Schüttung
- Setzung nach Bauende (bei guter Verdichtung etwa 0,2-0,8%)



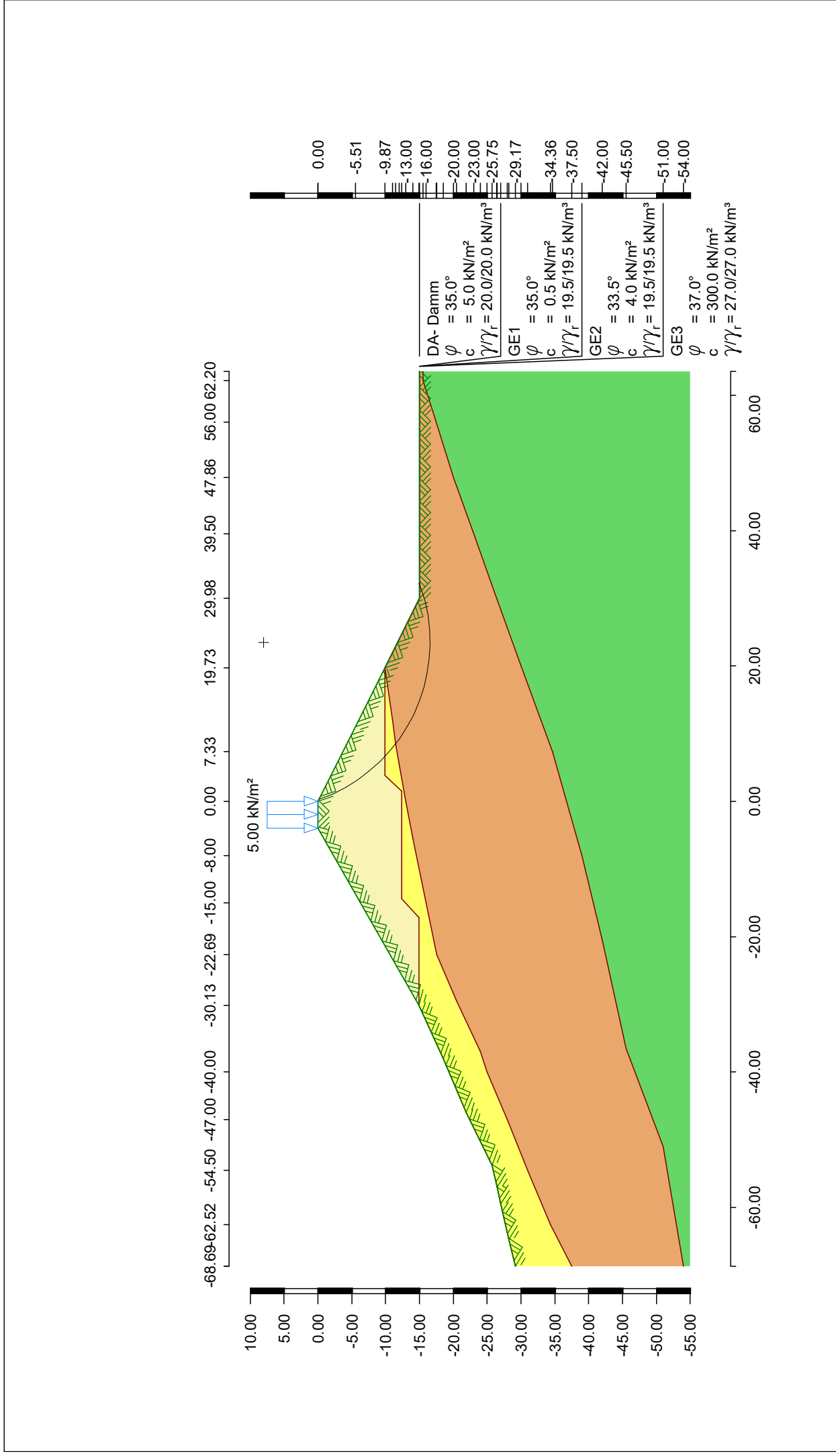
## Voraussichtliche Setzungen

Unmittelbare Setzungen des Untergrundes und Verformungen während der Schüttung können schon während der Bauphase ausgeglichen werden. Es bleiben somit die sekundären bzw. langzeitigen Setzungen (Kriechen) des Untergrundes und des Dammkörpers.

Bei einer guten Verdichtung können diese mit etwa **6,0 cm** abgeschätzt werden. Sollten die auftretenden Setzungen diesen Grenzwert jedoch überschreiten, so muss die Dammkrone wieder entsprechend erhöht werden (z.B. durch das Aufbringen einer 4cm Schotterschicht). Da es sich bei den auftretenden Setzungen um ein langsames Kriechen handelt ist diese Maßnahme mit den gesetzlich vorgeschriebenen halbjährlichen Kontrollen gut kontrollier- und umsetzbar.

Bruneck, August 2024

## 9 BERECHNUNGEN



Eingabedatei: M:\Projekte\2023\

23020\_P-BL-S-SK-K\_Speicher-Bodensee\_Kronplatz\Berechnungen\D-W\_LFK1.dbb

## Berechnung nach: NTC 2018 (Eurocode 7)

Berechnung mit Nachweisverfahren 1

Kombination mit Teilsicherheitsbeiwerten der Gruppen A2 + M2 + R2

| Schichtdaten                       |                      | DA- Damm<br>GE3       | GE1   | GE2   |
|------------------------------------|----------------------|-----------------------|-------|-------|
| Innere Reibung $\text{cal } \phi'$ | [Grad]               | 35.00<br>37.00        | 35.00 | 33.50 |
| Kohäsion $\text{cal } c'$          | [kN/m <sup>2</sup> ] | 5.0                   | 0.5   | 4.0   |
| Wichte Boden                       | [kN/m <sup>3</sup> ] | 300.0<br>20.0<br>27.0 | 19.5  | 19.5  |
| Wichte wassergesättigt             | [kN/m <sup>3</sup> ] | 20.0<br>27.0          | 19.5  | 19.5  |
| Wichte unter Auftrieb              | [kN/m <sup>3</sup> ] | 10.0<br>17.0          | 9.5   | 9.5   |

### Geländeverlauf und Schichten

|           |           |        |        |        |        |        |
|-----------|-----------|--------|--------|--------|--------|--------|
| x [m]     |           | -68.69 | -64.72 | -62.53 | -59.50 | -57.00 |
|           |           | -54.50 | -53.74 | -51.00 | -47.00 | -45.97 |
|           |           | -40.00 | -38.00 | -37.00 | -36.50 | -30.12 |
|           |           | -29.50 | -22.69 | -20.50 | -17.16 | -15.00 |
|           |           | -14.37 | -8.00  | -5.50  | -4.00  | 0.00   |
|           |           | 1.52   | 3.86   | 5.50   | 7.33   | 8.50   |
|           |           | 11.03  | 12.00  | 19.73  | 20.00  | 29.98  |
|           |           | 30.00  | 39.50  | 47.86  | 56.00  | 62.20  |
|           |           | 63.50  |        |        |        |        |
|           | z Gelände | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |           | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |           | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |           | -14.57 | -10.68 | -9.43  | -7.52  | -6.29  |
|           |           | -5.93  | -2.29  | -0.86  | 0.00   | 0.00   |
|           |           | -0.76  | -1.93  | -2.75  | -3.67  | -4.25  |
|           |           | -5.51  | -6.00  | -9.87  | -10.00 | -14.99 |
|           |           | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |           | -15.00 |        |        |        |        |
|           |           | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |           | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |           | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |           | -14.93 | -14.93 | -14.93 | -14.93 | -12.94 |
| z Schicht | DA- Damm  | -12.37 | -12.37 | -12.37 | -12.37 | -12.37 |
|           |           | -12.37 | -9.87  | -9.87  | -9.87  | -9.87  |
|           |           | -9.87  | -9.87  | -9.87  | -10.00 | -14.99 |
|           |           | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |           | -15.00 |        |        |        |        |
|           |           | -37.50 | -35.48 | -34.36 | -33.09 | -32.05 |
|           |           | -31.00 | -30.70 | -29.60 | -28.00 | -27.56 |
|           |           | -25.00 | -24.33 | -24.00 | -23.77 | -20.79 |
|           |           | -20.50 | -17.56 | -17.12 | -16.44 | -16.00 |
|           |           | -15.87 | -14.53 | -14.00 | -13.73 | -13.00 |
| z Schicht | GE1       | -12.72 | -12.30 | -12.00 | -11.69 | -11.50 |
|           |           | -11.14 | -11.00 | -9.87  | -10.00 | -14.99 |
|           |           | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |           | -15.00 |        |        |        |        |
|           |           | -37.50 | -35.48 | -34.36 | -33.09 | -32.05 |
|           |           | -31.00 | -30.70 | -29.60 | -28.00 | -27.56 |
|           |           | -25.00 | -24.33 | -24.00 | -23.77 | -20.79 |

|                                                                             |                                   |                |                |                |          |          |                |                |                |      |
|-----------------------------------------------------------------------------|-----------------------------------|----------------|----------------|----------------|----------|----------|----------------|----------------|----------------|------|
|                                                                             |                                   |                |                |                |          |          | Seite          | 3              |                |      |
| Programm DC-Böschung/Win Version 24.2.0                                     |                                   |                |                |                |          |          |                |                |                |      |
| D-W_LFK1                                                                    |                                   |                |                |                |          |          | Lastfall       | G              |                |      |
|                                                                             |                                   |                |                |                |          |          |                |                |                |      |
| z Schicht                                                                   | GE2                               | -54.00         | -53.33         | -52.95         | -52.44   | -52.02   |                |                |                |      |
|                                                                             |                                   | -51.59         | -51.46         | -51.00         | -49.48   | -49.09   |                |                |                |      |
|                                                                             |                                   | -46.83         | -46.07         | -45.69         | -45.50   | -44.11   |                |                |                |      |
|                                                                             |                                   | -43.97         | -42.48         | -42.00         | -41.20   | -40.68   |                |                |                |      |
|                                                                             |                                   | -40.53         | -39.00         | -38.29         | -37.86   | -36.72   |                |                |                |      |
|                                                                             |                                   | -36.29         | -35.62         | -35.15         | -34.63   | -34.20   |                |                |                |      |
|                                                                             |                                   | -33.28         | -32.92         | -30.10         | -30.00   | -26.39   |                |                |                |      |
|                                                                             |                                   | -26.38         | -23.00         | -20.00         | -17.50   | -15.49   |                |                |                |      |
|                                                                             |                                   | -15.49         |                |                |          |          |                |                |                |      |
| z Schicht                                                                   | GE3                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                                             |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                                             |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                                             |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                                             |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                                             |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                                             |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                                             |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                                             |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                                             |                                   | -1000.00       |                |                |          |          |                |                |                |      |
| <b>Streckenlasten</b>                                                       |                                   |                |                |                |          |          |                |                |                |      |
| Alle Lasten beziehen sich auf 1 m Länge                                     |                                   |                |                |                |          |          |                |                |                |      |
| LF-Komb.                                                                    | q                                 | x <sub>A</sub> | x <sub>E</sub> | z <sub>Q</sub> | γ        | ψ        |                |                |                |      |
| G    Q                                                                      | 5.0                               | -4.0           | 0.0            | 0.00           | 1.30     | 1.00     |                |                |                |      |
|                                                                             |                                   |                |                |                |          |          |                |                |                |      |
| <b>Lamellenbreiten</b>                                                      |                                   |                |                |                |          |          |                |                |                |      |
| Von x [m]                                                                   |                                   | bis x [m]      |                | Breite [m]     |          |          |                |                |                |      |
| -10000.00                                                                   |                                   | 10000.00       |                | 0.25           |          |          |                |                |                |      |
|                                                                             |                                   |                |                |                |          |          |                |                |                |      |
| <b>Teilsicherheitsbeiwerte (GEO) für NW-Verf. 1</b>                         |                                   |                |                |                |          |          |                |                |                |      |
| γ-                                                                          | G                                 | Q              | W              | E              | φ        | c        | c <sub>u</sub> | R <sub>a</sub> | R <sub>b</sub> | R    |
|                                                                             | 1.00                              | 1.30           | 1.00           | 1.30           | 1.25     | 1.25     | 1.40           | 1.10           | 1.10           | 1.10 |
|                                                                             |                                   |                |                |                |          |          |                |                |                |      |
| γ-                                                                          | Teilsicherheitsbeiwert für...     |                |                |                |          |          |                |                |                |      |
| G                                                                           | Ständige Lasten                   |                |                |                |          |          |                |                |                |      |
| Q                                                                           | Veränderliche Lasten              |                |                |                |          |          |                |                |                |      |
| W                                                                           | Wasserdruck                       |                |                |                |          |          |                |                |                |      |
| E                                                                           | Erdbeben                          |                |                |                |          |          |                |                |                |      |
| φ                                                                           | Reibungsbeiwert tan(φ)            |                |                |                |          |          |                |                |                |      |
| c                                                                           | Kohäsion c                        |                |                |                |          |          |                |                |                |      |
| c <sub>u</sub>                                                              | Kohäsion undränirt c <sub>u</sub> |                |                |                |          |          |                |                |                |      |
| R <sub>a</sub>                                                              | Anker                             |                |                |                |          |          |                |                |                |      |
| R <sub>b</sub>                                                              | Bauteile                          |                |                |                |          |          |                |                |                |      |
| R                                                                           | Widerstände                       |                |                |                |          |          |                |                |                |      |
|                                                                             |                                   |                |                |                |          |          |                |                |                |      |
| <b>Bestimmung der Sicherheit nach Krey-Bishop</b>                           |                                   |                |                |                |          |          |                |                |                |      |
| Gleitkreis mit Iteration des Mittelpunktes:                                 |                                   |                |                |                |          |          |                |                |                |      |
| Startpunkt: x <sub>M</sub> = 23.50 m, z <sub>M</sub> = 8.00 m,              |                                   |                |                |                |          |          |                |                |                |      |
| Δ x = 1.00 m, Δ z = 1.00 m,                                                 |                                   |                |                |                |          |          |                |                |                |      |
| mit Iteration des Radius: Δ R = 1.00 m ab R = 24.60 m                       |                                   |                |                |                |          |          |                |                |                |      |
|                                                                             |                                   |                |                |                |          |          |                |                |                |      |
| <b>Lastfallkomb. G</b>                                                      |                                   |                |                |                |          |          |                |                |                |      |
| Gleitkörper von x = 3.01 bis 29.99 m                                        |                                   |                |                |                |          |          |                |                |                |      |
| Gleitkreis: x <sub>M</sub> = 28.38 m, z <sub>M</sub> = 15.50 m, R = 30.54 m |                                   |                |                |                |          |          |                |                |                |      |
|                                                                             |                                   |                |                |                |          |          |                |                |                |      |
| <b>Bestimmung der Lamellen-Anteile</b>                                      |                                   |                |                |                |          |          |                |                |                |      |
| x <sub>M</sub>                                                              | Breite                            | Eigen-         | Auflast        | Wasser-        | φ        | c        | ψ              |                |                |      |
|                                                                             | b                                 | gewicht        |                | auflast        |          |          |                |                |                |      |
| [m]                                                                         | [m]                               | [kN/m]         | [kN/m]         | [kN/m]         | [Grad]   | [kN/m²]  |                |                |                |      |
| 3.13                                                                        | 0.24                              | 0.58           | 0.00           | 0.00           | 35.00    | 5.0      |                | -55.76         |                |      |
| 3.38                                                                        | 0.25                              | 1.76           | 0.00           | 0.00           | 35.00    | 5.0      |                | -54.95         |                |      |



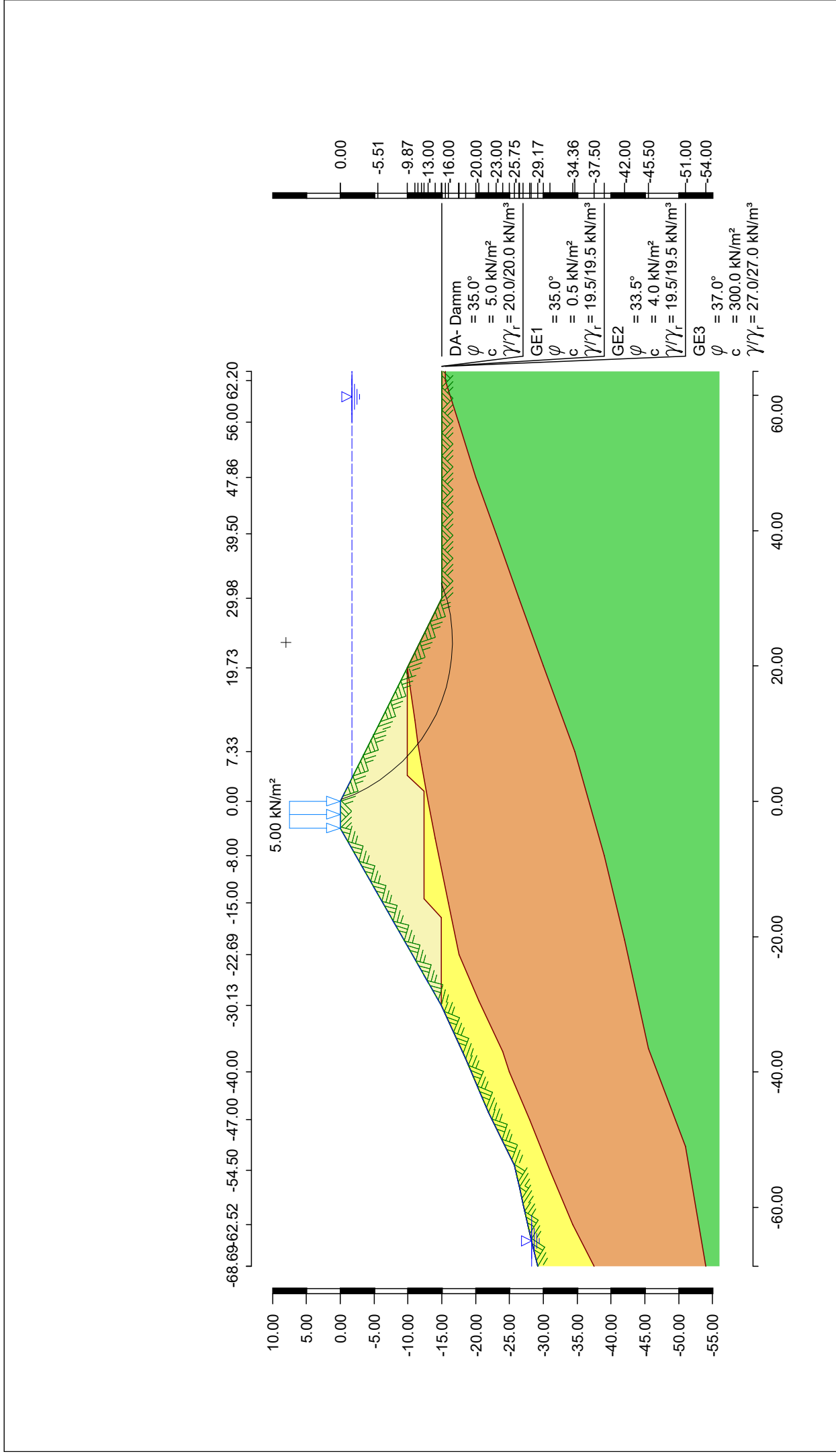
|                                         |             |                   |         |                    |           |                      |             |   |
|-----------------------------------------|-------------|-------------------|---------|--------------------|-----------|----------------------|-------------|---|
|                                         |             |                   |         |                    |           |                      | Seite       | 4 |
| Programm DC-Böschung/Win Version 24.2.0 |             |                   |         |                    |           |                      |             |   |
| D-W_LFK1                                |             |                   |         |                    |           |                      | Lastfall    | G |
|                                         |             |                   |         |                    |           |                      |             |   |
| $x_M$                                   | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c                    | $\vartheta$ |   |
| [m]                                     | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]      |   |
| 3.63                                    | 0.25        | 2.89              | 0.00    | 0.00               | 35.00     | 5.0                  | -54.14      |   |
| 3.88                                    | 0.25        | 3.97              | 0.00    | 0.00               | 35.00     | 5.0                  | -53.34      |   |
| 4.13                                    | 0.25        | 5.00              | 0.00    | 0.00               | 35.00     | 5.0                  | -52.57      |   |
| 4.38                                    | 0.25        | 5.99              | 0.00    | 0.00               | 35.00     | 5.0                  | -51.80      |   |
| 4.63                                    | 0.25        | 6.93              | 0.00    | 0.00               | 35.00     | 5.0                  | -51.05      |   |
| 4.88                                    | 0.25        | 7.83              | 0.00    | 0.00               | 35.00     | 5.0                  | -50.31      |   |
| 5.13                                    | 0.25        | 8.69              | 0.00    | 0.00               | 35.00     | 5.0                  | -49.58      |   |
| 5.38                                    | 0.25        | 9.52              | 0.00    | 0.00               | 35.00     | 5.0                  | -48.86      |   |
| 5.63                                    | 0.25        | 10.31             | 0.00    | 0.00               | 35.00     | 5.0                  | -48.15      |   |
| 5.88                                    | 0.25        | 11.06             | 0.00    | 0.00               | 35.00     | 5.0                  | -47.46      |   |
| 6.13                                    | 0.25        | 11.78             | 0.00    | 0.00               | 35.00     | 5.0                  | -46.77      |   |
| 6.38                                    | 0.25        | 12.47             | 0.00    | 0.00               | 35.00     | 5.0                  | -46.09      |   |
| 6.63                                    | 0.25        | 13.13             | 0.00    | 0.00               | 35.00     | 5.0                  | -45.41      |   |
| 6.88                                    | 0.25        | 13.76             | 0.00    | 0.00               | 35.00     | 5.0                  | -44.75      |   |
| 7.13                                    | 0.25        | 14.36             | 0.00    | 0.00               | 35.00     | 5.0                  | -44.09      |   |
| 7.38                                    | 0.25        | 14.93             | 0.00    | 0.00               | 35.00     | 5.0                  | -43.44      |   |
| 7.63                                    | 0.25        | 15.47             | 0.00    | 0.00               | 35.00     | 5.0                  | -42.80      |   |
| 7.88                                    | 0.25        | 15.99             | 0.00    | 0.00               | 35.00     | 5.0                  | -42.16      |   |
| 8.13                                    | 0.25        | 16.49             | 0.00    | 0.00               | 35.00     | 5.0                  | -41.53      |   |
| 8.38                                    | 0.25        | 16.96             | 0.00    | 0.00               | 35.00     | 5.0                  | -40.91      |   |
| 8.63                                    | 0.25        | 17.40             | 0.00    | 0.00               | 35.00     | 5.0                  | -40.29      |   |
| 8.88                                    | 0.25        | 17.83             | 0.00    | 0.00               | 35.00     | 5.0                  | -39.68      |   |
| 9.13                                    | 0.25        | 18.23             | 0.00    | 0.00               | 35.00     | 5.0                  | -39.07      |   |
| 9.38                                    | 0.25        | 18.61             | 0.00    | 0.00               | 35.00     | 5.0                  | -38.47      |   |
| 9.63                                    | 0.25        | 18.97             | 0.00    | 0.00               | 35.00     | 5.0                  | -37.88      |   |
| 9.88                                    | 0.25        | 19.30             | 0.00    | 0.00               | 35.00     | 5.0                  | -37.28      |   |
| 10.13                                   | 0.25        | 19.62             | 0.00    | 0.00               | 35.00     | 5.0                  | -36.70      |   |
| 10.38                                   | 0.25        | 19.92             | 0.00    | 0.00               | 35.00     | 5.0                  | -36.11      |   |
| 10.63                                   | 0.25        | 20.19             | 0.00    | 0.00               | 35.00     | 5.0                  | -35.54      |   |
| 10.88                                   | 0.25        | 20.45             | 0.00    | 0.00               | 35.00     | 5.0                  | -34.96      |   |
| 11.13                                   | 0.25        | 20.69             | 0.00    | 0.00               | 35.00     | 5.0                  | -34.39      |   |
| 11.38                                   | 0.25        | 20.91             | 0.00    | 0.00               | 35.00     | 0.5                  | -33.82      |   |
| 11.63                                   | 0.25        | 21.10             | 0.00    | 0.00               | 35.00     | 0.5                  | -33.26      |   |
| 11.88                                   | 0.25        | 21.26             | 0.00    | 0.00               | 35.00     | 0.5                  | -32.70      |   |
| 12.13                                   | 0.25        | 21.41             | 0.00    | 0.00               | 35.00     | 0.5                  | -32.15      |   |
| 12.38                                   | 0.25        | 21.54             | 0.00    | 0.00               | 35.00     | 0.5                  | -31.60      |   |
| 12.63                                   | 0.25        | 21.66             | 0.00    | 0.00               | 35.00     | 0.5                  | -31.05      |   |
| 12.88                                   | 0.25        | 21.76             | 0.00    | 0.00               | 35.00     | 0.5                  | -30.50      |   |
| 13.13                                   | 0.25        | 21.85             | 0.00    | 0.00               | 33.50     | 4.0                  | -29.96      |   |
| 13.38                                   | 0.25        | 21.92             | 0.00    | 0.00               | 33.50     | 4.0                  | -29.42      |   |
| 13.63                                   | 0.25        | 21.97             | 0.00    | 0.00               | 33.50     | 4.0                  | -28.88      |   |
| 13.88                                   | 0.25        | 22.01             | 0.00    | 0.00               | 33.50     | 4.0                  | -28.35      |   |
| 14.13                                   | 0.25        | 22.04             | 0.00    | 0.00               | 33.50     | 4.0                  | -27.81      |   |
| 14.38                                   | 0.25        | 22.05             | 0.00    | 0.00               | 33.50     | 4.0                  | -27.29      |   |
| 14.63                                   | 0.25        | 22.04             | 0.00    | 0.00               | 33.50     | 4.0                  | -26.76      |   |
| 14.88                                   | 0.25        | 22.03             | 0.00    | 0.00               | 33.50     | 4.0                  | -26.23      |   |
| 15.13                                   | 0.25        | 22.00             | 0.00    | 0.00               | 33.50     | 4.0                  | -25.71      |   |
| 15.38                                   | 0.25        | 21.95             | 0.00    | 0.00               | 33.50     | 4.0                  | -25.19      |   |
| 15.63                                   | 0.25        | 21.89             | 0.00    | 0.00               | 33.50     | 4.0                  | -24.68      |   |
| 15.88                                   | 0.25        | 21.82             | 0.00    | 0.00               | 33.50     | 4.0                  | -24.16      |   |
| 16.12                                   | 0.25        | 21.74             | 0.00    | 0.00               | 33.50     | 4.0                  | -23.65      |   |
| 16.37                                   | 0.25        | 21.64             | 0.00    | 0.00               | 33.50     | 4.0                  | -23.14      |   |
| 16.62                                   | 0.25        | 21.53             | 0.00    | 0.00               | 33.50     | 4.0                  | -22.63      |   |
| 16.87                                   | 0.25        | 21.41             | 0.00    | 0.00               | 33.50     | 4.0                  | -22.12      |   |
| 17.12                                   | 0.25        | 21.27             | 0.00    | 0.00               | 33.50     | 4.0                  | -21.62      |   |
| 17.37                                   | 0.25        | 21.12             | 0.00    | 0.00               | 33.50     | 4.0                  | -21.11      |   |
| 17.62                                   | 0.25        | 20.96             | 0.00    | 0.00               | 33.50     | 4.0                  | -20.61      |   |
| 17.87                                   | 0.25        | 20.79             | 0.00    | 0.00               | 33.50     | 4.0                  | -20.11      |   |

|                                         |             |                   |         |                    |           |                  |                            |   |
|-----------------------------------------|-------------|-------------------|---------|--------------------|-----------|------------------|----------------------------|---|
|                                         |             |                   |         |                    |           |                  | Seite                      | 5 |
| Programm DC-Böschung/Win Version 24.2.0 |             |                   |         |                    |           |                  | Lastfall                   | G |
| D-W_LFK1                                |             |                   |         |                    |           |                  |                            |   |
| $x_M$                                   | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c                | $\vartheta$                |   |
| [m]                                     | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m²]          | [Grad]                     |   |
| 18.12                                   | 0.25        | 20.60             | 0.00    | 0.00               | 33.50     | 4.0              | -19.61                     |   |
| 18.37                                   | 0.25        | 20.41             | 0.00    | 0.00               | 33.50     | 4.0              | -19.11                     |   |
| 18.62                                   | 0.25        | 20.20             | 0.00    | 0.00               | 33.50     | 4.0              | -18.62                     |   |
| 18.87                                   | 0.25        | 19.98             | 0.00    | 0.00               | 33.50     | 4.0              | -18.12                     |   |
| 19.12                                   | 0.25        | 19.75             | 0.00    | 0.00               | 33.50     | 4.0              | -17.63                     |   |
| 19.37                                   | 0.25        | 19.50             | 0.00    | 0.00               | 33.50     | 4.0              | -17.14                     |   |
| 19.62                                   | 0.25        | 19.25             | 0.00    | 0.00               | 33.50     | 4.0              | -16.65                     |   |
| 19.87                                   | 0.25        | 18.99             | 0.00    | 0.00               | 33.50     | 4.0              | -16.16                     |   |
| 20.12                                   | 0.25        | 18.73             | 0.00    | 0.00               | 33.50     | 4.0              | -15.67                     |   |
| 20.37                                   | 0.25        | 18.46             | 0.00    | 0.00               | 33.50     | 4.0              | -15.19                     |   |
| 20.63                                   | 0.25        | 18.17             | 0.00    | 0.00               | 33.50     | 4.0              | -14.70                     |   |
| 20.88                                   | 0.25        | 17.88             | 0.00    | 0.00               | 33.50     | 4.0              | -14.22                     |   |
| 21.13                                   | 0.25        | 17.57             | 0.00    | 0.00               | 33.50     | 4.0              | -13.73                     |   |
| 21.38                                   | 0.25        | 17.25             | 0.00    | 0.00               | 33.50     | 4.0              | -13.25                     |   |
| 21.63                                   | 0.25        | 16.93             | 0.00    | 0.00               | 33.50     | 4.0              | -12.77                     |   |
| 21.88                                   | 0.25        | 16.59             | 0.00    | 0.00               | 33.50     | 4.0              | -12.29                     |   |
| 22.13                                   | 0.25        | 16.24             | 0.00    | 0.00               | 33.50     | 4.0              | -11.81                     |   |
| 22.38                                   | 0.25        | 15.88             | 0.00    | 0.00               | 33.50     | 4.0              | -11.33                     |   |
| 22.63                                   | 0.25        | 15.51             | 0.00    | 0.00               | 33.50     | 4.0              | -10.85                     |   |
| 22.88                                   | 0.25        | 15.13             | 0.00    | 0.00               | 33.50     | 4.0              | -10.38                     |   |
| 23.13                                   | 0.25        | 14.73             | 0.00    | 0.00               | 33.50     | 4.0              | -9.90                      |   |
| 23.38                                   | 0.25        | 14.33             | 0.00    | 0.00               | 33.50     | 4.0              | -9.42                      |   |
| 23.63                                   | 0.25        | 13.92             | 0.00    | 0.00               | 33.50     | 4.0              | -8.95                      |   |
| 23.88                                   | 0.25        | 13.50             | 0.00    | 0.00               | 33.50     | 4.0              | -8.47                      |   |
| 24.13                                   | 0.25        | 13.06             | 0.00    | 0.00               | 33.50     | 4.0              | -8.00                      |   |
| 24.38                                   | 0.25        | 12.62             | 0.00    | 0.00               | 33.50     | 4.0              | -7.53                      |   |
| 24.63                                   | 0.25        | 12.17             | 0.00    | 0.00               | 33.50     | 4.0              | -7.05                      |   |
| 24.88                                   | 0.25        | 11.70             | 0.00    | 0.00               | 33.50     | 4.0              | -6.58                      |   |
| 25.13                                   | 0.25        | 11.23             | 0.00    | 0.00               | 33.50     | 4.0              | -6.11                      |   |
| 25.38                                   | 0.25        | 10.75             | 0.00    | 0.00               | 33.50     | 4.0              | -5.64                      |   |
| 25.63                                   | 0.25        | 10.25             | 0.00    | 0.00               | 33.50     | 4.0              | -5.17                      |   |
| 25.88                                   | 0.25        | 9.75              | 0.00    | 0.00               | 33.50     | 4.0              | -4.70                      |   |
| 26.13                                   | 0.25        | 9.23              | 0.00    | 0.00               | 33.50     | 4.0              | -4.23                      |   |
| 26.38                                   | 0.25        | 8.71              | 0.00    | 0.00               | 33.50     | 4.0              | -3.75                      |   |
| 26.63                                   | 0.25        | 8.17              | 0.00    | 0.00               | 33.50     | 4.0              | -3.29                      |   |
| 26.88                                   | 0.25        | 7.63              | 0.00    | 0.00               | 33.50     | 4.0              | -2.82                      |   |
| 27.13                                   | 0.25        | 7.08              | 0.00    | 0.00               | 33.50     | 4.0              | -2.35                      |   |
| 27.38                                   | 0.25        | 6.51              | 0.00    | 0.00               | 33.50     | 4.0              | -1.88                      |   |
| 27.63                                   | 0.25        | 5.94              | 0.00    | 0.00               | 33.50     | 4.0              | -1.41                      |   |
| 27.88                                   | 0.25        | 5.35              | 0.00    | 0.00               | 33.50     | 4.0              | -0.94                      |   |
| 28.13                                   | 0.25        | 4.76              | 0.00    | 0.00               | 33.50     | 4.0              | -0.47                      |   |
| 28.38                                   | 0.25        | 4.15              | 0.00    | 0.00               | 33.50     | 4.0              | 0.00                       |   |
| 28.63                                   | 0.25        | 3.54              | 0.00    | 0.00               | 33.50     | 4.0              | 0.47                       |   |
| 28.88                                   | 0.25        | 2.91              | 0.00    | 0.00               | 33.50     | 4.0              | 0.94                       |   |
| 29.13                                   | 0.25        | 2.28              | 0.00    | 0.00               | 33.50     | 4.0              | 1.41                       |   |
| 29.38                                   | 0.25        | 1.64              | 0.00    | 0.00               | 33.50     | 4.0              | 1.88                       |   |
| 29.63                                   | 0.25        | 0.98              | 0.00    | 0.00               | 33.50     | 4.0              | 2.35                       |   |
| 29.87                                   | 0.24        | 0.32              | 0.00    | 0.00               | 33.50     | 4.0              | 2.81                       |   |
| $x_M$                                   |             |                   |         |                    |           | R*T <sub>i</sub> | R*G*<br>sin( $\vartheta$ ) |   |
| [m]                                     |             |                   |         |                    |           | [kNm/m]          | [kNm/m]                    |   |
| 3.13                                    |             |                   |         |                    |           | 38.18            | 14.56                      |   |
| 3.38                                    |             |                   |         |                    |           | 58.03            | 44.01                      |   |
| 3.63                                    |             |                   |         |                    |           | 75.91            | 71.55                      |   |
| 3.88                                    |             |                   |         |                    |           | 92.73            | 97.29                      |   |
| 4.13                                    |             |                   |         |                    |           | 108.53           | 121.29                     |   |
| 4.38                                    |             |                   |         |                    |           | 123.43           | 143.69                     |   |

|                                         |  |               |                             |   |
|-----------------------------------------|--|---------------|-----------------------------|---|
|                                         |  |               | Seite                       | 6 |
| Programm DC-Böschung/Win Version 24.2.0 |  |               |                             |   |
| D-W_LFK1                                |  |               | Lastfall                    | G |
|                                         |  |               |                             |   |
| $x_M$                                   |  | $R \cdot T_i$ | $R \cdot G^* \sin(\varphi)$ |   |
| [m]                                     |  | [kNm/m]       | [kNm/m]                     |   |
| 4.63                                    |  | 137.49        | 164.58                      |   |
| 4.88                                    |  | 150.75        | 184.02                      |   |
| 5.13                                    |  | 163.28        | 202.10                      |   |
| 5.38                                    |  | 175.12        | 218.89                      |   |
| 5.63                                    |  | 186.31        | 234.44                      |   |
| 5.88                                    |  | 196.90        | 248.83                      |   |
| 6.13                                    |  | 206.92        | 262.10                      |   |
| 6.38                                    |  | 216.40        | 274.31                      |   |
| 6.63                                    |  | 225.37        | 285.51                      |   |
| 6.88                                    |  | 233.86        | 295.74                      |   |
| 7.13                                    |  | 241.89        | 305.06                      |   |
| 7.38                                    |  | 249.49        | 313.50                      |   |
| 7.63                                    |  | 256.67        | 321.08                      |   |
| 7.88                                    |  | 263.46        | 327.87                      |   |
| 8.13                                    |  | 269.87        | 333.88                      |   |
| 8.38                                    |  | 275.92        | 339.17                      |   |
| 8.63                                    |  | 281.63        | 343.74                      |   |
| 8.88                                    |  | 287.00        | 347.65                      |   |
| 9.13                                    |  | 292.05        | 350.91                      |   |
| 9.38                                    |  | 296.80        | 353.56                      |   |
| 9.63                                    |  | 301.25        | 355.61                      |   |
| 9.88                                    |  | 305.42        | 357.11                      |   |
| 10.13                                   |  | 309.31        | 358.06                      |   |
| 10.38                                   |  | 312.94        | 358.50                      |   |
| 10.63                                   |  | 316.31        | 358.44                      |   |
| 10.88                                   |  | 319.43        | 357.92                      |   |
| 11.13                                   |  | 322.31        | 356.94                      |   |
| 11.38                                   |  | 301.91        | 355.49                      |   |
| 11.63                                   |  | 304.10        | 353.37                      |   |
| 11.88                                   |  | 306.03        | 350.83                      |   |
| 12.13                                   |  | 307.76        | 347.94                      |   |
| 12.38                                   |  | 309.27        | 344.71                      |   |
| 12.63                                   |  | 310.59        | 341.17                      |   |
| 12.88                                   |  | 311.70        | 337.31                      |   |
| 13.13                                   |  | 317.02        | 333.17                      |   |
| 13.38                                   |  | 317.64        | 328.76                      |   |
| 13.63                                   |  | 318.09        | 324.09                      |   |
| 13.88                                   |  | 318.36        | 319.17                      |   |
| 14.13                                   |  | 318.47        | 314.03                      |   |
| 14.38                                   |  | 318.40        | 308.67                      |   |
| 14.63                                   |  | 318.18        | 303.12                      |   |
| 14.88                                   |  | 317.79        | 297.37                      |   |
| 15.13                                   |  | 317.24        | 291.45                      |   |
| 15.38                                   |  | 316.54        | 285.37                      |   |
| 15.63                                   |  | 315.68        | 279.14                      |   |
| 15.88                                   |  | 314.66        | 272.77                      |   |
| 16.12                                   |  | 313.50        | 266.28                      |   |
| 16.37                                   |  | 312.19        | 259.67                      |   |
| 16.62                                   |  | 310.72        | 252.96                      |   |
| 16.87                                   |  | 309.11        | 246.16                      |   |
| 17.12                                   |  | 307.36        | 239.28                      |   |
| 17.37                                   |  | 305.46        | 232.34                      |   |
| 17.62                                   |  | 303.41        | 225.33                      |   |
| 17.87                                   |  | 301.22        | 218.28                      |   |
| 18.12                                   |  | 298.89        | 211.19                      |   |
| 18.37                                   |  | 296.42        | 204.07                      |   |
| 18.62                                   |  | 293.80        | 196.94                      |   |
| 18.87                                   |  | 291.05        | 189.79                      |   |

|                                         |  |               |                                 |   |
|-----------------------------------------|--|---------------|---------------------------------|---|
|                                         |  |               | Seite                           | 7 |
| Programm DC-Böschung/Win Version 24.2.0 |  |               |                                 |   |
| D-W_LFK1                                |  |               | Lastfall                        | G |
|                                         |  |               |                                 |   |
| $x_M$                                   |  | $R \cdot T_i$ | $R \cdot G \cdot \sin(\varphi)$ |   |
| [m]                                     |  | [kNm/m]       | [kNm/m]                         |   |
| 19.12                                   |  | 288.15        | 182.66                          |   |
| 19.37                                   |  | 285.11        | 175.53                          |   |
| 19.62                                   |  | 281.94        | 168.42                          |   |
| 19.87                                   |  | 278.73        | 161.42                          |   |
| 20.12                                   |  | 275.48        | 154.52                          |   |
| 20.37                                   |  | 272.09        | 147.65                          |   |
| 20.63                                   |  | 268.56        | 140.83                          |   |
| 20.88                                   |  | 264.89        | 134.08                          |   |
| 21.13                                   |  | 261.07        | 127.39                          |   |
| 21.38                                   |  | 257.12        | 120.78                          |   |
| 21.63                                   |  | 253.02        | 114.25                          |   |
| 21.88                                   |  | 248.77        | 107.82                          |   |
| 22.13                                   |  | 244.38        | 101.49                          |   |
| 22.38                                   |  | 239.85        | 95.27                           |   |
| 22.63                                   |  | 235.17        | 89.17                           |   |
| 22.88                                   |  | 230.34        | 83.20                           |   |
| 23.13                                   |  | 225.36        | 77.36                           |   |
| 23.38                                   |  | 220.24        | 71.67                           |   |
| 23.63                                   |  | 214.96        | 66.12                           |   |
| 23.88                                   |  | 209.53        | 60.74                           |   |
| 24.13                                   |  | 203.94        | 55.53                           |   |
| 24.38                                   |  | 198.20        | 50.49                           |   |
| 24.63                                   |  | 192.30        | 45.63                           |   |
| 24.88                                   |  | 186.24        | 40.97                           |   |
| 25.13                                   |  | 180.01        | 36.50                           |   |
| 25.38                                   |  | 173.63        | 32.24                           |   |
| 25.63                                   |  | 167.07        | 28.19                           |   |
| 25.88                                   |  | 160.35        | 24.37                           |   |
| 26.13                                   |  | 153.46        | 20.78                           |   |
| 26.38                                   |  | 146.39        | 17.42                           |   |
| 26.63                                   |  | 139.15        | 14.31                           |   |
| 26.88                                   |  | 131.73        | 11.45                           |   |
| 27.13                                   |  | 124.13        | 8.84                            |   |
| 27.38                                   |  | 116.34        | 6.51                            |   |
| 27.63                                   |  | 108.36        | 4.45                            |   |
| 27.88                                   |  | 100.19        | 2.68                            |   |
| 28.13                                   |  | 91.83         | 1.19                            |   |
| 28.38                                   |  | 83.27         | 0.00                            |   |
| 28.63                                   |  | 74.50         | -0.88                           |   |
| 28.88                                   |  | 65.53         | -1.46                           |   |
| 29.13                                   |  | 56.35         | -1.71                           |   |
| 29.38                                   |  | 46.95         | -1.64                           |   |
| 29.63                                   |  | 37.33         | -1.23                           |   |
| 29.87                                   |  | 26.87         | -0.47                           |   |
| Summen:                                 |  | 24912.46      | 20306.59                        |   |
|                                         |  |               |                                 |   |
| Einwirkungen $E_d = 20306.59$ kN        |  |               |                                 |   |
| Widerstände $R_d = 24912.46$ kN         |  |               |                                 |   |
|                                         |  |               |                                 |   |
| $E_d/R_d = 0.82 < 1.0$                  |  |               |                                 |   |
| *** Nachweis erfüllt ***                |  |               |                                 |   |





Eingabedatei: M:\Projekte\2023\

23020\_P-BL-S-SK-K\_Speicher-Bodensee\_Kronplatz\Berechnungen\D-W\_LFK2.dbb

## Berechnung nach: NTC 2018 (Eurocode 7)

Berechnung mit Nachweisverfahren 1

Kombination mit Teilsicherheitsbeiwerten der Gruppen A2 + M2 + R2

| Schichtdaten                       |                      | DA- Damm<br>GE3 | GE1   | GE2   |
|------------------------------------|----------------------|-----------------|-------|-------|
| Innere Reibung $\text{cal } \phi'$ | [Grad]               | 35.00<br>37.00  | 35.00 | 33.50 |
| Kohäsion $\text{cal } c'$          | [kN/m <sup>2</sup> ] | 2.5<br>300.0    | 0.0   | 4.0   |
| Wichte Boden                       | [kN/m <sup>3</sup> ] | 20.0<br>27.0    | 19.5  | 19.5  |
| Wichte wassergesättigt             | [kN/m <sup>3</sup> ] | 20.0<br>27.0    | 19.5  | 19.5  |
| Wichte unter Auftrieb              | [kN/m <sup>3</sup> ] | 10.0<br>17.0    | 9.5   | 9.5   |

### Geländeverlauf und Schichten

|           |           |        |        |        |        |        |
|-----------|-----------|--------|--------|--------|--------|--------|
| x [m]     |           | -68.69 | -64.72 | -62.53 | -59.50 | -57.00 |
|           |           | -54.50 | -53.74 | -51.00 | -47.00 | -45.97 |
|           |           | -40.00 | -38.00 | -37.00 | -36.50 | -30.12 |
|           |           | -29.50 | -22.69 | -20.50 | -17.16 | -15.00 |
|           |           | -14.37 | -8.00  | -5.50  | -4.00  | 0.00   |
|           |           | 1.52   | 3.86   | 5.50   | 7.33   | 8.50   |
|           |           | 11.03  | 12.00  | 19.73  | 20.00  | 29.98  |
|           |           | 30.00  | 39.50  | 47.86  | 56.00  | 62.20  |
|           |           | 63.50  |        |        |        |        |
|           | z Gelände | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |           | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |           | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |           | -14.57 | -10.68 | -9.43  | -7.52  | -6.29  |
|           |           | -5.93  | -2.29  | -0.86  | 0.00   | 0.00   |
|           |           | -0.76  | -1.93  | -2.75  | -3.67  | -4.25  |
|           |           | -5.51  | -6.00  | -9.87  | -10.00 | -14.99 |
|           |           | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |           | -15.00 |        |        |        |        |
|           |           | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |           | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |           | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |           | -14.93 | -14.93 | -14.93 | -14.93 | -12.94 |
| z Schicht | DA- Damm  | -12.37 | -12.37 | -12.37 | -12.37 | -12.37 |
|           |           | -12.37 | -9.87  | -9.87  | -9.87  | -9.87  |
|           |           | -9.87  | -9.87  | -9.87  | -10.00 | -14.99 |
|           |           | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |           | -15.00 |        |        |        |        |
|           |           | -37.50 | -35.48 | -34.36 | -33.09 | -32.05 |
|           |           | -31.00 | -30.70 | -29.60 | -28.00 | -27.56 |
|           |           | -25.00 | -24.33 | -24.00 | -23.77 | -20.79 |
|           |           | -20.50 | -17.56 | -17.12 | -16.44 | -16.00 |
|           |           | -15.87 | -14.53 | -14.00 | -13.73 | -13.00 |
| z Schicht | GE1       | -12.72 | -12.30 | -12.00 | -11.69 | -11.50 |
|           |           | -11.14 | -11.00 | -9.87  | -10.00 | -14.99 |
|           |           | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |           | -15.00 |        |        |        |        |
|           |           | -37.50 | -35.48 | -34.36 | -33.09 | -32.05 |
|           |           | -31.00 | -30.70 | -29.60 | -28.00 | -27.56 |
|           |           | -25.00 | -24.33 | -24.00 | -23.77 | -20.79 |





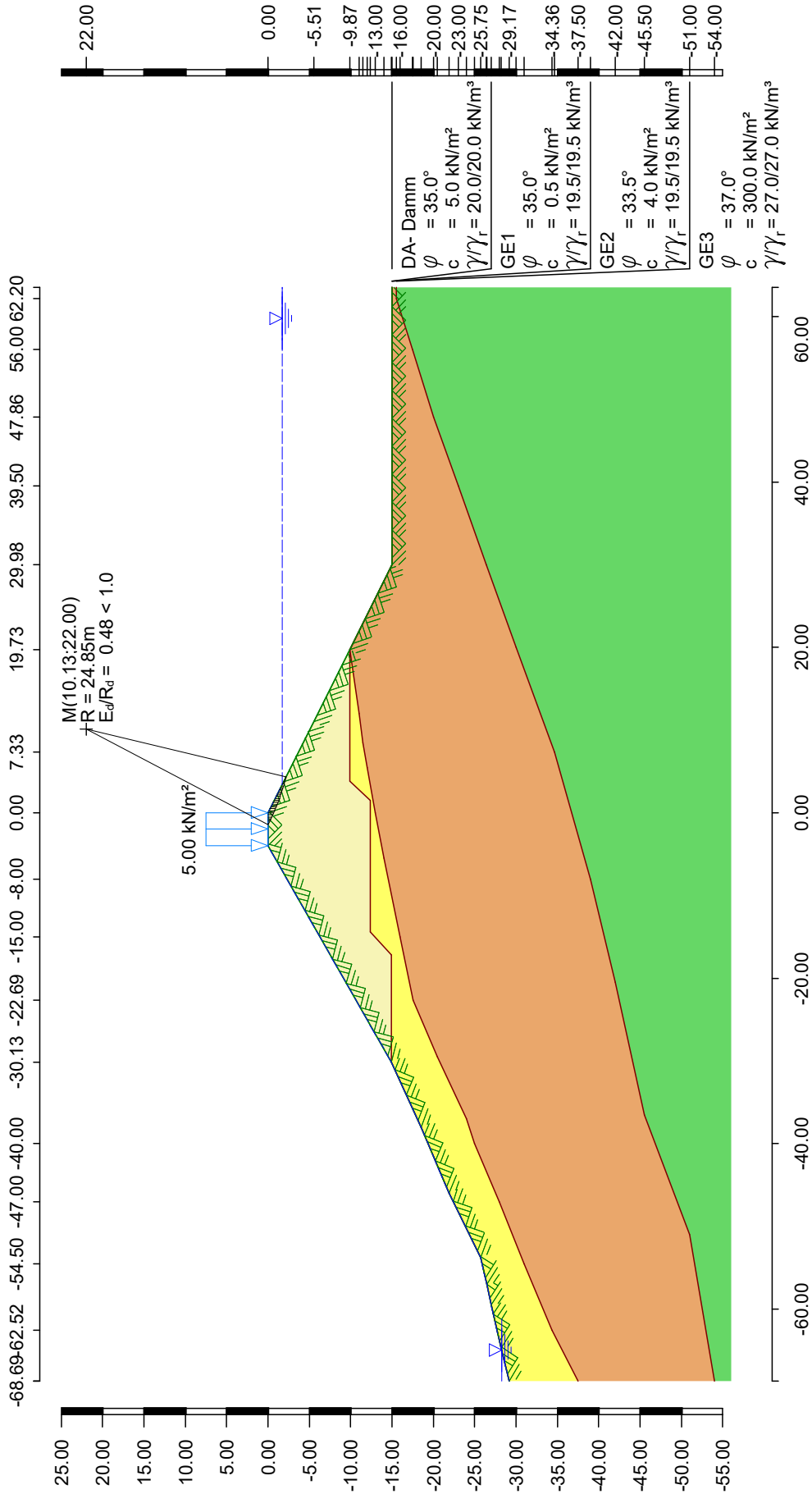
**Bestimmung der Sicherheit nach Krey-Bishop**

Gleitkreis mit Iteration des Mittelpunktes:

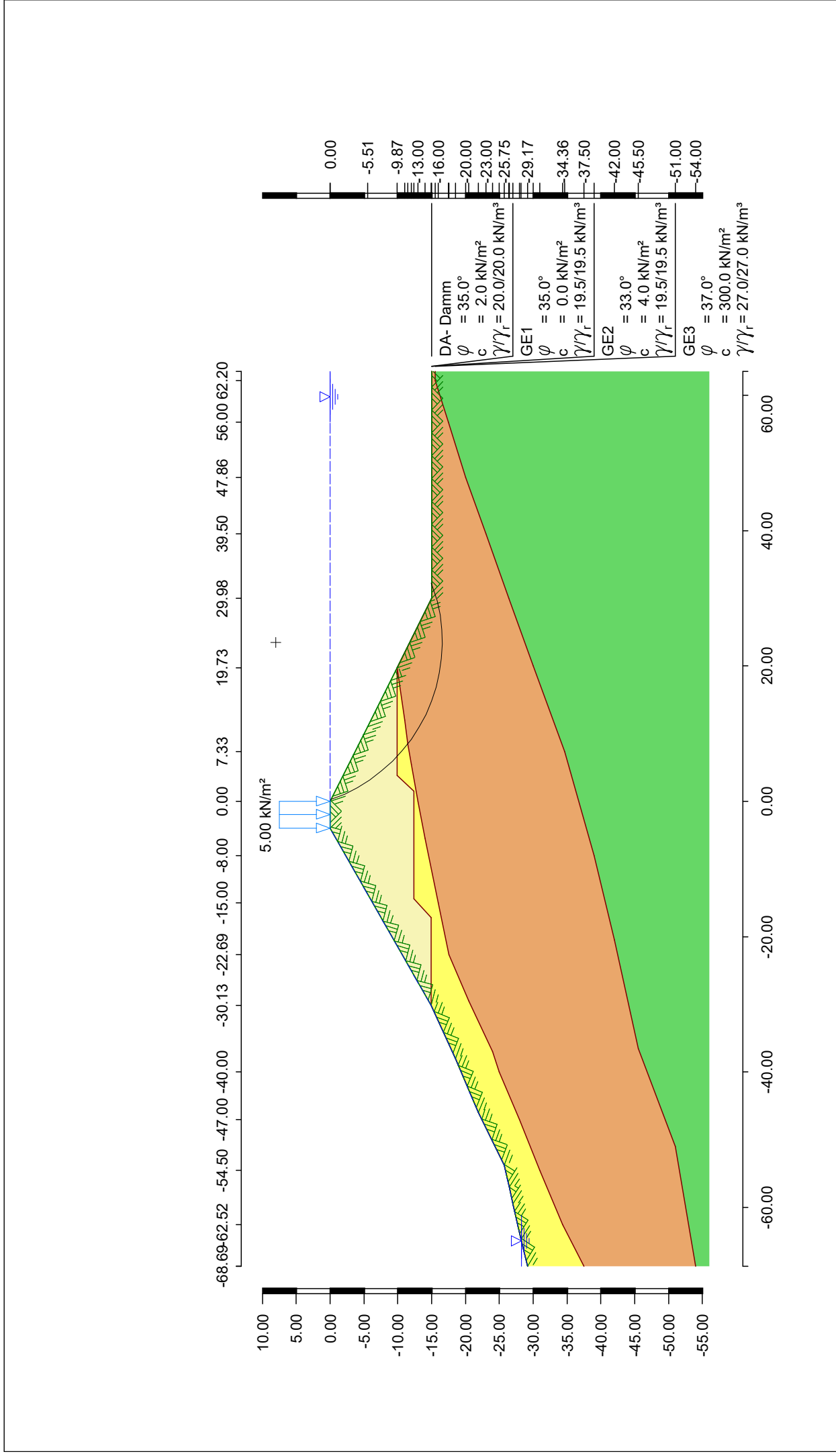
Startpunkt:  $x_M = 23.50$  m,  $z_M = 8.00$  m, $\Delta x = 1.00$  m,  $\Delta z = 1.00$  m,mit Iteration des Radius:  $\Delta R = 1.00$  m ab  $R = 24.60$  m**Lastfallkomb. G**Gleitkörper von  $x = -1.43$  bis  $4.34$  mGleitkreis:  $x_M = 10.13$  m,  $z_M = 22.00$  m,  $R = 24.85$  m**Bestimmung der Lamellen-Anteile**

| $x_M$ | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c                    | $\vartheta$                   |
|-------|-------------|-------------------|---------|--------------------|-----------|----------------------|-------------------------------|
| [m]   | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]                        |
| -1.34 | 0.18        | 0.18              | 0.00    | 0.00               | 35.00     | 2.5                  | -27.48                        |
| -1.12 | 0.25        | 0.80              | 0.00    | 0.00               | 35.00     | 2.5                  | -26.92                        |
| -0.88 | 0.25        | 1.42              | 0.00    | 0.00               | 35.00     | 2.5                  | -26.27                        |
| -0.63 | 0.25        | 2.03              | 0.00    | 0.00               | 35.00     | 2.5                  | -25.63                        |
| -0.38 | 0.25        | 2.62              | 0.00    | 0.00               | 35.00     | 2.5                  | -24.99                        |
| -0.13 | 0.25        | 3.20              | 0.00    | 0.00               | 35.00     | 2.5                  | -24.36                        |
| 0.13  | 0.25        | 3.44              | 0.00    | 0.00               | 35.00     | 2.5                  | -23.73                        |
| 0.38  | 0.25        | 3.36              | 0.00    | 0.00               | 35.00     | 2.5                  | -23.10                        |
| 0.63  | 0.25        | 3.26              | 0.00    | 0.00               | 35.00     | 2.5                  | -22.47                        |
| 0.88  | 0.25        | 3.14              | 0.00    | 0.00               | 35.00     | 2.5                  | -21.85                        |
| 1.12  | 0.25        | 3.01              | 0.00    | 0.00               | 35.00     | 2.5                  | -21.23                        |
| 1.38  | 0.25        | 2.86              | 0.00    | 0.00               | 35.00     | 2.5                  | -20.61                        |
| 1.62  | 0.25        | 2.70              | 0.00    | 0.00               | 35.00     | 2.5                  | -20.00                        |
| 1.87  | 0.25        | 2.52              | 0.00    | 0.00               | 35.00     | 2.5                  | -19.39                        |
| 2.12  | 0.25        | 2.33              | 0.00    | 0.00               | 35.00     | 2.5                  | -18.78                        |
| 2.37  | 0.25        | 2.13              | 0.00    | 0.00               | 35.00     | 2.5                  | -18.17                        |
| 2.63  | 0.25        | 1.90              | 0.00    | 0.00               | 35.00     | 2.5                  | -17.56                        |
| 2.88  | 0.25        | 1.67              | 0.00    | 0.00               | 35.00     | 2.5                  | -16.96                        |
| 3.13  | 0.25        | 1.42              | 0.00    | 0.00               | 35.00     | 2.5                  | -16.36                        |
| 3.38  | 0.25        | 1.15              | 0.00    | 0.01               | 35.00     | 2.5                  | -15.76                        |
| 3.63  | 0.25        | 0.87              | 0.00    | 0.18               | 35.00     | 2.5                  | -15.16                        |
| 3.88  | 0.25        | 0.58              | 0.00    | 0.50               | 35.00     | 2.5                  | -14.57                        |
| 4.13  | 0.25        | 0.27              | 0.00    | 0.81               | 35.00     | 2.5                  | -13.97                        |
| 4.29  | 0.09        | 0.02              | 0.00    | 0.36               | 35.00     | 2.5                  | -13.57                        |
| $x_M$ |             |                   |         |                    |           | $R \cdot T_i$        | $R \cdot G^* \sin(\vartheta)$ |
| [m]   |             |                   |         |                    |           | [kNm/m]              | [kNm/m]                       |
| -1.34 |             |                   |         |                    |           | 10.45                | 2.04                          |
| -1.12 |             |                   |         |                    |           | 21.09                | 8.98                          |
| -0.88 |             |                   |         |                    |           | 28.83                | 15.66                         |
| -0.63 |             |                   |         |                    |           | 36.32                | 21.85                         |
| -0.38 |             |                   |         |                    |           | 43.58                | 27.55                         |
| -0.13 |             |                   |         |                    |           | 50.60                | 32.78                         |
| 0.13  |             |                   |         |                    |           | 53.55                | 34.43                         |
| 0.38  |             |                   |         |                    |           | 52.43                | 32.75                         |
| 0.63  |             |                   |         |                    |           | 51.12                | 30.97                         |
| 0.88  |             |                   |         |                    |           | 49.63                | 29.08                         |
| 1.12  |             |                   |         |                    |           | 47.96                | 27.11                         |
| 1.38  |             |                   |         |                    |           | 46.10                | 25.07                         |
| 1.62  |             |                   |         |                    |           | 44.07                | 22.98                         |
| 1.87  |             |                   |         |                    |           | 41.86                | 20.84                         |
| 2.12  |             |                   |         |                    |           | 39.48                | 18.67                         |
| 2.37  |             |                   |         |                    |           | 36.92                | 16.48                         |
| 2.63  |             |                   |         |                    |           | 34.18                | 14.28                         |
| 2.88  |             |                   |         |                    |           | 31.28                | 12.09                         |
| 3.13  |             |                   |         |                    |           | 28.21                | 9.92                          |

|                                             |         |           |                                 |                             |
|---------------------------------------------|---------|-----------|---------------------------------|-----------------------------|
|                                             |         |           | Seite                           | 5                           |
|                                             |         |           |                                 |                             |
| Programm DC-Böschung/Win Version 24.2.0     |         |           | Lastfall                        | G                           |
| D-W_LFK2                                    |         |           |                                 |                             |
| $x_M$                                       |         |           | $R \cdot T_i$                   | $R \cdot G^* \sin(\varphi)$ |
| [m]                                         |         |           | [kNm/m]                         | [kNm/m]                     |
| 3.38                                        |         |           | 25.13                           | 7.86                        |
| 3.63                                        |         |           | 23.79                           | 6.86                        |
| 3.88                                        |         |           | 24.02                           | 6.71                        |
| 4.13                                        |         |           | 24.09                           | 6.48                        |
| 4.29                                        |         |           | 8.41                            | 2.19                        |
|                                             |         |           |                                 |                             |
| Summen:                                     |         |           | 853.12                          | 433.61                      |
| <b>Wasserdruckkraft</b>                     |         |           |                                 | $M_{abtr.}$                 |
| [kN/m]                                      |         |           |                                 | [kNm/m]                     |
| 0.85                                        |         |           |                                 | -20.38                      |
| Einwirkungen                                | $E_d =$ | 413.23 kN |                                 |                             |
| Widerstände                                 | $R_d =$ | 853.12 kN |                                 |                             |
| <b><math>E_d/R_d = 0.48 &lt; 1.0</math></b> |         |           | <b>*** Nachweis erfüllt ***</b> |                             |



|          |        |
|----------|--------|
| Seite    | 6      |
| Lastfall | G      |
| Maßstab  | 1: 750 |



Eingabedatei: M:\Projekte\2023\

23020\_P-BL-S-SK-K\_Speicher-Bodensee\_Kronplatz\Berechnungen\D-W\_LFK3.dbb

## Berechnung nach: NTC 2018 (Eurocode 7)

Berechnung mit Nachweisverfahren 1

Kombination mit Teilsicherheitsbeiwerten der Gruppen A2 + M2 + R2

| Schichtdaten                          |                      | DA- Damm<br>GE3 | GE1   | GE2   |
|---------------------------------------|----------------------|-----------------|-------|-------|
| Innere Reibung $\text{cal } \varphi'$ | [Grad]               | 35.00<br>37.00  | 35.00 | 33.00 |
| Kohäsion $\text{cal } c'$             | [kN/m <sup>2</sup> ] | 2.0<br>300.0    | 0.0   | 4.0   |
| Wichte Boden                          | [kN/m <sup>3</sup> ] | 20.0<br>27.0    | 19.5  | 19.5  |
| Wichte wassergesättigt                | [kN/m <sup>3</sup> ] | 20.0<br>27.0    | 19.5  | 19.5  |
| Wichte unter Auftrieb                 | [kN/m <sup>3</sup> ] | 10.0<br>17.0    | 9.5   | 9.5   |

### Geländeverlauf und Schichten

|           |          |        |        |        |        |        |
|-----------|----------|--------|--------|--------|--------|--------|
| x [m]     |          | -68.69 | -64.72 | -62.53 | -59.50 | -57.00 |
|           |          | -54.50 | -53.74 | -51.00 | -47.00 | -45.97 |
|           |          | -40.00 | -38.00 | -37.00 | -36.50 | -30.12 |
|           |          | -29.50 | -22.69 | -20.50 | -17.16 | -15.00 |
|           |          | -14.37 | -8.00  | -5.50  | -4.00  | 0.00   |
|           |          | 1.52   | 3.86   | 5.50   | 7.33   | 8.50   |
|           |          | 11.03  | 12.00  | 19.73  | 20.00  | 29.98  |
|           |          | 30.00  | 39.50  | 47.86  | 56.00  | 62.20  |
|           |          | 63.50  |        |        |        |        |
| z Gelände |          | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |          | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |          | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |          | -14.57 | -10.68 | -9.43  | -7.52  | -6.29  |
|           |          | -5.93  | -2.29  | -0.86  | 0.00   | 0.00   |
|           |          | -0.76  | -1.93  | -2.75  | -3.67  | -4.25  |
|           |          | -5.51  | -6.00  | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |          | -15.00 |        |        |        |        |
| z Schicht | DA- Damm | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |          | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |          | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |          | -14.93 | -14.93 | -14.93 | -14.93 | -12.94 |
|           |          | -12.37 | -12.37 | -12.37 | -12.37 | -12.37 |
|           |          | -12.37 | -9.87  | -9.87  | -9.87  | -9.87  |
|           |          | -9.87  | -9.87  | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |          | -15.00 |        |        |        |        |
| z Schicht | GE1      | -37.50 | -35.48 | -34.36 | -33.09 | -32.05 |
|           |          | -31.00 | -30.70 | -29.60 | -28.00 | -27.56 |
|           |          | -25.00 | -24.33 | -24.00 | -23.77 | -20.79 |
|           |          | -20.50 | -17.56 | -17.12 | -16.44 | -16.00 |
|           |          | -15.87 | -14.53 | -14.00 | -13.73 | -13.00 |
|           |          | -12.72 | -12.30 | -12.00 | -11.69 | -11.50 |
|           |          | -11.14 | -11.00 | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |          | -15.00 |        |        |        |        |



**Bestimmung der Sicherheit nach Krey-Bishop**

Gleitkreis mit Iteration des Mittelpunktes:

Startpunkt:  $x_M = 23.50$  m,  $z_M = 8.00$  m, $\Delta x = 1.00$  m,  $\Delta z = 1.00$  m,mit Iteration des Radius:  $\Delta R = 1.00$  m ab  $R = 24.60$  m**Lastfallkomb. G**Gleitkörper von  $x = -4.06$  bis  $24.45$  mGleitkreis:  $x_M = 21.00$  m,  $z_M = 19.13$  m,  $R = 31.54$  m**Bestimmung der Lamellen-Anteile**

| $x_M$ | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c                    | $\vartheta$ |
|-------|-------------|-------------------|---------|--------------------|-----------|----------------------|-------------|
| [m]   | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]      |
| -4.03 | 0.06        | 0.06              | 0.00    | 0.00               | 35.00     | 2.0                  | -52.52      |
| -3.88 | 0.25        | 1.32              | 1.62    | 0.00               | 35.00     | 2.0                  | -52.06      |
| -3.63 | 0.25        | 2.91              | 1.62    | 0.00               | 35.00     | 2.0                  | -51.33      |
| -3.38 | 0.25        | 4.45              | 1.62    | 0.00               | 35.00     | 2.0                  | -50.61      |
| -3.13 | 0.25        | 5.95              | 1.62    | 0.00               | 35.00     | 2.0                  | -49.90      |
| -2.88 | 0.25        | 7.42              | 1.62    | 0.00               | 35.00     | 2.0                  | -49.20      |
| -2.63 | 0.25        | 8.85              | 1.62    | 0.00               | 35.00     | 2.0                  | -48.51      |
| -2.37 | 0.25        | 10.24             | 1.62    | 0.00               | 35.00     | 2.0                  | -47.83      |
| -2.12 | 0.25        | 11.61             | 1.62    | 0.00               | 35.00     | 2.0                  | -47.16      |
| -1.87 | 0.25        | 12.94             | 1.62    | 0.00               | 35.00     | 2.0                  | -46.49      |
| -1.62 | 0.25        | 14.24             | 1.62    | 0.00               | 35.00     | 2.0                  | -45.84      |
| -1.38 | 0.25        | 15.51             | 1.62    | 0.00               | 35.00     | 2.0                  | -45.19      |
| -1.12 | 0.25        | 16.76             | 1.62    | 0.00               | 35.00     | 2.0                  | -44.55      |
| -0.88 | 0.25        | 17.98             | 1.62    | 0.00               | 35.00     | 2.0                  | -43.91      |
| -0.63 | 0.25        | 19.17             | 1.62    | 0.00               | 35.00     | 2.0                  | -43.29      |
| -0.38 | 0.25        | 20.33             | 1.62    | 0.00               | 35.00     | 2.0                  | -42.67      |
| -0.13 | 0.25        | 21.47             | 1.62    | 0.00               | 35.00     | 2.0                  | -42.05      |
| 0.13  | 0.25        | 22.27             | 0.00    | 0.16               | 35.00     | 2.0                  | -41.44      |
| 0.38  | 0.25        | 22.74             | 0.00    | 0.47               | 35.00     | 2.0                  | -40.84      |
| 0.63  | 0.25        | 23.19             | 0.00    | 0.78               | 35.00     | 2.0                  | -40.24      |
| 0.88  | 0.25        | 23.61             | 0.00    | 1.09               | 35.00     | 2.0                  | -39.65      |
| 1.12  | 0.25        | 24.01             | 0.00    | 1.41               | 35.00     | 2.0                  | -39.06      |
| 1.38  | 0.25        | 24.39             | 0.00    | 1.72               | 35.00     | 2.0                  | -38.48      |
| 1.62  | 0.25        | 24.75             | 0.00    | 2.03               | 35.00     | 2.0                  | -37.90      |
| 1.87  | 0.25        | 25.08             | 0.00    | 2.34               | 35.00     | 2.0                  | -37.33      |
| 2.12  | 0.25        | 25.40             | 0.00    | 2.66               | 35.00     | 2.0                  | -36.76      |
| 2.37  | 0.25        | 25.70             | 0.00    | 2.97               | 35.00     | 2.0                  | -36.19      |
| 2.63  | 0.25        | 25.98             | 0.00    | 3.28               | 35.00     | 2.0                  | -35.63      |
| 2.88  | 0.25        | 26.24             | 0.00    | 3.59               | 35.00     | 2.0                  | -35.08      |
| 3.13  | 0.25        | 26.49             | 0.00    | 3.91               | 35.00     | 2.0                  | -34.52      |
| 3.38  | 0.25        | 26.71             | 0.00    | 4.22               | 35.00     | 2.0                  | -33.97      |
| 3.63  | 0.25        | 26.92             | 0.00    | 4.53               | 35.00     | 2.0                  | -33.43      |
| 3.88  | 0.25        | 27.11             | 0.00    | 4.84               | 35.00     | 2.0                  | -32.89      |
| 4.13  | 0.25        | 27.29             | 0.00    | 5.16               | 35.00     | 2.0                  | -32.35      |
| 4.38  | 0.25        | 27.45             | 0.00    | 5.47               | 35.00     | 2.0                  | -31.81      |
| 4.63  | 0.25        | 27.59             | 0.00    | 5.78               | 35.00     | 2.0                  | -31.28      |
| 4.88  | 0.25        | 27.72             | 0.00    | 6.09               | 35.00     | 2.0                  | -30.75      |
| 5.13  | 0.25        | 27.83             | 0.00    | 6.41               | 35.00     | 2.0                  | -30.22      |
| 5.38  | 0.25        | 27.92             | 0.00    | 6.72               | 35.00     | 2.0                  | -29.70      |
| 5.63  | 0.25        | 28.00             | 0.00    | 7.03               | 35.00     | 2.0                  | -29.18      |
| 5.88  | 0.25        | 28.07             | 0.00    | 7.34               | 35.00     | 2.0                  | -28.66      |
| 6.13  | 0.25        | 28.12             | 0.00    | 7.66               | 35.00     | 2.0                  | -28.14      |
| 6.38  | 0.25        | 28.16             | 0.00    | 7.97               | 35.00     | 2.0                  | -27.63      |
| 6.63  | 0.25        | 28.18             | 0.00    | 8.28               | 35.00     | 2.0                  | -27.11      |
| 6.88  | 0.25        | 28.19             | 0.00    | 8.59               | 35.00     | 2.0                  | -26.61      |
| 7.13  | 0.25        | 28.18             | 0.00    | 8.91               | 35.00     | 2.0                  | -26.10      |
| 7.38  | 0.25        | 28.16             | 0.00    | 9.22               | 35.00     | 2.0                  | -25.59      |

|                                         |             |                   |         |                    |           |                      |             |   |
|-----------------------------------------|-------------|-------------------|---------|--------------------|-----------|----------------------|-------------|---|
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| Programm DC-Böschung/Win Version 24.2.0 |             |                   |         |                    |           |                      |             |   |
| D-W_LFK3                                |             |                   |         |                    |           |                      | Lastfall    | G |
|                                         |             |                   |         |                    |           |                      |             |   |
| $x_M$                                   | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c                    | $\vartheta$ |   |
| [m]                                     | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]      |   |
| 7.63                                    | 0.25        | 28.13             | 0.00    | 9.53               | 35.00     | 2.0                  | -25.09      |   |
| 7.88                                    | 0.25        | 28.08             | 0.00    | 9.84               | 35.00     | 2.0                  | -24.59      |   |
| 8.13                                    | 0.25        | 28.02             | 0.00    | 10.16              | 35.00     | 2.0                  | -24.09      |   |
| 8.38                                    | 0.25        | 27.95             | 0.00    | 10.47              | 35.00     | 2.0                  | -23.60      |   |
| 8.63                                    | 0.25        | 27.86             | 0.00    | 10.78              | 35.00     | 0.0                  | -23.10      |   |
| 8.88                                    | 0.25        | 27.75             | 0.00    | 11.09              | 35.00     | 0.0                  | -22.61      |   |
| 9.13                                    | 0.25        | 27.63             | 0.00    | 11.41              | 35.00     | 0.0                  | -22.12      |   |
| 9.38                                    | 0.25        | 27.49             | 0.00    | 11.72              | 35.00     | 0.0                  | -21.63      |   |
| 9.63                                    | 0.25        | 27.34             | 0.00    | 12.03              | 35.00     | 0.0                  | -21.14      |   |
| 9.88                                    | 0.25        | 27.18             | 0.00    | 12.34              | 35.00     | 0.0                  | -20.65      |   |
| 10.13                                   | 0.25        | 27.01             | 0.00    | 12.66              | 35.00     | 0.0                  | -20.17      |   |
| 10.38                                   | 0.25        | 26.83             | 0.00    | 12.97              | 35.00     | 0.0                  | -19.69      |   |
| 10.63                                   | 0.25        | 26.63             | 0.00    | 13.28              | 35.00     | 0.0                  | -19.21      |   |
| 10.88                                   | 0.25        | 26.43             | 0.00    | 13.59              | 35.00     | 0.0                  | -18.72      |   |
| 11.13                                   | 0.25        | 26.21             | 0.00    | 13.91              | 35.00     | 0.0                  | -18.25      |   |
| 11.38                                   | 0.25        | 25.98             | 0.00    | 14.22              | 35.00     | 0.0                  | -17.77      |   |
| 11.63                                   | 0.25        | 25.74             | 0.00    | 14.53              | 35.00     | 0.0                  | -17.29      |   |
| 11.88                                   | 0.25        | 25.49             | 0.00    | 14.84              | 33.00     | 4.0                  | -16.82      |   |
| 12.13                                   | 0.25        | 25.23             | 0.00    | 15.16              | 33.00     | 4.0                  | -16.34      |   |
| 12.38                                   | 0.25        | 24.96             | 0.00    | 15.47              | 33.00     | 4.0                  | -15.87      |   |
| 12.63                                   | 0.25        | 24.67             | 0.00    | 15.78              | 33.00     | 4.0                  | -15.40      |   |
| 12.88                                   | 0.25        | 24.38             | 0.00    | 16.09              | 33.00     | 4.0                  | -14.93      |   |
| 13.13                                   | 0.25        | 24.07             | 0.00    | 16.41              | 33.00     | 4.0                  | -14.46      |   |
| 13.38                                   | 0.25        | 23.76             | 0.00    | 16.72              | 33.00     | 4.0                  | -13.99      |   |
| 13.63                                   | 0.25        | 23.43             | 0.00    | 17.03              | 33.00     | 4.0                  | -13.52      |   |
| 13.88                                   | 0.25        | 23.09             | 0.00    | 17.34              | 33.00     | 4.0                  | -13.06      |   |
| 14.13                                   | 0.25        | 22.74             | 0.00    | 17.66              | 33.00     | 4.0                  | -12.59      |   |
| 14.38                                   | 0.25        | 22.39             | 0.00    | 17.97              | 33.00     | 4.0                  | -12.13      |   |
| 14.63                                   | 0.25        | 22.02             | 0.00    | 18.28              | 33.00     | 4.0                  | -11.66      |   |
| 14.88                                   | 0.25        | 21.64             | 0.00    | 18.59              | 33.00     | 4.0                  | -11.20      |   |
| 15.13                                   | 0.25        | 21.25             | 0.00    | 18.91              | 33.00     | 4.0                  | -10.74      |   |
| 15.38                                   | 0.25        | 20.85             | 0.00    | 19.22              | 33.00     | 4.0                  | -10.27      |   |
| 15.63                                   | 0.25        | 20.44             | 0.00    | 19.53              | 33.00     | 4.0                  | -9.81       |   |
| 15.88                                   | 0.25        | 20.02             | 0.00    | 19.84              | 33.00     | 4.0                  | -9.35       |   |
| 16.12                                   | 0.25        | 19.59             | 0.00    | 20.16              | 33.00     | 4.0                  | -8.89       |   |
| 16.37                                   | 0.25        | 19.16             | 0.00    | 20.47              | 33.00     | 4.0                  | -8.43       |   |
| 16.62                                   | 0.25        | 18.71             | 0.00    | 20.78              | 33.00     | 4.0                  | -7.97       |   |
| 16.87                                   | 0.25        | 18.25             | 0.00    | 21.09              | 33.00     | 4.0                  | -7.52       |   |
| 17.12                                   | 0.25        | 17.78             | 0.00    | 21.41              | 33.00     | 4.0                  | -7.06       |   |
| 17.37                                   | 0.25        | 17.30             | 0.00    | 21.72              | 33.00     | 4.0                  | -6.60       |   |
| 17.62                                   | 0.25        | 16.81             | 0.00    | 22.03              | 33.00     | 4.0                  | -6.14       |   |
| 17.87                                   | 0.25        | 16.31             | 0.00    | 22.34              | 33.00     | 4.0                  | -5.69       |   |
| 18.12                                   | 0.25        | 15.80             | 0.00    | 22.66              | 33.00     | 4.0                  | -5.23       |   |
| 18.37                                   | 0.25        | 15.28             | 0.00    | 22.97              | 33.00     | 4.0                  | -4.77       |   |
| 18.62                                   | 0.25        | 14.76             | 0.00    | 23.28              | 33.00     | 4.0                  | -4.32       |   |
| 18.87                                   | 0.25        | 14.22             | 0.00    | 23.59              | 33.00     | 4.0                  | -3.86       |   |
| 19.12                                   | 0.25        | 13.67             | 0.00    | 23.91              | 33.00     | 4.0                  | -3.41       |   |
| 19.37                                   | 0.25        | 13.11             | 0.00    | 24.22              | 33.00     | 4.0                  | -2.95       |   |
| 19.62                                   | 0.25        | 12.55             | 0.00    | 24.53              | 33.00     | 4.0                  | -2.50       |   |
| 19.87                                   | 0.25        | 11.98             | 0.00    | 24.84              | 33.00     | 4.0                  | -2.04       |   |
| 20.12                                   | 0.25        | 11.41             | 0.00    | 25.16              | 33.00     | 4.0                  | -1.59       |   |
| 20.37                                   | 0.25        | 10.83             | 0.00    | 25.47              | 33.00     | 4.0                  | -1.14       |   |
| 20.63                                   | 0.25        | 10.24             | 0.00    | 25.78              | 33.00     | 4.0                  | -0.68       |   |
| 20.88                                   | 0.25        | 9.64              | 0.00    | 26.09              | 33.00     | 4.0                  | -0.23       |   |
| 21.13                                   | 0.25        | 9.03              | 0.00    | 26.41              | 33.00     | 4.0                  | 0.23        |   |
| 21.38                                   | 0.25        | 8.41              | 0.00    | 26.72              | 33.00     | 4.0                  | 0.68        |   |
| 21.63                                   | 0.25        | 7.78              | 0.00    | 27.03              | 33.00     | 4.0                  | 1.14        |   |
| 21.88                                   | 0.25        | 7.14              | 0.00    | 27.34              | 33.00     | 4.0                  | 1.59        |   |



|                                         |             |                   |         |                    |           |                      |                            |   |
|-----------------------------------------|-------------|-------------------|---------|--------------------|-----------|----------------------|----------------------------|---|
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| Programm DC-Böschung/Win Version 24.2.0 |             |                   |         |                    |           |                      |                            |   |
| D-W_LFK3                                |             |                   |         |                    |           |                      | Lastfall                   | G |
|                                         |             |                   |         |                    |           |                      |                            |   |
| $x_M$                                   | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c                    | $\vartheta$                |   |
| [m]                                     | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]                     |   |
| 22.13                                   | 0.25        | 6.49              | 0.00    | 27.66              | 33.00     | 4.0                  | 2.04                       |   |
| 22.38                                   | 0.25        | 5.84              | 0.00    | 27.97              | 33.00     | 4.0                  | 2.50                       |   |
| 22.63                                   | 0.25        | 5.17              | 0.00    | 28.28              | 33.00     | 4.0                  | 2.95                       |   |
| 22.88                                   | 0.25        | 4.49              | 0.00    | 28.59              | 33.00     | 4.0                  | 3.41                       |   |
| 23.13                                   | 0.25        | 3.81              | 0.00    | 28.91              | 33.00     | 4.0                  | 3.86                       |   |
| 23.38                                   | 0.25        | 3.11              | 0.00    | 29.22              | 33.00     | 4.0                  | 4.32                       |   |
| 23.63                                   | 0.25        | 2.40              | 0.00    | 29.53              | 33.00     | 4.0                  | 4.77                       |   |
| 23.88                                   | 0.25        | 1.69              | 0.00    | 29.84              | 33.00     | 4.0                  | 5.23                       |   |
| 24.13                                   | 0.25        | 0.96              | 0.00    | 30.16              | 33.00     | 4.0                  | 5.69                       |   |
| 24.35                                   | 0.20        | 0.24              | 0.00    | 24.45              | 33.00     | 4.0                  | 6.10                       |   |
| $x_M$                                   |             |                   |         |                    |           | R*T <sub>i</sub>     | R*G*<br>sin( $\vartheta$ ) |   |
| [m]                                     |             |                   |         |                    |           | [kNm/m]              | [kNm/m]                    |   |
| -4.03                                   |             |                   |         |                    |           | 4.25                 | 1.43                       |   |
| -3.88                                   |             |                   |         |                    |           | 71.76                | 73.32                      |   |
| -3.63                                   |             |                   |         |                    |           | 101.61               | 111.56                     |   |
| -3.38                                   |             |                   |         |                    |           | 130.04               | 148.02                     |   |
| -3.13                                   |             |                   |         |                    |           | 157.18               | 182.77                     |   |
| -2.88                                   |             |                   |         |                    |           | 183.11               | 215.88                     |   |
| -2.63                                   |             |                   |         |                    |           | 207.92               | 247.42                     |   |
| -2.37                                   |             |                   |         |                    |           | 231.69               | 277.44                     |   |
| -2.12                                   |             |                   |         |                    |           | 254.49               | 306.02                     |   |
| -1.87                                   |             |                   |         |                    |           | 276.37               | 333.18                     |   |
| -1.62                                   |             |                   |         |                    |           | 297.41               | 359.00                     |   |
| -1.38                                   |             |                   |         |                    |           | 317.64               | 383.51                     |   |
| -1.12                                   |             |                   |         |                    |           | 337.12               | 406.75                     |   |
| -0.88                                   |             |                   |         |                    |           | 355.90               | 428.78                     |   |
| -0.63                                   |             |                   |         |                    |           | 374.00               | 449.62                     |   |
| -0.38                                   |             |                   |         |                    |           | 391.48               | 469.32                     |   |
| -0.13                                   |             |                   |         |                    |           | 408.36               | 487.91                     |   |
| 0.13                                    |             |                   |         |                    |           | 394.32               | 468.24                     |   |
| 0.38                                    |             |                   |         |                    |           | 405.00               | 478.71                     |   |
| 0.63                                    |             |                   |         |                    |           | 415.23               | 488.32                     |   |
| 0.88                                    |             |                   |         |                    |           | 425.02               | 497.11                     |   |
| 1.12                                    |             |                   |         |                    |           | 434.41               | 505.10                     |   |
| 1.38                                    |             |                   |         |                    |           | 443.41               | 512.32                     |   |
| 1.62                                    |             |                   |         |                    |           | 452.03               | 518.79                     |   |
| 1.87                                    |             |                   |         |                    |           | 460.29               | 524.54                     |   |
| 2.12                                    |             |                   |         |                    |           | 468.22               | 529.59                     |   |
| 2.37                                    |             |                   |         |                    |           | 475.81               | 533.97                     |   |
| 2.63                                    |             |                   |         |                    |           | 483.09               | 537.70                     |   |
| 2.88                                    |             |                   |         |                    |           | 490.06               | 540.79                     |   |
| 3.13                                    |             |                   |         |                    |           | 496.75               | 543.28                     |   |
| 3.38                                    |             |                   |         |                    |           | 503.15               | 545.17                     |   |
| 3.63                                    |             |                   |         |                    |           | 509.29               | 546.49                     |   |
| 3.88                                    |             |                   |         |                    |           | 515.16               | 547.27                     |   |
| 4.13                                    |             |                   |         |                    |           | 520.78               | 547.50                     |   |
| 4.38                                    |             |                   |         |                    |           | 526.16               | 547.22                     |   |
| 4.63                                    |             |                   |         |                    |           | 531.30               | 546.44                     |   |
| 4.88                                    |             |                   |         |                    |           | 536.22               | 545.17                     |   |
| 5.13                                    |             |                   |         |                    |           | 540.92               | 543.44                     |   |
| 5.38                                    |             |                   |         |                    |           | 545.40               | 541.26                     |   |
| 5.63                                    |             |                   |         |                    |           | 549.67               | 538.64                     |   |
| 5.88                                    |             |                   |         |                    |           | 553.75               | 535.60                     |   |
| 6.13                                    |             |                   |         |                    |           | 557.62               | 532.15                     |   |
| 6.38                                    |             |                   |         |                    |           | 561.31               | 528.31                     |   |
| 6.63                                    |             |                   |         |                    |           | 564.81               | 524.09                     |   |

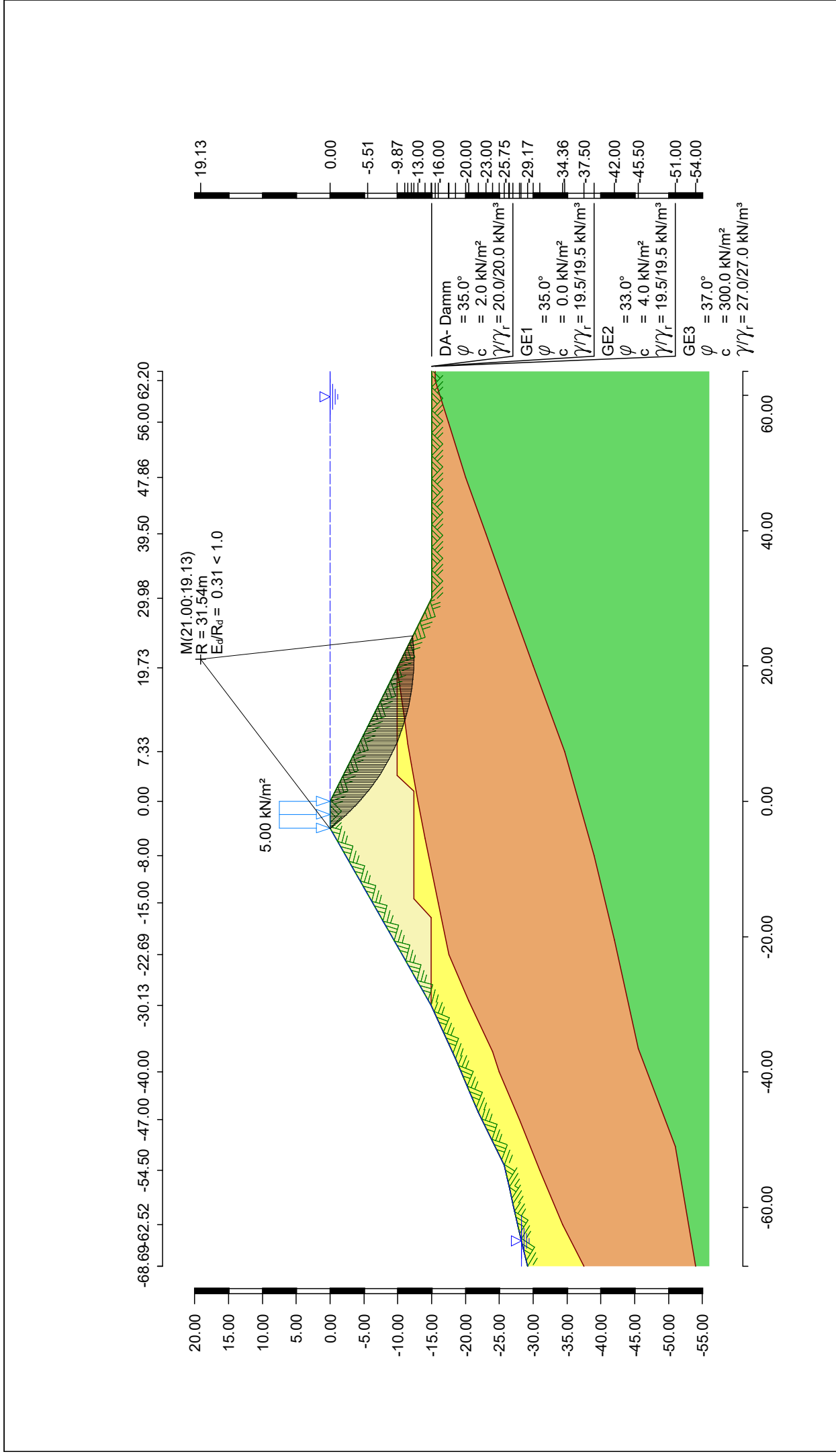
|                                         |  |               |                                 |   |
|-----------------------------------------|--|---------------|---------------------------------|---|
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|                                         |  |               |                                 |   |
| Programm DC-Böschung/Win Version 24.2.0 |  |               | Lastfall                        | G |
| D-W_LFK3                                |  |               |                                 |   |
| $x_M$                                   |  | $R \cdot T_i$ | $R \cdot G \cdot \sin(\varphi)$ |   |
| [m]                                     |  | [kNm/m]       | [kNm/m]                         |   |
| 6.88                                    |  | 568.13        | 519.50                          |   |
| 7.13                                    |  | 571.28        | 514.56                          |   |
| 7.38                                    |  | 574.26        | 509.29                          |   |
| 7.63                                    |  | 577.06        | 503.68                          |   |
| 7.88                                    |  | 579.70        | 497.76                          |   |
| 8.13                                    |  | 582.19        | 491.54                          |   |
| 8.38                                    |  | 584.51        | 485.02                          |   |
| 8.63                                    |  | 575.99        | 478.19                          |   |
| 8.88                                    |  | 577.85        | 470.98                          |   |
| 9.13                                    |  | 579.55        | 463.51                          |   |
| 9.38                                    |  | 581.12        | 455.81                          |   |
| 9.63                                    |  | 582.54        | 447.88                          |   |
| 9.88                                    |  | 583.83        | 439.73                          |   |
| 10.13                                   |  | 584.99        | 431.39                          |   |
| 10.38                                   |  | 586.02        | 422.84                          |   |
| 10.63                                   |  | 586.91        | 414.12                          |   |
| 10.88                                   |  | 587.68        | 405.22                          |   |
| 11.13                                   |  | 588.33        | 396.15                          |   |
| 11.38                                   |  | 588.85        | 386.92                          |   |
| 11.63                                   |  | 589.25        | 377.55                          |   |
| 11.88                                   |  | 569.68        | 368.05                          |   |
| 12.13                                   |  | 569.75        | 358.41                          |   |
| 12.38                                   |  | 569.71        | 348.66                          |   |
| 12.63                                   |  | 569.57        | 338.79                          |   |
| 12.88                                   |  | 569.31        | 328.82                          |   |
| 13.13                                   |  | 568.95        | 318.76                          |   |
| 13.38                                   |  | 568.49        | 308.61                          |   |
| 13.63                                   |  | 567.92        | 298.39                          |   |
| 13.88                                   |  | 567.25        | 288.10                          |   |
| 14.13                                   |  | 566.48        | 277.75                          |   |
| 14.38                                   |  | 565.61        | 267.35                          |   |
| 14.63                                   |  | 564.63        | 256.91                          |   |
| 14.88                                   |  | 563.56        | 246.43                          |   |
| 15.13                                   |  | 562.38        | 235.92                          |   |
| 15.38                                   |  | 561.11        | 225.39                          |   |
| 15.63                                   |  | 559.73        | 214.86                          |   |
| 15.88                                   |  | 558.25        | 204.32                          |   |
| 16.12                                   |  | 556.68        | 193.78                          |   |
| 16.37                                   |  | 555.01        | 183.26                          |   |
| 16.62                                   |  | 553.23        | 172.75                          |   |
| 16.87                                   |  | 551.36        | 162.28                          |   |
| 17.12                                   |  | 549.39        | 151.83                          |   |
| 17.37                                   |  | 547.32        | 141.43                          |   |
| 17.62                                   |  | 545.14        | 131.09                          |   |
| 17.87                                   |  | 542.87        | 120.79                          |   |
| 18.12                                   |  | 540.50        | 110.57                          |   |
| 18.37                                   |  | 538.03        | 100.41                          |   |
| 18.62                                   |  | 535.45        | 90.34                           |   |
| 18.87                                   |  | 532.78        | 80.35                           |   |
| 19.12                                   |  | 530.00        | 70.46                           |   |
| 19.37                                   |  | 527.12        | 60.66                           |   |
| 19.62                                   |  | 524.13        | 50.98                           |   |
| 19.87                                   |  | 521.16        | 41.42                           |   |
| 20.12                                   |  | 518.18        | 31.99                           |   |
| 20.37                                   |  | 515.09        | 22.68                           |   |
| 20.63                                   |  | 511.90        | 13.51                           |   |
| 20.88                                   |  | 508.60        | 4.47                            |   |
| 21.13                                   |  | 505.19        | -4.43                           |   |

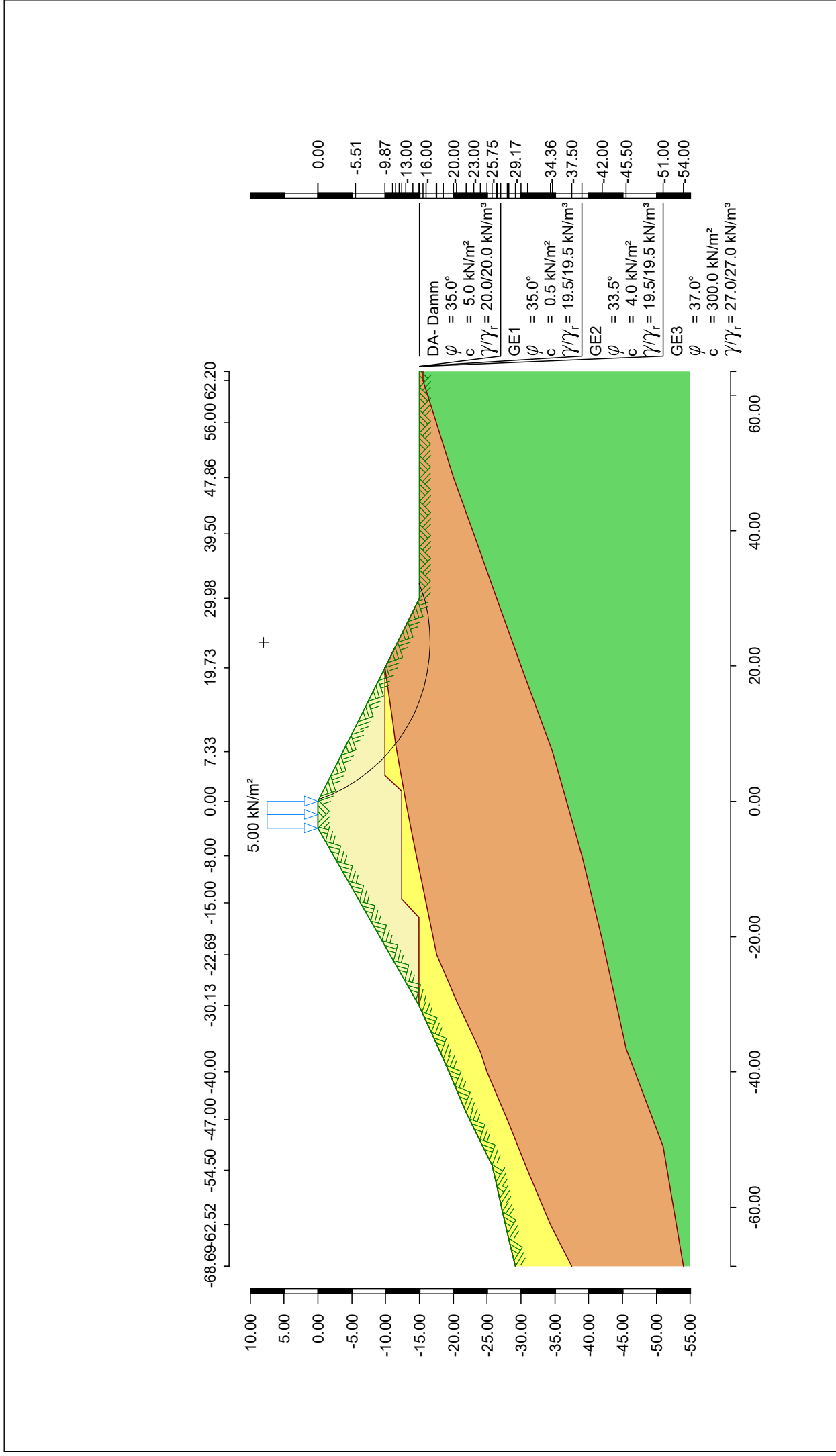
|                         |          |                          |
|-------------------------|----------|--------------------------|
| $x_M$                   | $R^*T_i$ | $R^*G^* \sin(\vartheta)$ |
| [m]                     | [kNm/m]  | [kNm/m]                  |
| 21.38                   | 501.67   | -13.17                   |
| 21.63                   | 498.04   | -21.76                   |
| 21.88                   | 494.30   | -30.17                   |
| 22.13                   | 490.45   | -38.42                   |
| 22.38                   | 486.48   | -46.48                   |
| 22.63                   | 482.40   | -54.36                   |
| 22.88                   | 478.20   | -62.03                   |
| 23.13                   | 473.88   | -69.51                   |
| 23.38                   | 469.44   | -76.78                   |
| 23.63                   | 464.88   | -83.82                   |
| 23.88                   | 460.19   | -90.65                   |
| 24.13                   | 455.38   | -97.24                   |
| 24.35                   | 362.26   | -82.72                   |
| Summen:                 | 56038.72 | 34289.78                 |
| <b>Wasserdruckkraft</b> |          | $M_{abtr.}$              |
| [kN/m]                  |          | [kNm/m]                  |
| 622.73                  |          | -16984.90                |

|              |                             |
|--------------|-----------------------------|
| Einwirkungen | $E_d = 17304.88 \text{ kN}$ |
| Widerstände  | $R_d = 56038.72 \text{ kN}$ |

$$E_d/R_d = 0.31 < 1.0$$

**\*\*\* Nachweis erfüllt \*\*\***





Eingabedatei: M:\Projekte\2023\

23020\_P-BL-S-SK-K\_Speicher-Bodensee\_Kronplatz\Berechnungen\D-W\_LFK4a.dbb

## Berechnung nach: NTC 2018 (Eurocode 7)

Berechnung mit Nachweisverfahren 1

Kombination mit Teilsicherheitsbeiwerten der Gruppen A2 + M2 + R2

| Schichtdaten                       |                      | DA- Damm<br>GE3    | GE1   | GE2   |
|------------------------------------|----------------------|--------------------|-------|-------|
| Innere Reibung $\text{cal } \phi'$ | [Grad]               | 35.00<br>37.00     | 35.00 | 33.50 |
| Kohäsion $\text{cal } c'$          | [kN/m <sup>2</sup> ] | 5.0                | 0.5   | 4.0   |
| Wichte Boden                       | [kN/m <sup>3</sup> ] | 300.0<br>20.0      | 19.5  | 19.5  |
| Wichte wassergesättigt             | [kN/m <sup>3</sup> ] | 27.0<br>20.0       | 19.5  | 19.5  |
| Wichte unter Auftrieb              | [kN/m <sup>3</sup> ] | 27.0<br>10.0       | 9.5   | 9.5   |
| Erdbebenfaktor                     | [-]                  | 17.0<br>1.0<br>1.0 | 1.0   | 1.0   |

### Geländeverlauf und Schichten

|           |           |        |        |        |        |        |
|-----------|-----------|--------|--------|--------|--------|--------|
| x [m]     |           | -68.69 | -64.72 | -62.53 | -59.50 | -57.00 |
|           |           | -54.50 | -53.74 | -51.00 | -47.00 | -45.97 |
|           |           | -40.00 | -38.00 | -37.00 | -36.50 | -30.12 |
|           |           | -29.50 | -22.69 | -20.50 | -17.16 | -15.00 |
|           |           | -14.37 | -8.00  | -5.50  | -4.00  | 0.00   |
|           |           | 1.52   | 3.86   | 5.50   | 7.33   | 8.50   |
|           |           | 11.03  | 12.00  | 19.73  | 20.00  | 29.98  |
|           |           | 30.00  | 39.50  | 47.86  | 56.00  | 62.20  |
|           |           | 63.50  |        |        |        |        |
|           | z Gelände | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |           | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |           | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |           | -14.57 | -10.68 | -9.43  | -7.52  | -6.29  |
| z Schicht | DA- Damm  | -5.93  | -2.29  | -0.86  | 0.00   | 0.00   |
|           |           | -0.76  | -1.93  | -2.75  | -3.67  | -4.25  |
|           |           | -5.51  | -6.00  | -9.87  | -10.00 | -14.99 |
|           |           | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |           | -15.00 |        |        |        |        |
|           |           | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |           | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |           | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |           | -14.93 | -14.93 | -14.93 | -14.93 | -12.94 |
|           |           | -12.37 | -12.37 | -12.37 | -12.37 | -12.37 |
|           |           | -12.37 | -9.87  | -9.87  | -9.87  | -9.87  |
|           |           | -9.87  | -9.87  | -9.87  | -10.00 | -14.99 |
|           |           | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |           | -15.00 |        |        |        |        |
| z Schicht | GE1       | -37.50 | -35.48 | -34.36 | -33.09 | -32.05 |
|           |           | -31.00 | -30.70 | -29.60 | -28.00 | -27.56 |
|           |           | -25.00 | -24.33 | -24.00 | -23.77 | -20.79 |
|           |           | -20.50 | -17.56 | -17.12 | -16.44 | -16.00 |
|           |           | -15.87 | -14.53 | -14.00 | -13.73 | -13.00 |
|           |           | -12.72 | -12.30 | -12.00 | -11.69 | -11.50 |
|           |           | -11.14 | -11.00 | -9.87  | -10.00 | -14.99 |
|           |           | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |           |        |        |        |        |        |

|                                                                             |                                   |                |                |                |          |          |                |                |                |      |
|-----------------------------------------------------------------------------|-----------------------------------|----------------|----------------|----------------|----------|----------|----------------|----------------|----------------|------|
|                                                                             |                                   |                |                |                |          |          | Seite          | 3              |                |      |
| Programm DC-Böschung/Win Version 24.2.0                                     |                                   |                |                |                |          |          | Lastfall       | G              |                |      |
| D-W_LFK4                                                                    |                                   |                |                |                |          |          |                |                |                |      |
| z Schicht                                                                   | GE2                               | -15.00         |                |                |          |          |                |                |                |      |
|                                                                             |                                   | -54.00         | -53.33         | -52.95         | -52.44   | -52.02   |                |                |                |      |
|                                                                             |                                   | -51.59         | -51.46         | -51.00         | -49.48   | -49.09   |                |                |                |      |
|                                                                             |                                   | -46.83         | -46.07         | -45.69         | -45.50   | -44.11   |                |                |                |      |
|                                                                             |                                   | -43.97         | -42.48         | -42.00         | -41.20   | -40.68   |                |                |                |      |
|                                                                             |                                   | -40.53         | -39.00         | -38.29         | -37.86   | -36.72   |                |                |                |      |
|                                                                             |                                   | -36.29         | -35.62         | -35.15         | -34.63   | -34.20   |                |                |                |      |
|                                                                             |                                   | -33.28         | -32.92         | -30.10         | -30.00   | -26.39   |                |                |                |      |
|                                                                             |                                   | -26.38         | -23.00         | -20.00         | -17.50   | -15.49   |                |                |                |      |
|                                                                             |                                   | -15.49         |                |                |          |          |                |                |                |      |
|                                                                             |                                   | z Schicht      | GE3            | -1000.00       | -1000.00 | -1000.00 | -1000.00       | -1000.00       |                |      |
|                                                                             |                                   |                |                | -1000.00       | -1000.00 | -1000.00 | -1000.00       | -1000.00       |                |      |
| -1000.00                                                                    | -1000.00                          |                |                | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
| -1000.00                                                                    | -1000.00                          |                |                | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
| -1000.00                                                                    | -1000.00                          |                |                | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
| -1000.00                                                                    | -1000.00                          |                |                | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
| -1000.00                                                                    | -1000.00                          |                |                | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
| -1000.00                                                                    | -1000.00                          |                |                | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
| -1000.00                                                                    | -1000.00                          |                |                | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
| -1000.00                                                                    | -1000.00                          |                |                | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
| -1000.00                                                                    | -1000.00                          |                |                | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
| -1000.00                                                                    | -1000.00                          |                |                | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
| Streckenlasten                                                              |                                   |                |                |                |          |          |                |                |                |      |
| Alle Lasten beziehen sich auf 1 m Länge                                     |                                   |                |                |                |          |          |                |                |                |      |
| LF-Komb.                                                                    | q                                 | x <sub>A</sub> | x <sub>E</sub> | z <sub>Q</sub> | γ        | ψ        |                |                |                |      |
| G    Q                                                                      | 5.0                               | -4.0           | 0.0            | 0.00           | 1.30     | 1.00     |                |                |                |      |
| Berechnung mit Erdbebenlasten nach Eurocode 8, BS-E                         |                                   |                |                |                |          |          |                |                |                |      |
| k <sub>h</sub> /S = a <sub>g</sub> /g = 0.038                               |                                   |                |                |                |          |          |                |                |                |      |
| k <sub>v</sub> /S = a <sub>vg</sub> /g = 0.019                              |                                   |                |                |                |          |          |                |                |                |      |
| Lamellenbreiten                                                             |                                   |                |                |                |          |          |                |                |                |      |
| Von x [m]                                                                   |                                   | bis x [m]      |                | Breite [m]     |          |          |                |                |                |      |
| -10000.00                                                                   |                                   | 10000.00       |                | 0.25           |          |          |                |                |                |      |
| Teilsicherheitsbeiwerte (GEO) für NW-Verf. 1                                |                                   |                |                |                |          |          |                |                |                |      |
| γ-                                                                          | G                                 | Q              | W              | E              | φ        | c        | c <sub>u</sub> | R <sub>a</sub> | R <sub>b</sub> | R    |
| BS-E                                                                        | 1.00                              | 1.00           | 1.00           | 1.00           | 1.00     | 1.00     | 1.00           | 1.00           | 1.00           | 1.20 |
| γ-                                                                          | Teilsicherheitsbeiwert für...     |                |                |                |          |          |                |                |                |      |
| G                                                                           | Ständige Lasten                   |                |                |                |          |          |                |                |                |      |
| Q                                                                           | Veränderliche Lasten              |                |                |                |          |          |                |                |                |      |
| W                                                                           | Wasserdruck                       |                |                |                |          |          |                |                |                |      |
| E                                                                           | Erdbeben                          |                |                |                |          |          |                |                |                |      |
| φ                                                                           | Reibungsbeiwert tan(φ)            |                |                |                |          |          |                |                |                |      |
| c                                                                           | Kohäsion c                        |                |                |                |          |          |                |                |                |      |
| c <sub>u</sub>                                                              | Kohäsion undränirt c <sub>u</sub> |                |                |                |          |          |                |                |                |      |
| R <sub>a</sub>                                                              | Anker                             |                |                |                |          |          |                |                |                |      |
| R <sub>b</sub>                                                              | Bauteile                          |                |                |                |          |          |                |                |                |      |
| R                                                                           | Widerstände                       |                |                |                |          |          |                |                |                |      |
| Bestimmung der Sicherheit nach Krey-Bishop                                  |                                   |                |                |                |          |          |                |                |                |      |
| Gleitkreis mit Iteration des Mittelpunktes:                                 |                                   |                |                |                |          |          |                |                |                |      |
| Startpunkt: x <sub>M</sub> = 23.50 m, z <sub>M</sub> = 8.00 m,              |                                   |                |                |                |          |          |                |                |                |      |
| Δ x = 1.00 m, Δ z = 1.00 m,                                                 |                                   |                |                |                |          |          |                |                |                |      |
| mit Iteration des Radius: Δ R = 1.00 m ab R = 24.60 m                       |                                   |                |                |                |          |          |                |                |                |      |
| Lastfallkomb. G                                                             |                                   |                |                |                |          |          |                |                |                |      |
| Gleitkörper von x = 3.01 bis 29.99 m                                        |                                   |                |                |                |          |          |                |                |                |      |
| Gleitkreis: x <sub>M</sub> = 28.38 m, z <sub>M</sub> = 15.50 m, R = 30.54 m |                                   |                |                |                |          |          |                |                |                |      |

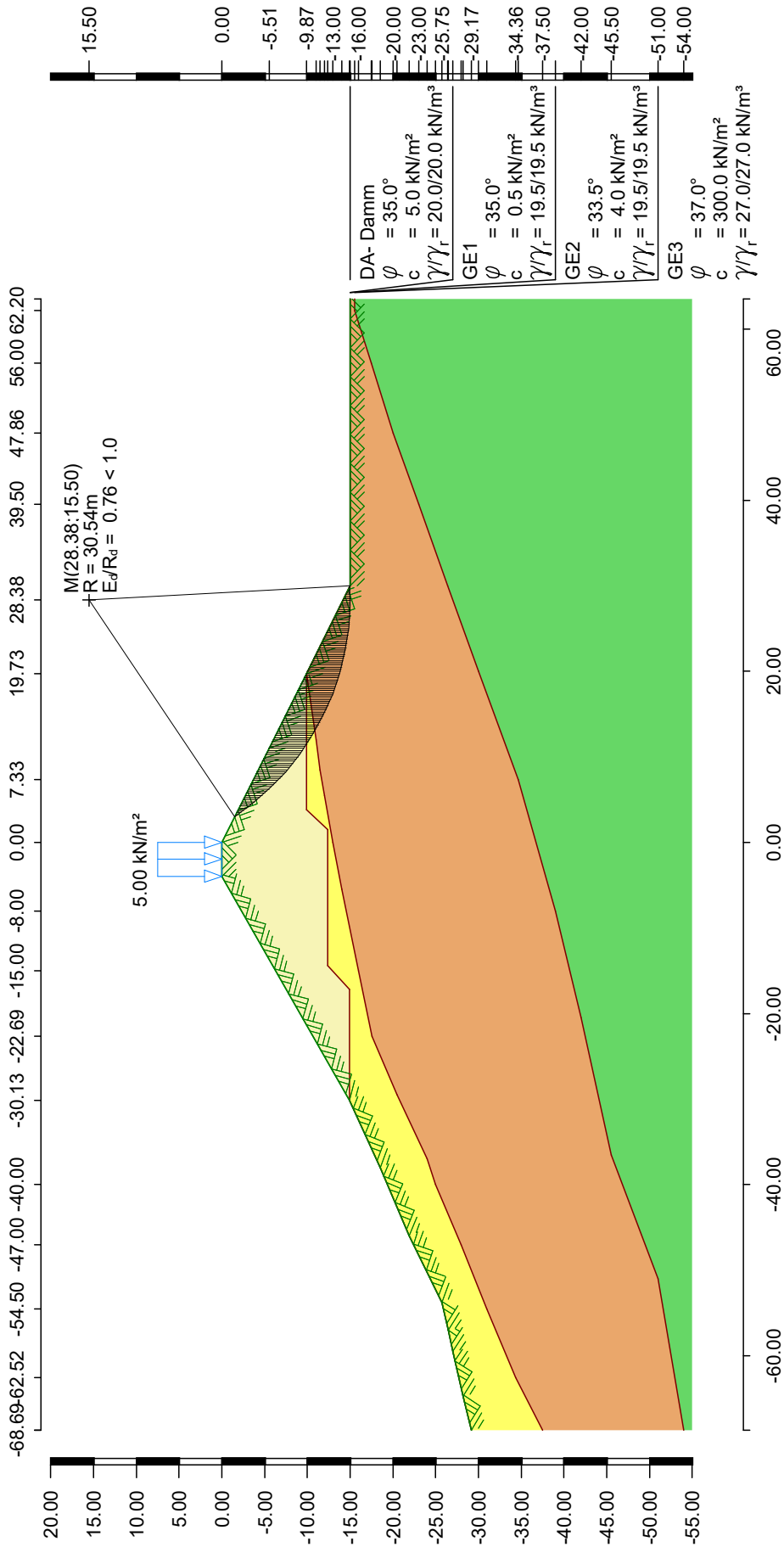
|                                                     |          |                   |         |                    |           |         |             |   |
|-----------------------------------------------------|----------|-------------------|---------|--------------------|-----------|---------|-------------|---|
|                                                     |          |                   |         |                    |           |         | Seite       | 4 |
| Programm DC-Böschung/Win Version 24.2.0<br>D-W_LFK4 |          |                   |         |                    |           |         | Lastfall    | G |
|                                                     |          |                   |         |                    |           |         |             |   |
| <b>Bestimmung der Lamellen-Anteile</b>              |          |                   |         |                    |           |         |             |   |
| $x_M$                                               | Breite   | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c       | $\vartheta$ |   |
| [m]                                                 | b<br>[m] | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m²] | [Grad]      |   |
| 3.13                                                | 0.24     | 0.58              | 0.00    | 0.00               | 35.00     | 5.0     | -55.76      |   |
| 3.38                                                | 0.25     | 1.76              | 0.00    | 0.00               | 35.00     | 5.0     | -54.95      |   |
| 3.63                                                | 0.25     | 2.89              | 0.00    | 0.00               | 35.00     | 5.0     | -54.14      |   |
| 3.88                                                | 0.25     | 3.97              | 0.00    | 0.00               | 35.00     | 5.0     | -53.34      |   |
| 4.13                                                | 0.25     | 5.00              | 0.00    | 0.00               | 35.00     | 5.0     | -52.57      |   |
| 4.38                                                | 0.25     | 5.99              | 0.00    | 0.00               | 35.00     | 5.0     | -51.80      |   |
| 4.63                                                | 0.25     | 6.93              | 0.00    | 0.00               | 35.00     | 5.0     | -51.05      |   |
| 4.88                                                | 0.25     | 7.83              | 0.00    | 0.00               | 35.00     | 5.0     | -50.31      |   |
| 5.13                                                | 0.25     | 8.69              | 0.00    | 0.00               | 35.00     | 5.0     | -49.58      |   |
| 5.38                                                | 0.25     | 9.52              | 0.00    | 0.00               | 35.00     | 5.0     | -48.86      |   |
| 5.63                                                | 0.25     | 10.31             | 0.00    | 0.00               | 35.00     | 5.0     | -48.15      |   |
| 5.88                                                | 0.25     | 11.06             | 0.00    | 0.00               | 35.00     | 5.0     | -47.46      |   |
| 6.13                                                | 0.25     | 11.78             | 0.00    | 0.00               | 35.00     | 5.0     | -46.77      |   |
| 6.38                                                | 0.25     | 12.47             | 0.00    | 0.00               | 35.00     | 5.0     | -46.09      |   |
| 6.63                                                | 0.25     | 13.13             | 0.00    | 0.00               | 35.00     | 5.0     | -45.41      |   |
| 6.88                                                | 0.25     | 13.76             | 0.00    | 0.00               | 35.00     | 5.0     | -44.75      |   |
| 7.13                                                | 0.25     | 14.36             | 0.00    | 0.00               | 35.00     | 5.0     | -44.09      |   |
| 7.38                                                | 0.25     | 14.93             | 0.00    | 0.00               | 35.00     | 5.0     | -43.44      |   |
| 7.63                                                | 0.25     | 15.47             | 0.00    | 0.00               | 35.00     | 5.0     | -42.80      |   |
| 7.88                                                | 0.25     | 15.99             | 0.00    | 0.00               | 35.00     | 5.0     | -42.16      |   |
| 8.13                                                | 0.25     | 16.49             | 0.00    | 0.00               | 35.00     | 5.0     | -41.53      |   |
| 8.38                                                | 0.25     | 16.96             | 0.00    | 0.00               | 35.00     | 5.0     | -40.91      |   |
| 8.63                                                | 0.25     | 17.40             | 0.00    | 0.00               | 35.00     | 5.0     | -40.29      |   |
| 8.88                                                | 0.25     | 17.83             | 0.00    | 0.00               | 35.00     | 5.0     | -39.68      |   |
| 9.13                                                | 0.25     | 18.23             | 0.00    | 0.00               | 35.00     | 5.0     | -39.07      |   |
| 9.38                                                | 0.25     | 18.61             | 0.00    | 0.00               | 35.00     | 5.0     | -38.47      |   |
| 9.63                                                | 0.25     | 18.97             | 0.00    | 0.00               | 35.00     | 5.0     | -37.88      |   |
| 9.88                                                | 0.25     | 19.30             | 0.00    | 0.00               | 35.00     | 5.0     | -37.28      |   |
| 10.13                                               | 0.25     | 19.62             | 0.00    | 0.00               | 35.00     | 5.0     | -36.70      |   |
| 10.38                                               | 0.25     | 19.92             | 0.00    | 0.00               | 35.00     | 5.0     | -36.11      |   |
| 10.63                                               | 0.25     | 20.19             | 0.00    | 0.00               | 35.00     | 5.0     | -35.54      |   |
| 10.88                                               | 0.25     | 20.45             | 0.00    | 0.00               | 35.00     | 5.0     | -34.96      |   |
| 11.13                                               | 0.25     | 20.69             | 0.00    | 0.00               | 35.00     | 5.0     | -34.39      |   |
| 11.38                                               | 0.25     | 20.91             | 0.00    | 0.00               | 35.00     | 0.5     | -33.82      |   |
| 11.63                                               | 0.25     | 21.10             | 0.00    | 0.00               | 35.00     | 0.5     | -33.26      |   |
| 11.88                                               | 0.25     | 21.26             | 0.00    | 0.00               | 35.00     | 0.5     | -32.70      |   |
| 12.13                                               | 0.25     | 21.41             | 0.00    | 0.00               | 35.00     | 0.5     | -32.15      |   |
| 12.38                                               | 0.25     | 21.54             | 0.00    | 0.00               | 35.00     | 0.5     | -31.60      |   |
| 12.63                                               | 0.25     | 21.66             | 0.00    | 0.00               | 35.00     | 0.5     | -31.05      |   |
| 12.88                                               | 0.25     | 21.76             | 0.00    | 0.00               | 35.00     | 0.5     | -30.50      |   |
| 13.13                                               | 0.25     | 21.85             | 0.00    | 0.00               | 33.50     | 4.0     | -29.96      |   |
| 13.38                                               | 0.25     | 21.92             | 0.00    | 0.00               | 33.50     | 4.0     | -29.42      |   |
| 13.63                                               | 0.25     | 21.97             | 0.00    | 0.00               | 33.50     | 4.0     | -28.88      |   |
| 13.88                                               | 0.25     | 22.01             | 0.00    | 0.00               | 33.50     | 4.0     | -28.35      |   |
| 14.13                                               | 0.25     | 22.04             | 0.00    | 0.00               | 33.50     | 4.0     | -27.81      |   |
| 14.38                                               | 0.25     | 22.05             | 0.00    | 0.00               | 33.50     | 4.0     | -27.29      |   |
| 14.63                                               | 0.25     | 22.04             | 0.00    | 0.00               | 33.50     | 4.0     | -26.76      |   |
| 14.88                                               | 0.25     | 22.03             | 0.00    | 0.00               | 33.50     | 4.0     | -26.23      |   |
| 15.13                                               | 0.25     | 22.00             | 0.00    | 0.00               | 33.50     | 4.0     | -25.71      |   |
| 15.38                                               | 0.25     | 21.95             | 0.00    | 0.00               | 33.50     | 4.0     | -25.19      |   |
| 15.63                                               | 0.25     | 21.89             | 0.00    | 0.00               | 33.50     | 4.0     | -24.68      |   |
| 15.88                                               | 0.25     | 21.82             | 0.00    | 0.00               | 33.50     | 4.0     | -24.16      |   |
| 16.12                                               | 0.25     | 21.74             | 0.00    | 0.00               | 33.50     | 4.0     | -23.65      |   |
| 16.37                                               | 0.25     | 21.64             | 0.00    | 0.00               | 33.50     | 4.0     | -23.14      |   |
| 16.62                                               | 0.25     | 21.53             | 0.00    | 0.00               | 33.50     | 4.0     | -22.63      |   |
| 16.87                                               | 0.25     | 21.41             | 0.00    | 0.00               | 33.50     | 4.0     | -22.12      |   |
| 17.12                                               | 0.25     | 21.27             | 0.00    | 0.00               | 33.50     | 4.0     | -21.62      |   |

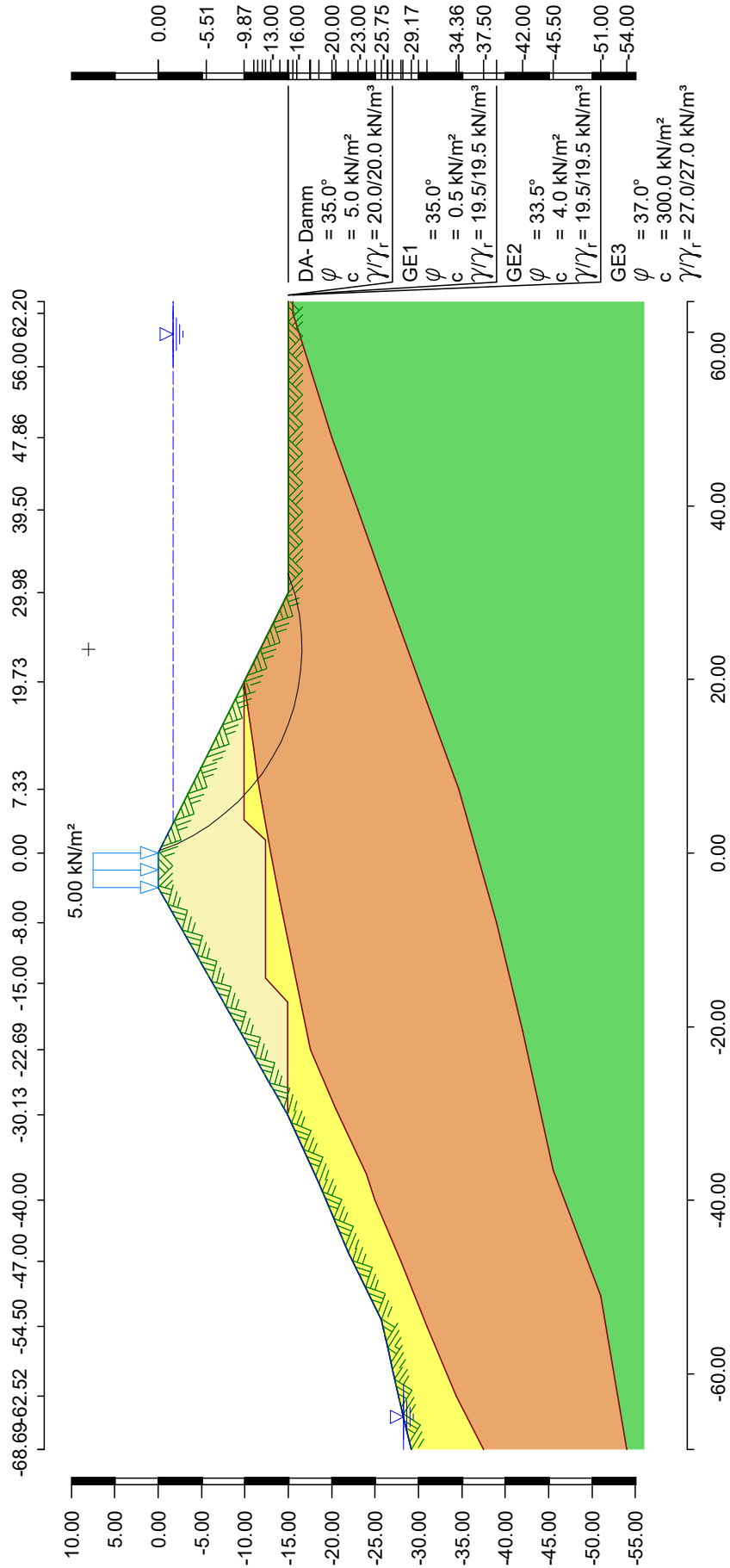


|                                         |             |                   |                     |                     |           |                      |                          |   |
|-----------------------------------------|-------------|-------------------|---------------------|---------------------|-----------|----------------------|--------------------------|---|
|                                         |             |                   |                     |                     |           |                      | Seite                    | 5 |
| Programm DC-Böschung/Win Version 24.2.0 |             |                   |                     |                     |           |                      |                          |   |
| D-W_LFK4                                |             |                   |                     |                     |           |                      | Lastfall                 | G |
|                                         |             |                   |                     |                     |           |                      |                          |   |
| $x_M$                                   | Breite<br>b | Eigen-<br>gewicht | Auflast             | Wasser-<br>auflast  | $\varphi$ | c                    | $\vartheta$              |   |
| [m]                                     | [m]         | [kN/m]            | [kN/m]              | [kN/m]              | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]                   |   |
| 17.37                                   | 0.25        | 21.12             | 0.00                | 0.00                | 33.50     | 4.0                  | -21.11                   |   |
| 17.62                                   | 0.25        | 20.96             | 0.00                | 0.00                | 33.50     | 4.0                  | -20.61                   |   |
| 17.87                                   | 0.25        | 20.79             | 0.00                | 0.00                | 33.50     | 4.0                  | -20.11                   |   |
| 18.12                                   | 0.25        | 20.60             | 0.00                | 0.00                | 33.50     | 4.0                  | -19.61                   |   |
| 18.37                                   | 0.25        | 20.41             | 0.00                | 0.00                | 33.50     | 4.0                  | -19.11                   |   |
| 18.62                                   | 0.25        | 20.20             | 0.00                | 0.00                | 33.50     | 4.0                  | -18.62                   |   |
| 18.87                                   | 0.25        | 19.98             | 0.00                | 0.00                | 33.50     | 4.0                  | -18.12                   |   |
| 19.12                                   | 0.25        | 19.75             | 0.00                | 0.00                | 33.50     | 4.0                  | -17.63                   |   |
| 19.37                                   | 0.25        | 19.50             | 0.00                | 0.00                | 33.50     | 4.0                  | -17.14                   |   |
| 19.62                                   | 0.25        | 19.25             | 0.00                | 0.00                | 33.50     | 4.0                  | -16.65                   |   |
| 19.87                                   | 0.25        | 18.99             | 0.00                | 0.00                | 33.50     | 4.0                  | -16.16                   |   |
| 20.12                                   | 0.25        | 18.73             | 0.00                | 0.00                | 33.50     | 4.0                  | -15.67                   |   |
| 20.37                                   | 0.25        | 18.46             | 0.00                | 0.00                | 33.50     | 4.0                  | -15.19                   |   |
| 20.63                                   | 0.25        | 18.17             | 0.00                | 0.00                | 33.50     | 4.0                  | -14.70                   |   |
| 20.88                                   | 0.25        | 17.88             | 0.00                | 0.00                | 33.50     | 4.0                  | -14.22                   |   |
| 21.13                                   | 0.25        | 17.57             | 0.00                | 0.00                | 33.50     | 4.0                  | -13.73                   |   |
| 21.38                                   | 0.25        | 17.25             | 0.00                | 0.00                | 33.50     | 4.0                  | -13.25                   |   |
| 21.63                                   | 0.25        | 16.93             | 0.00                | 0.00                | 33.50     | 4.0                  | -12.77                   |   |
| 21.88                                   | 0.25        | 16.59             | 0.00                | 0.00                | 33.50     | 4.0                  | -12.29                   |   |
| 22.13                                   | 0.25        | 16.24             | 0.00                | 0.00                | 33.50     | 4.0                  | -11.81                   |   |
| 22.38                                   | 0.25        | 15.88             | 0.00                | 0.00                | 33.50     | 4.0                  | -11.33                   |   |
| 22.63                                   | 0.25        | 15.51             | 0.00                | 0.00                | 33.50     | 4.0                  | -10.85                   |   |
| 22.88                                   | 0.25        | 15.13             | 0.00                | 0.00                | 33.50     | 4.0                  | -10.38                   |   |
| 23.13                                   | 0.25        | 14.73             | 0.00                | 0.00                | 33.50     | 4.0                  | -9.90                    |   |
| 23.38                                   | 0.25        | 14.33             | 0.00                | 0.00                | 33.50     | 4.0                  | -9.42                    |   |
| 23.63                                   | 0.25        | 13.92             | 0.00                | 0.00                | 33.50     | 4.0                  | -8.95                    |   |
| 23.88                                   | 0.25        | 13.50             | 0.00                | 0.00                | 33.50     | 4.0                  | -8.47                    |   |
| 24.13                                   | 0.25        | 13.06             | 0.00                | 0.00                | 33.50     | 4.0                  | -8.00                    |   |
| 24.38                                   | 0.25        | 12.62             | 0.00                | 0.00                | 33.50     | 4.0                  | -7.53                    |   |
| 24.63                                   | 0.25        | 12.17             | 0.00                | 0.00                | 33.50     | 4.0                  | -7.05                    |   |
| 24.88                                   | 0.25        | 11.70             | 0.00                | 0.00                | 33.50     | 4.0                  | -6.58                    |   |
| 25.13                                   | 0.25        | 11.23             | 0.00                | 0.00                | 33.50     | 4.0                  | -6.11                    |   |
| 25.38                                   | 0.25        | 10.75             | 0.00                | 0.00                | 33.50     | 4.0                  | -5.64                    |   |
| 25.63                                   | 0.25        | 10.25             | 0.00                | 0.00                | 33.50     | 4.0                  | -5.17                    |   |
| 25.88                                   | 0.25        | 9.75              | 0.00                | 0.00                | 33.50     | 4.0                  | -4.70                    |   |
| 26.13                                   | 0.25        | 9.23              | 0.00                | 0.00                | 33.50     | 4.0                  | -4.23                    |   |
| 26.38                                   | 0.25        | 8.71              | 0.00                | 0.00                | 33.50     | 4.0                  | -3.75                    |   |
| 26.63                                   | 0.25        | 8.17              | 0.00                | 0.00                | 33.50     | 4.0                  | -3.29                    |   |
| 26.88                                   | 0.25        | 7.63              | 0.00                | 0.00                | 33.50     | 4.0                  | -2.82                    |   |
| 27.13                                   | 0.25        | 7.08              | 0.00                | 0.00                | 33.50     | 4.0                  | -2.35                    |   |
| 27.38                                   | 0.25        | 6.51              | 0.00                | 0.00                | 33.50     | 4.0                  | -1.88                    |   |
| 27.63                                   | 0.25        | 5.94              | 0.00                | 0.00                | 33.50     | 4.0                  | -1.41                    |   |
| 27.88                                   | 0.25        | 5.35              | 0.00                | 0.00                | 33.50     | 4.0                  | -0.94                    |   |
| 28.13                                   | 0.25        | 4.76              | 0.00                | 0.00                | 33.50     | 4.0                  | -0.47                    |   |
| 28.38                                   | 0.25        | 4.15              | 0.00                | 0.00                | 33.50     | 4.0                  | 0.00                     |   |
| 28.63                                   | 0.25        | 3.54              | 0.00                | 0.00                | 33.50     | 4.0                  | 0.47                     |   |
| 28.88                                   | 0.25        | 2.91              | 0.00                | 0.00                | 33.50     | 4.0                  | 0.94                     |   |
| 29.13                                   | 0.25        | 2.28              | 0.00                | 0.00                | 33.50     | 4.0                  | 1.41                     |   |
| 29.38                                   | 0.25        | 1.64              | 0.00                | 0.00                | 33.50     | 4.0                  | 1.88                     |   |
| 29.63                                   | 0.25        | 0.98              | 0.00                | 0.00                | 33.50     | 4.0                  | 2.35                     |   |
| 29.87                                   | 0.24        | 0.32              | 0.00                | 0.00                | 33.50     | 4.0                  | 2.81                     |   |
| $x_M$                                   |             |                   | Erdbeben-<br>last V | Erdbeben-<br>last H | $R^*T_i$  |                      | $R^*G^* \sin(\vartheta)$ |   |
| [m]                                     |             |                   | [kN/m]              | [kN/m]              | [kNm/m]   |                      | [kNm/m]                  |   |
| 3.13                                    |             |                   | 0.01                | 0.01                | 41.20     |                      | 14.88                    |   |
| 3.38                                    |             |                   | 0.02                | 0.03                | 62.83     |                      | 45.01                    |   |
| 3.63                                    |             |                   | 0.03                | 0.05                | 82.37     |                      | 73.19                    |   |

|                                         |  |           |           |               |                 |
|-----------------------------------------|--|-----------|-----------|---------------|-----------------|
|                                         |  |           |           | Seite         | 6               |
| Programm DC-Böschung/Win Version 24.2.0 |  |           |           |               |                 |
| D-W_LFK4                                |  |           |           | Lastfall      | G               |
|                                         |  |           |           |               |                 |
| $x_M$                                   |  | Erdbeben- | Erdbeben- | $R \cdot T_i$ | $R \cdot G^*$   |
| [m]                                     |  | last V    | last H    |               | $\sin(\varphi)$ |
|                                         |  | [kN/m]    | [kN/m]    | [kNm/m]       | [kNm/m]         |
| 3.88                                    |  | 0.04      | 0.08      | 100.79        | 99.56           |
| 4.13                                    |  | 0.05      | 0.10      | 118.14        | 124.15          |
| 4.38                                    |  | 0.06      | 0.11      | 134.54        | 147.14          |
| 4.63                                    |  | 0.07      | 0.13      | 150.03        | 168.58          |
| 4.88                                    |  | 0.07      | 0.15      | 164.69        | 188.55          |
| 5.13                                    |  | 0.08      | 0.17      | 178.56        | 207.15          |
| 5.38                                    |  | 0.09      | 0.18      | 191.69        | 224.43          |
| 5.63                                    |  | 0.10      | 0.20      | 204.14        | 240.46          |
| 5.88                                    |  | 0.11      | 0.21      | 215.94        | 255.30          |
| 6.13                                    |  | 0.11      | 0.22      | 227.13        | 269.01          |
| 6.38                                    |  | 0.12      | 0.24      | 237.74        | 281.64          |
| 6.63                                    |  | 0.12      | 0.25      | 247.80        | 293.24          |
| 6.88                                    |  | 0.13      | 0.26      | 257.34        | 303.86          |
| 7.13                                    |  | 0.14      | 0.27      | 266.39        | 313.54          |
| 7.38                                    |  | 0.14      | 0.28      | 274.97        | 322.34          |
| 7.63                                    |  | 0.15      | 0.29      | 283.09        | 330.26          |
| 7.88                                    |  | 0.15      | 0.30      | 290.80        | 337.37          |
| 8.13                                    |  | 0.16      | 0.31      | 298.09        | 343.70          |
| 8.38                                    |  | 0.16      | 0.32      | 304.99        | 349.28          |
| 8.63                                    |  | 0.17      | 0.33      | 311.51        | 354.14          |
| 8.88                                    |  | 0.17      | 0.34      | 317.67        | 358.31          |
| 9.13                                    |  | 0.17      | 0.35      | 323.48        | 361.83          |
| 9.38                                    |  | 0.18      | 0.35      | 328.96        | 364.71          |
| 9.63                                    |  | 0.18      | 0.36      | 334.12        | 367.00          |
| 9.88                                    |  | 0.18      | 0.37      | 338.96        | 368.70          |
| 10.13                                   |  | 0.19      | 0.37      | 343.50        | 369.86          |
| 10.38                                   |  | 0.19      | 0.38      | 347.74        | 370.49          |
| 10.63                                   |  | 0.19      | 0.38      | 351.71        | 370.61          |
| 10.88                                   |  | 0.19      | 0.39      | 355.39        | 370.25          |
| 11.13                                   |  | 0.20      | 0.39      | 358.81        | 369.43          |
| 11.38                                   |  | 0.20      | 0.40      | 336.53        | 368.11          |
| 11.63                                   |  | 0.20      | 0.40      | 339.17        | 366.11          |
| 11.88                                   |  | 0.20      | 0.40      | 341.53        | 363.68          |
| 12.13                                   |  | 0.20      | 0.41      | 343.65        | 360.89          |
| 12.38                                   |  | 0.20      | 0.41      | 345.54        | 357.75          |
| 12.63                                   |  | 0.21      | 0.41      | 347.21        | 354.28          |
| 12.88                                   |  | 0.21      | 0.41      | 348.65        | 350.49          |
| 13.13                                   |  | 0.21      | 0.42      | 355.11        | 346.40          |
| 13.38                                   |  | 0.21      | 0.42      | 356.00        | 342.04          |
| 13.63                                   |  | 0.21      | 0.42      | 356.70        | 337.40          |
| 13.88                                   |  | 0.21      | 0.42      | 357.19        | 332.51          |
| 14.13                                   |  | 0.21      | 0.42      | 357.50        | 327.39          |
| 14.38                                   |  | 0.21      | 0.42      | 357.62        | 322.04          |
| 14.63                                   |  | 0.21      | 0.42      | 357.55        | 316.48          |
| 14.88                                   |  | 0.21      | 0.42      | 357.30        | 310.72          |
| 15.13                                   |  | 0.21      | 0.42      | 356.87        | 304.78          |
| 15.38                                   |  | 0.21      | 0.42      | 356.26        | 298.67          |
| 15.63                                   |  | 0.21      | 0.42      | 355.47        | 292.40          |
| 15.88                                   |  | 0.21      | 0.41      | 354.51        | 285.99          |
| 16.12                                   |  | 0.21      | 0.41      | 353.38        | 279.44          |
| 16.37                                   |  | 0.21      | 0.41      | 352.08        | 272.77          |
| 16.62                                   |  | 0.20      | 0.41      | 350.60        | 265.99          |
| 16.87                                   |  | 0.20      | 0.41      | 348.96        | 259.12          |
| 17.12                                   |  | 0.20      | 0.40      | 347.15        | 252.15          |
| 17.37                                   |  | 0.20      | 0.40      | 345.18        | 245.11          |
| 17.62                                   |  | 0.20      | 0.40      | 343.04        | 238.00          |
| 17.87                                   |  | 0.20      | 0.39      | 340.73        | 230.84          |
| 18.12                                   |  | 0.20      | 0.39      | 338.26        | 223.63          |

|                                         |                             |                          |           |          |                   |
|-----------------------------------------|-----------------------------|--------------------------|-----------|----------|-------------------|
|                                         |                             |                          |           | Seite    | 7                 |
| Programm DC-Böschung/Win Version 24.2.0 |                             |                          |           |          |                   |
| D-W_LFK4                                |                             |                          |           | Lastfall | G                 |
|                                         |                             |                          |           |          |                   |
| $x_M$                                   |                             | Erdbeben-                | Erdbeben- | $R^*T_i$ | $R^*G^*$          |
|                                         |                             | last V                   | last H    |          | $\sin(\vartheta)$ |
| [m]                                     |                             | [kN/m]                   | [kN/m]    | [kNm/m]  | [kNm/m]           |
| 18.37                                   | 0.19                        | 0.39                     | 335.63    | 216.39   |                   |
| 18.62                                   | 0.19                        | 0.38                     | 332.83    | 209.12   |                   |
| 18.87                                   | 0.19                        | 0.38                     | 329.87    | 201.84   |                   |
| 19.12                                   | 0.19                        | 0.38                     | 326.75    | 194.55   |                   |
| 19.37                                   | 0.19                        | 0.37                     | 323.46    | 187.27   |                   |
| 19.62                                   | 0.18                        | 0.37                     | 320.01    | 180.00   |                   |
| 19.87                                   | 0.18                        | 0.36                     | 316.54    | 172.84   |                   |
| 20.12                                   | 0.18                        | 0.36                     | 313.00    | 165.76   |                   |
| 20.37                                   | 0.18                        | 0.35                     | 309.30    | 158.72   |                   |
| 20.63                                   | 0.17                        | 0.35                     | 305.43    | 151.73   |                   |
| 20.88                                   | 0.17                        | 0.34                     | 301.40    | 144.78   |                   |
| 21.13                                   | 0.17                        | 0.33                     | 297.20    | 137.90   |                   |
| 21.38                                   | 0.16                        | 0.33                     | 292.84    | 131.09   |                   |
| 21.63                                   | 0.16                        | 0.32                     | 288.31    | 124.35   |                   |
| 21.88                                   | 0.16                        | 0.32                     | 283.62    | 117.71   |                   |
| 22.13                                   | 0.15                        | 0.31                     | 278.75    | 111.16   |                   |
| 22.38                                   | 0.15                        | 0.30                     | 273.71    | 104.72   |                   |
| 22.63                                   | 0.15                        | 0.29                     | 268.50    | 98.38    |                   |
| 22.88                                   | 0.14                        | 0.29                     | 263.11    | 92.17    |                   |
| 23.13                                   | 0.14                        | 0.28                     | 257.55    | 86.09    |                   |
| 23.38                                   | 0.14                        | 0.27                     | 251.82    | 80.15    |                   |
| 23.63                                   | 0.13                        | 0.26                     | 245.90    | 74.35    |                   |
| 23.88                                   | 0.13                        | 0.26                     | 239.80    | 68.71    |                   |
| 24.13                                   | 0.12                        | 0.25                     | 233.52    | 63.23    |                   |
| 24.38                                   | 0.12                        | 0.24                     | 227.06    | 57.92    |                   |
| 24.63                                   | 0.12                        | 0.23                     | 220.41    | 52.78    |                   |
| 24.88                                   | 0.11                        | 0.22                     | 213.56    | 47.83    |                   |
| 25.13                                   | 0.11                        | 0.21                     | 206.53    | 43.08    |                   |
| 25.38                                   | 0.10                        | 0.20                     | 199.30    | 38.53    |                   |
| 25.63                                   | 0.10                        | 0.19                     | 191.87    | 34.18    |                   |
| 25.88                                   | 0.09                        | 0.19                     | 184.23    | 30.05    |                   |
| 26.13                                   | 0.09                        | 0.18                     | 176.40    | 26.15    |                   |
| 26.38                                   | 0.08                        | 0.17                     | 168.36    | 22.48    |                   |
| 26.63                                   | 0.08                        | 0.16                     | 160.10    | 19.05    |                   |
| 26.88                                   | 0.07                        | 0.14                     | 151.63    | 15.86    |                   |
| 27.13                                   | 0.07                        | 0.13                     | 142.94    | 12.93    |                   |
| 27.38                                   | 0.06                        | 0.12                     | 134.03    | 10.27    |                   |
| 27.63                                   | 0.06                        | 0.11                     | 124.89    | 7.87     |                   |
| 27.88                                   | 0.05                        | 0.10                     | 115.53    | 5.75     |                   |
| 28.13                                   | 0.05                        | 0.09                     | 105.92    | 3.92     |                   |
| 28.38                                   | 0.04                        | 0.08                     | 96.07     | 2.38     |                   |
| 28.63                                   | 0.03                        | 0.07                     | 85.98     | 1.14     |                   |
| 28.88                                   | 0.03                        | 0.06                     | 75.64     | 0.20     |                   |
| 29.13                                   | 0.02                        | 0.04                     | 65.05     | -0.41    |                   |
| 29.38                                   | 0.02                        | 0.03                     | 54.19     | -0.71    |                   |
| 29.63                                   | 0.01                        | 0.02                     | 43.06     | -0.67    |                   |
| 29.87                                   | 0.00                        | 0.01                     | 30.95     | -0.30    |                   |
| Summen:                                 |                             |                          |           | 28007.42 | 21266.45          |
|                                         |                             |                          |           |          |                   |
| Einwirkungen                            | $E_d = 21266.45 \text{ kN}$ |                          |           |          |                   |
| Widerstände                             | $R_d = 28007.42 \text{ kN}$ |                          |           |          |                   |
|                                         |                             |                          |           |          |                   |
| $E_d/R_d = 0.76 < 1.0$                  |                             | *** Nachweis erfüllt *** |           |          |                   |





Eingabedatei: M:\Projekte\2023\

23020\_P-BL-S-SK-K\_Speicher-Bodensee\_Kronplatz\Berechnungen\D-W\_LFK4b.dbb

## Berechnung nach: NTC 2018 (Eurocode 7)

Berechnung mit Nachweisverfahren 1

Kombination mit Teilsicherheitsbeiwerten der Gruppen A2 + M2 + R2

| Schichtdaten                       |                      | DA- Damm<br>GE3 | GE1   | GE2   |
|------------------------------------|----------------------|-----------------|-------|-------|
| Innere Reibung $\text{cal } \phi'$ | [Grad]               | 35.00<br>37.00  | 35.00 | 33.50 |
| Kohäsion $\text{cal } c'$          | [kN/m <sup>2</sup> ] | 5.0<br>300.0    | 0.5   | 4.0   |
| Wichte Boden                       | [kN/m <sup>3</sup> ] | 20.0<br>27.0    | 19.5  | 19.5  |
| Wichte wassergesättigt             | [kN/m <sup>3</sup> ] | 20.0<br>27.0    | 19.5  | 19.5  |
| Wichte unter Auftrieb              | [kN/m <sup>3</sup> ] | 10.0<br>17.0    | 9.5   | 9.5   |
| Erdbebenfaktor                     | [-]                  | 1.0<br>1.0      | 1.0   | 1.0   |

### Geländeverlauf und Schichten

|           |          |        |        |        |        |        |
|-----------|----------|--------|--------|--------|--------|--------|
| x [m]     |          | -68.69 | -64.72 | -62.53 | -59.50 | -57.00 |
|           |          | -54.50 | -53.74 | -51.00 | -47.00 | -45.97 |
|           |          | -40.00 | -38.00 | -37.00 | -36.50 | -30.12 |
|           |          | -29.50 | -22.69 | -20.50 | -17.16 | -15.00 |
|           |          | -14.37 | -8.00  | -5.50  | -4.00  | 0.00   |
|           |          | 1.52   | 3.86   | 5.50   | 7.33   | 8.50   |
|           |          | 11.03  | 12.00  | 19.73  | 20.00  | 29.98  |
|           |          | 30.00  | 39.50  | 47.86  | 56.00  | 62.20  |
|           |          | 63.50  |        |        |        |        |
| z Gelände |          | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |          | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |          | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |          | -14.57 | -10.68 | -9.43  | -7.52  | -6.29  |
|           |          | -5.93  | -2.29  | -0.86  | 0.00   | 0.00   |
|           |          | -0.76  | -1.93  | -2.75  | -3.67  | -4.25  |
|           |          | -5.51  | -6.00  | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |          | -15.00 |        |        |        |        |
| z Schicht | DA- Damm | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |          | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |          | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |          | -14.93 | -14.93 | -14.93 | -14.93 | -12.94 |
|           |          | -12.37 | -12.37 | -12.37 | -12.37 | -12.37 |
|           |          | -12.37 | -9.87  | -9.87  | -9.87  | -9.87  |
|           |          | -9.87  | -9.87  | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |          | -15.00 |        |        |        |        |
| z Schicht | GE1      | -37.50 | -35.48 | -34.36 | -33.09 | -32.05 |
|           |          | -31.00 | -30.70 | -29.60 | -28.00 | -27.56 |
|           |          | -25.00 | -24.33 | -24.00 | -23.77 | -20.79 |
|           |          | -20.50 | -17.56 | -17.12 | -16.44 | -16.00 |
|           |          | -15.87 | -14.53 | -14.00 | -13.73 | -13.00 |
|           |          | -12.72 | -12.30 | -12.00 | -11.69 | -11.50 |
|           |          | -11.14 | -11.00 | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |

|                                                     |                               |                |                |                |          |          |                |                |                |      |
|-----------------------------------------------------|-------------------------------|----------------|----------------|----------------|----------|----------|----------------|----------------|----------------|------|
|                                                     |                               |                |                |                |          |          | Seite          | 3              |                |      |
| Programm DC-Böschung/Win Version 24.2.0             |                               |                |                |                |          |          | Lastfall       | G              |                |      |
| D-W_LFK4b                                           |                               |                |                |                |          |          |                |                |                |      |
| z Schicht                                           | GE2                           | -15.00         |                |                |          |          |                |                |                |      |
|                                                     |                               | -54.00         | -53.33         | -52.95         | -52.44   | -52.02   |                |                |                |      |
|                                                     |                               | -51.59         | -51.46         | -51.00         | -49.48   | -49.09   |                |                |                |      |
|                                                     |                               | -46.83         | -46.07         | -45.69         | -45.50   | -44.11   |                |                |                |      |
|                                                     |                               | -43.97         | -42.48         | -42.00         | -41.20   | -40.68   |                |                |                |      |
|                                                     |                               | -40.53         | -39.00         | -38.29         | -37.86   | -36.72   |                |                |                |      |
|                                                     |                               | -36.29         | -35.62         | -35.15         | -34.63   | -34.20   |                |                |                |      |
|                                                     |                               | -33.28         | -32.92         | -30.10         | -30.00   | -26.39   |                |                |                |      |
|                                                     |                               | -26.38         | -23.00         | -20.00         | -17.50   | -15.49   |                |                |                |      |
|                                                     |                               | -15.49         |                |                |          |          |                |                |                |      |
| z Schicht                                           | GE3                           | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       |                |                |          |          |                |                |                |      |
| Verlauf des Grundwasserspiegels                     |                               |                |                |                |          |          |                |                |                |      |
| x [m]                                               |                               | z [m]          |                |                |          |          |                |                |                |      |
| -68.69                                              |                               | -29.17         |                |                |          |          |                |                |                |      |
| -64.72                                              |                               | -28.19         |                |                |          |          |                |                |                |      |
| -59.50                                              |                               | -27.00         |                |                |          |          |                |                |                |      |
| -57.00                                              |                               | -26.50         |                |                |          |          |                |                |                |      |
| -53.74                                              |                               | -25.75         |                |                |          |          |                |                |                |      |
| -45.97                                              |                               | -21.92         |                |                |          |          |                |                |                |      |
| -38.00                                              |                               | -18.50         |                |                |          |          |                |                |                |      |
| -30.13                                              |                               | -14.93         |                |                |          |          |                |                |                |      |
| -4.00                                               |                               | 0.00           |                |                |          |          |                |                |                |      |
| 0.00                                                |                               | 0.00           |                |                |          |          |                |                |                |      |
| 3.48                                                |                               | -1.74          |                |                |          |          |                |                |                |      |
| 52.00                                               |                               | -1.74          |                |                |          |          |                |                |                |      |
| 63.50                                               |                               | -1.75          |                |                |          |          |                |                |                |      |
| Streckenlasten                                      |                               |                |                |                |          |          |                |                |                |      |
| Alle Lasten beziehen sich auf 1 m Länge             |                               |                |                |                |          |          |                |                |                |      |
| LF-Komb.                                            | q                             | x <sub>A</sub> | x <sub>E</sub> | z <sub>Q</sub> | γ        | ψ        |                |                |                |      |
| G                                                   | Q                             | 5.0            | -4.0           | 0.0            | 0.00     | 1.30     | 1.00           |                |                |      |
| Berechnung mit Erdbebenlasten nach Eurocode 8, BS-E |                               |                |                |                |          |          |                |                |                |      |
| k <sub>h</sub> /S = a <sub>g</sub> /g = 0.038       |                               |                |                |                |          |          |                |                |                |      |
| k <sub>v</sub> /S = a <sub>vg</sub> /g = 0.019      |                               |                |                |                |          |          |                |                |                |      |
| Lamellenbreiten                                     |                               |                |                |                |          |          |                |                |                |      |
| Von x [m]                                           |                               | bis x [m]      |                | Breite [m]     |          |          |                |                |                |      |
| -10000.00                                           |                               | 10000.00       |                | 0.25           |          |          |                |                |                |      |
| Teilsicherheitsbeiwerte (GEO) für NW-Verf. 1        |                               |                |                |                |          |          |                |                |                |      |
| γ-                                                  | G                             | Q              | W              | E              | φ        | c        | c <sub>u</sub> | R <sub>a</sub> | R <sub>b</sub> | R    |
| BS-E                                                | 1.00                          | 1.00           | 1.00           | 1.00           | 1.00     | 1.00     | 1.00           | 1.00           | 1.00           | 1.20 |
| γ-                                                  | Teilsicherheitsbeiwert für... |                |                |                |          |          |                |                |                |      |
| G                                                   | Ständige Lasten               |                |                |                |          |          |                |                |                |      |
| Q                                                   | Veränderliche Lasten          |                |                |                |          |          |                |                |                |      |
| W                                                   | Wasserdruck                   |                |                |                |          |          |                |                |                |      |
| E                                                   | Erdbeben                      |                |                |                |          |          |                |                |                |      |
| φ                                                   | Reibungsbeiwert tan(φ)        |                |                |                |          |          |                |                |                |      |
| c                                                   | Kohäsion c                    |                |                |                |          |          |                |                |                |      |

$c_u$  Kohäsion undränirt  $c_u$   
 $R_a$  Anker  
 $R_b$  Bauteile  
 $R$  Widerstände

**Bestimmung der Sicherheit nach Krey-Bishop**

Gleitkreis mit Iteration des Mittelpunktes:  
 Startpunkt:  $x_M = 23.50\text{ m}$ ,  $z_M = 8.00\text{ m}$ ,  
 $\Delta x = 1.00\text{ m}$ ,  $\Delta z = 1.00\text{ m}$ ,  
 mit Iteration des Radius:  $\Delta R = 1.00\text{ m}$  ab  $R = 24.60\text{ m}$

**Lastfallkomb. G**

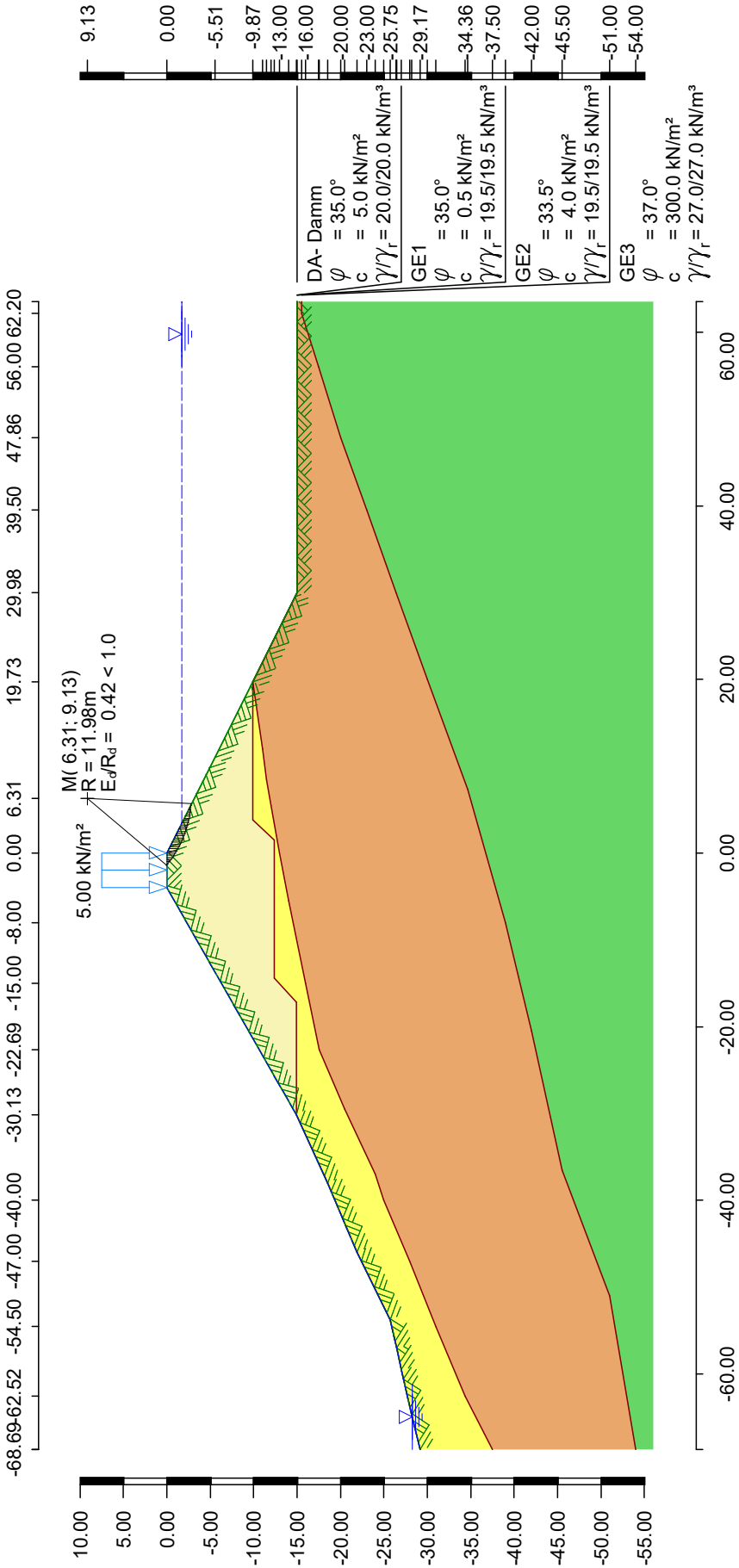
Gleitkörper von  $x = -1.45$  bis  $5.67\text{ m}$   
 Gleitkreis:  $x_M = 6.31\text{ m}$ ,  $z_M = 9.13\text{ m}$ ,  $R = 11.98\text{ m}$

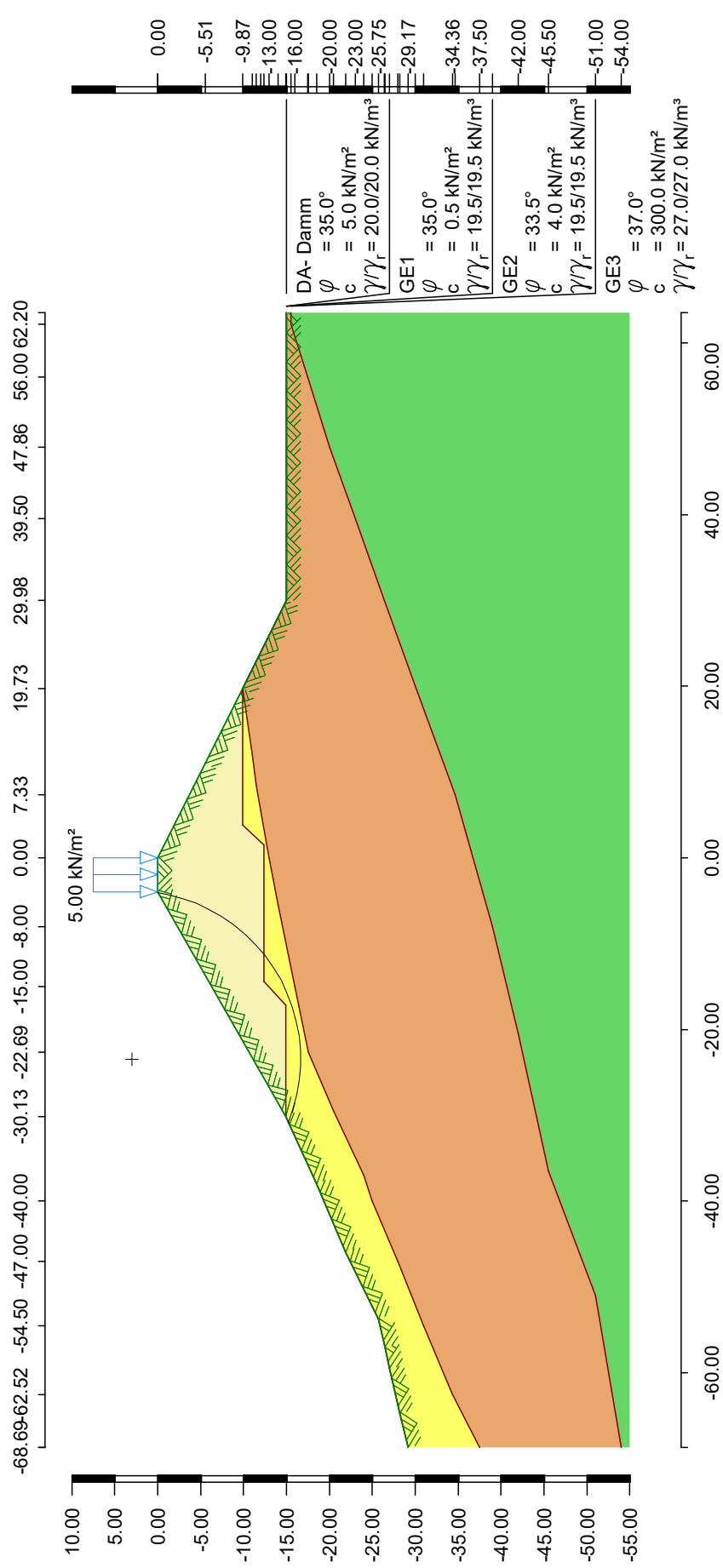
**Bestimmung der Lamellen-Anteile**

| $x_M$ | Breite<br>b | Eigen-<br>gewicht | Auflast             | Wasser-<br>auflast  | $\varphi$     | c       | $\vartheta$                   |
|-------|-------------|-------------------|---------------------|---------------------|---------------|---------|-------------------------------|
| [m]   | [m]         | [kN/m]            | [kN/m]              | [kN/m]              | [Grad]        | [kN/m²] | [Grad]                        |
| -1.35 | 0.20        | 0.32              | 1.27                | 0.00                | 35.00         | 5.0     | -39.76                        |
| -1.12 | 0.25        | 1.31              | 1.62                | 0.00                | 35.00         | 5.0     | -38.39                        |
| -0.88 | 0.25        | 2.27              | 1.62                | 0.00                | 35.00         | 5.0     | -36.88                        |
| -0.63 | 0.25        | 3.19              | 1.25                | 0.00                | 35.00         | 5.0     | -35.40                        |
| -0.38 | 0.25        | 4.05              | 0.00                | 0.00                | 35.00         | 5.0     | -33.94                        |
| -0.13 | 0.25        | 4.87              | 0.00                | 0.00                | 35.00         | 5.0     | -32.51                        |
| 0.13  | 0.25        | 5.33              | 0.00                | 0.00                | 35.00         | 5.0     | -31.11                        |
| 0.38  | 0.25        | 5.44              | 0.00                | 0.00                | 35.00         | 5.0     | -29.72                        |
| 0.63  | 0.25        | 5.51              | 0.00                | 0.00                | 35.00         | 5.0     | -28.35                        |
| 0.88  | 0.25        | 5.54              | 0.00                | 0.00                | 35.00         | 5.0     | -27.00                        |
| 1.12  | 0.25        | 5.54              | 0.00                | 0.00                | 35.00         | 5.0     | -25.67                        |
| 1.38  | 0.25        | 5.49              | 0.00                | 0.00                | 35.00         | 5.0     | -24.35                        |
| 1.62  | 0.25        | 5.42              | 0.00                | 0.00                | 35.00         | 5.0     | -23.04                        |
| 1.87  | 0.25        | 5.31              | 0.00                | 0.00                | 35.00         | 5.0     | -21.75                        |
| 2.12  | 0.25        | 5.17              | 0.00                | 0.00                | 35.00         | 5.0     | -20.46                        |
| 2.37  | 0.25        | 4.99              | 0.00                | 0.00                | 35.00         | 5.0     | -19.19                        |
| 2.63  | 0.25        | 4.79              | 0.00                | 0.00                | 35.00         | 5.0     | -17.93                        |
| 2.88  | 0.25        | 4.55              | 0.00                | 0.00                | 35.00         | 5.0     | -16.68                        |
| 3.13  | 0.25        | 4.29              | 0.00                | 0.00                | 35.00         | 5.0     | -15.43                        |
| 3.38  | 0.25        | 3.99              | 0.00                | 0.01                | 35.00         | 5.0     | -14.20                        |
| 3.63  | 0.25        | 3.67              | 0.00                | 0.18                | 35.00         | 5.0     | -12.97                        |
| 3.88  | 0.25        | 3.32              | 0.00                | 0.50                | 35.00         | 5.0     | -11.74                        |
| 4.13  | 0.25        | 2.94              | 0.00                | 0.81                | 35.00         | 5.0     | -10.52                        |
| 4.38  | 0.25        | 2.53              | 0.00                | 1.12                | 35.00         | 5.0     | -9.31                         |
| 4.63  | 0.25        | 2.10              | 0.00                | 1.43                | 35.00         | 5.0     | -8.10                         |
| 4.88  | 0.25        | 1.64              | 0.00                | 1.75                | 35.00         | 5.0     | -6.89                         |
| 5.13  | 0.25        | 1.15              | 0.00                | 2.06                | 35.00         | 5.0     | -5.69                         |
| 5.38  | 0.25        | 0.64              | 0.00                | 2.37                | 35.00         | 5.0     | -4.49                         |
| 5.58  | 0.17        | 0.13              | 0.00                | 1.78                | 35.00         | 5.0     | -3.48                         |
| $x_M$ |             |                   | Erdbeben-<br>last V | Erdbeben-<br>last H | $R \cdot T_i$ |         | $R \cdot G^* \sin(\vartheta)$ |
| [m]   |             |                   | [kN/m]              | [kN/m]              | [kNm/m]       |         | [kNm/m]                       |
| -1.35 |             |                   | 0.00                | 0.01                | 21.79         |         | 12.24                         |
| -1.12 |             |                   | 0.01                | 0.02                | 34.20         |         | 22.16                         |
| -0.88 |             |                   | 0.02                | 0.04                | 40.81         |         | 28.59                         |
| -0.63 |             |                   | 0.03                | 0.06                | 44.33         |         | 31.59                         |
| -0.38 |             |                   | 0.04                | 0.08                | 41.29         |         | 28.09                         |
| -0.13 |             |                   | 0.05                | 0.09                | 46.75         |         | 32.55                         |
| 0.13  |             |                   | 0.05                | 0.10                | 49.67         |         | 34.31                         |
| 0.38  |             |                   | 0.05                | 0.10                | 50.13         |         | 33.65                         |



|                                         |         |                          |           |               |                 |
|-----------------------------------------|---------|--------------------------|-----------|---------------|-----------------|
|                                         |         |                          |           | Seite         | 5               |
| Programm DC-Böschung/Win Version 24.2.0 |         |                          |           |               |                 |
| D-W_LFK4b                               |         |                          |           | Lastfall      | G               |
|                                         |         |                          |           |               |                 |
| $x_M$                                   |         | Erdbeben-                | Erdbeben- | $R \cdot T_i$ | $R \cdot G^*$   |
|                                         |         | last V                   | last H    |               | $\sin(\varphi)$ |
| [m]                                     |         | [kN/m]                   | [kN/m]    | [kNm/m]       | [kNm/m]         |
| 0.63                                    |         | 0.05                     | 0.10      | 50.34         | 32.70           |
| 0.88                                    |         | 0.05                     | 0.11      | 50.32         | 31.49           |
| 1.12                                    |         | 0.05                     | 0.11      | 50.07         | 30.07           |
| 1.38                                    |         | 0.05                     | 0.10      | 49.61         | 28.47           |
| 1.62                                    |         | 0.05                     | 0.10      | 48.95         | 26.72           |
| 1.87                                    |         | 0.05                     | 0.10      | 48.09         | 24.85           |
| 2.12                                    |         | 0.05                     | 0.10      | 47.04         | 22.89           |
| 2.37                                    |         | 0.05                     | 0.09      | 45.80         | 20.87           |
| 2.63                                    |         | 0.05                     | 0.09      | 44.37         | 18.81           |
| 2.88                                    |         | 0.04                     | 0.09      | 42.76         | 16.75           |
| 3.13                                    |         | 0.04                     | 0.08      | 40.98         | 14.70           |
| 3.38                                    |         | 0.04                     | 0.08      | 39.10         | 12.73           |
| 3.63                                    |         | 0.03                     | 0.07      | 38.09         | 11.23           |
| 3.88                                    |         | 0.03                     | 0.06      | 37.87         | 10.09           |
| 4.13                                    |         | 0.03                     | 0.06      | 37.47         | 8.90            |
| 4.38                                    |         | 0.02                     | 0.05      | 36.90         | 7.68            |
| 4.63                                    |         | 0.02                     | 0.04      | 36.16         | 6.46            |
| 4.88                                    |         | 0.02                     | 0.03      | 35.24         | 5.25            |
| 5.13                                    |         | 0.01                     | 0.02      | 34.15         | 4.08            |
| 5.38                                    |         | 0.01                     | 0.01      | 32.88         | 2.97            |
| 5.58                                    |         | 0.00                     | 0.00      | 21.48         | 1.42            |
|                                         |         |                          |           |               |                 |
| Summen:                                 |         |                          |           | 1196.63       | 562.34          |
|                                         |         |                          |           |               |                 |
| <b>Wasserdruckkraft</b>                 |         |                          |           |               | $M_{abtr.}$     |
| [kN/m]                                  |         |                          |           |               | [kNm/m]         |
| 5.01                                    |         |                          |           |               | -58.09          |
|                                         |         |                          |           |               |                 |
| Einwirkungen                            | $E_d =$ | 504.25 kN                |           |               |                 |
| Widerstände                             | $R_d =$ | 1196.63 kN               |           |               |                 |
|                                         |         |                          |           |               |                 |
| $E_d/R_d = 0.42 < 1.0$                  |         | *** Nachweis erfüllt *** |           |               |                 |





Eingabedatei: M:\Projekte\2023\

23020\_P-BL-S-SK-K\_Speicher-Bodensee\_Kronplatz\Berechnungen\D-L\_LFK1.dbb

## Berechnung nach: NTC 2018 (Eurocode 7)

Berechnung mit Nachweisverfahren 1

Kombination mit Teilsicherheitsbeiwerten der Gruppen A2 + M2 + R2

| Schichtdaten                       |                      | DA- Damm<br>GE3      | GE1   | GE2   |
|------------------------------------|----------------------|----------------------|-------|-------|
| Innere Reibung $\text{cal } \phi'$ | [Grad]               | 35.00<br>37.00       | 35.00 | 33.50 |
| Kohäsion $\text{cal } c'$          | [kN/m <sup>2</sup> ] | 5.0                  | 0.5   | 4.0   |
| Wichte Boden                       | [kN/m <sup>3</sup> ] | 300.0<br>20.0        | 19.5  | 19.5  |
| Wichte wassergesättigt             | [kN/m <sup>3</sup> ] | 27.0<br>20.0         | 19.5  | 19.5  |
| Wichte unter Auftrieb              | [kN/m <sup>3</sup> ] | 27.0<br>10.0<br>17.0 | 9.5   | 9.5   |

### Geländeverlauf und Schichten

|           |          |        |        |        |        |        |
|-----------|----------|--------|--------|--------|--------|--------|
| x [m]     |          | -68.69 | -64.72 | -62.53 | -59.50 | -57.00 |
|           |          | -54.50 | -53.74 | -51.00 | -47.00 | -45.97 |
|           |          | -40.00 | -38.00 | -37.00 | -36.50 | -30.12 |
|           |          | -29.50 | -22.69 | -20.50 | -17.16 | -15.00 |
|           |          | -14.37 | -8.00  | -5.50  | -4.00  | 0.00   |
|           |          | 1.52   | 3.86   | 5.50   | 7.33   | 8.50   |
|           |          | 11.03  | 12.00  | 19.73  | 20.00  | 29.98  |
|           |          | 30.00  | 39.50  | 47.86  | 56.00  | 62.20  |
|           |          | 63.50  |        |        |        |        |
| z Gelände |          | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |          | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |          | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |          | -14.57 | -10.68 | -9.43  | -7.52  | -6.29  |
|           |          | -5.93  | -2.29  | -0.86  | 0.00   | 0.00   |
|           |          | -0.76  | -1.93  | -2.75  | -3.67  | -4.25  |
|           |          | -5.51  | -6.00  | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |          | -15.00 |        |        |        |        |
| z Schicht | DA- Damm | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |          | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |          | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |          | -14.93 | -14.93 | -14.93 | -14.93 | -12.94 |
|           |          | -12.37 | -12.37 | -12.37 | -12.37 | -12.37 |
|           |          | -12.37 | -9.87  | -9.87  | -9.87  | -9.87  |
|           |          | -9.87  | -9.87  | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |          | -15.00 |        |        |        |        |
| z Schicht | GE1      | -37.50 | -35.48 | -34.36 | -33.09 | -32.05 |
|           |          | -31.00 | -30.70 | -29.60 | -28.00 | -27.56 |
|           |          | -25.00 | -24.33 | -24.00 | -23.77 | -20.79 |
|           |          | -20.50 | -17.56 | -17.12 | -16.44 | -16.00 |
|           |          | -15.87 | -14.53 | -14.00 | -13.73 | -13.00 |
|           |          | -12.72 | -12.30 | -12.00 | -11.69 | -11.50 |
|           |          | -11.14 | -11.00 | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |          | -15.00 |        |        |        |        |



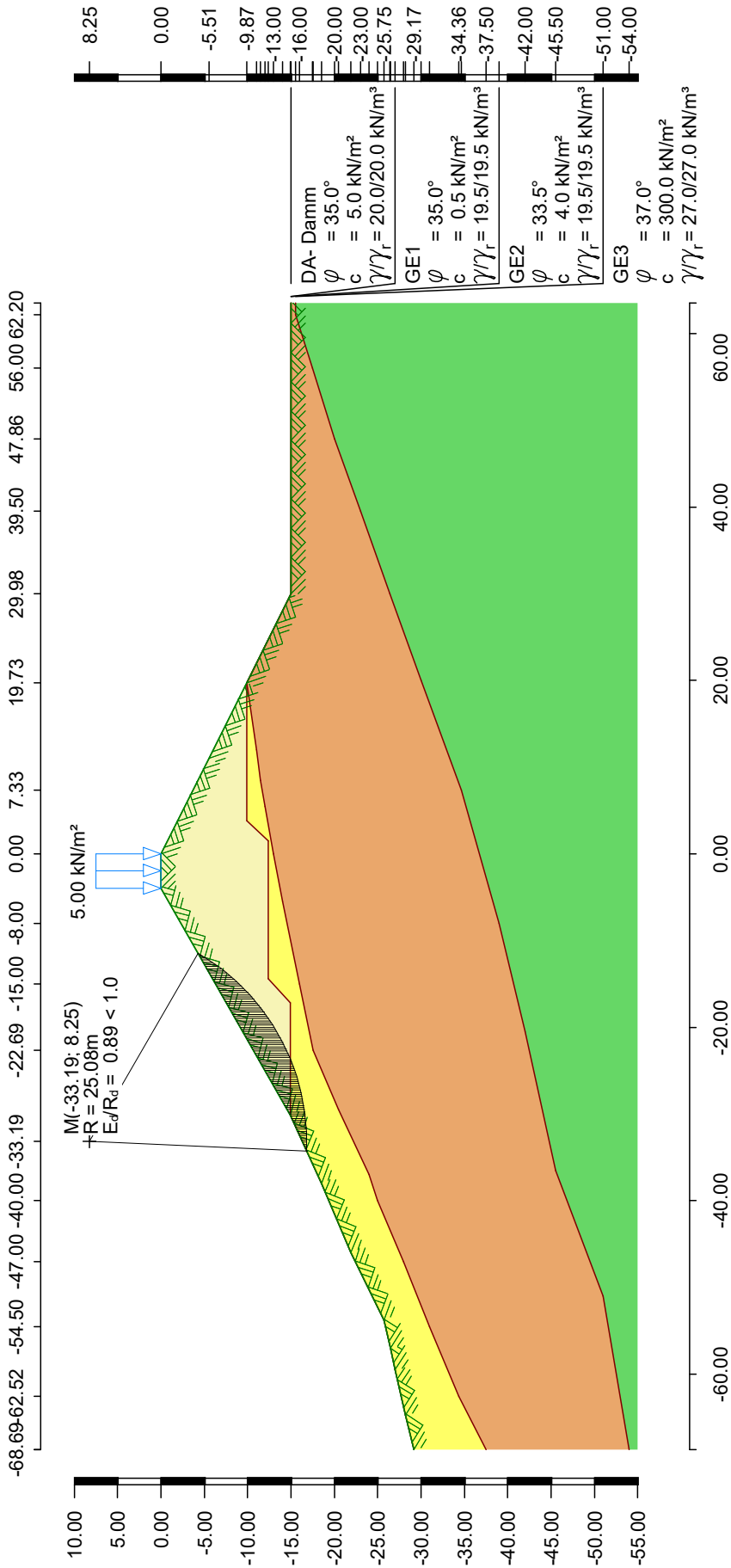
|                                         |             |                   |         |                    |           |         | Seite       | 4 |
|-----------------------------------------|-------------|-------------------|---------|--------------------|-----------|---------|-------------|---|
| Programm DC-Böschung/Win Version 24.2.0 |             |                   |         |                    |           |         |             |   |
| D-L_LFK1                                |             |                   |         |                    |           |         | Lastfall    | G |
| $x_M$                                   | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c       | $\vartheta$ |   |
| [m]                                     | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m²] | [Grad]      |   |
| -33.88                                  | 0.25        | 0.93              | 0.00    | 0.00               | 35.00     | 0.5     | -1.57       |   |
| -33.63                                  | 0.25        | 1.51              | 0.00    | 0.00               | 35.00     | 0.5     | -1.00       |   |
| -33.38                                  | 0.25        | 2.07              | 0.00    | 0.00               | 35.00     | 0.5     | -0.43       |   |
| -33.13                                  | 0.25        | 2.63              | 0.00    | 0.00               | 35.00     | 0.5     | 0.14        |   |
| -32.88                                  | 0.25        | 3.17              | 0.00    | 0.00               | 35.00     | 0.5     | 0.71        |   |
| -32.63                                  | 0.25        | 3.70              | 0.00    | 0.00               | 35.00     | 0.5     | 1.29        |   |
| -32.38                                  | 0.25        | 4.22              | 0.00    | 0.00               | 35.00     | 0.5     | 1.86        |   |
| -32.13                                  | 0.25        | 4.73              | 0.00    | 0.00               | 35.00     | 0.5     | 2.43        |   |
| -31.88                                  | 0.25        | 5.23              | 0.00    | 0.00               | 35.00     | 0.5     | 3.00        |   |
| -31.63                                  | 0.25        | 5.71              | 0.00    | 0.00               | 35.00     | 0.5     | 3.57        |   |
| -31.38                                  | 0.25        | 6.18              | 0.00    | 0.00               | 35.00     | 0.5     | 4.14        |   |
| -31.13                                  | 0.25        | 6.64              | 0.00    | 0.00               | 35.00     | 0.5     | 4.72        |   |
| -30.88                                  | 0.25        | 7.08              | 0.00    | 0.00               | 35.00     | 0.5     | 5.29        |   |
| -30.63                                  | 0.25        | 7.52              | 0.00    | 0.00               | 35.00     | 0.5     | 5.86        |   |
| -30.38                                  | 0.25        | 7.94              | 0.00    | 0.00               | 35.00     | 0.5     | 6.44        |   |
| -30.13                                  | 0.25        | 8.37              | 0.00    | 0.00               | 35.00     | 0.5     | 7.01        |   |
| -29.88                                  | 0.25        | 8.90              | 0.00    | 0.00               | 35.00     | 0.5     | 7.59        |   |
| -29.63                                  | 0.25        | 9.45              | 0.00    | 0.00               | 35.00     | 0.5     | 8.17        |   |
| -29.38                                  | 0.25        | 9.98              | 0.00    | 0.00               | 35.00     | 0.5     | 8.74        |   |
| -29.13                                  | 0.25        | 10.50             | 0.00    | 0.00               | 35.00     | 0.5     | 9.32        |   |
| -28.88                                  | 0.25        | 11.01             | 0.00    | 0.00               | 35.00     | 0.5     | 9.90        |   |
| -28.63                                  | 0.25        | 11.51             | 0.00    | 0.00               | 35.00     | 0.5     | 10.48       |   |
| -28.38                                  | 0.25        | 11.99             | 0.00    | 0.00               | 35.00     | 0.5     | 11.06       |   |
| -28.13                                  | 0.25        | 12.46             | 0.00    | 0.00               | 35.00     | 0.5     | 11.65       |   |
| -27.88                                  | 0.25        | 12.92             | 0.00    | 0.00               | 35.00     | 0.5     | 12.23       |   |
| -27.63                                  | 0.25        | 13.36             | 0.00    | 0.00               | 35.00     | 0.5     | 12.81       |   |
| -27.38                                  | 0.25        | 13.79             | 0.00    | 0.00               | 35.00     | 0.5     | 13.40       |   |
| -27.13                                  | 0.25        | 14.21             | 0.00    | 0.00               | 35.00     | 0.5     | 13.99       |   |
| -26.88                                  | 0.25        | 14.61             | 0.00    | 0.00               | 35.00     | 0.5     | 14.58       |   |
| -26.63                                  | 0.25        | 15.00             | 0.00    | 0.00               | 35.00     | 0.5     | 15.17       |   |
| -26.38                                  | 0.25        | 15.38             | 0.00    | 0.00               | 35.00     | 0.5     | 15.76       |   |
| -26.13                                  | 0.25        | 15.74             | 0.00    | 0.00               | 35.00     | 0.5     | 16.36       |   |
| -25.88                                  | 0.25        | 16.09             | 0.00    | 0.00               | 35.00     | 0.5     | 16.95       |   |
| -25.63                                  | 0.25        | 16.43             | 0.00    | 0.00               | 35.00     | 0.5     | 17.55       |   |
| -25.38                                  | 0.25        | 16.75             | 0.00    | 0.00               | 35.00     | 0.5     | 18.15       |   |
| -25.13                                  | 0.25        | 17.06             | 0.00    | 0.00               | 35.00     | 0.5     | 18.75       |   |
| -24.88                                  | 0.25        | 17.35             | 0.00    | 0.00               | 35.00     | 0.5     | 19.36       |   |
| -24.63                                  | 0.25        | 17.63             | 0.00    | 0.00               | 35.00     | 0.5     | 19.96       |   |
| -24.38                                  | 0.25        | 17.89             | 0.00    | 0.00               | 35.00     | 0.5     | 20.57       |   |
| -24.13                                  | 0.25        | 18.14             | 0.00    | 0.00               | 35.00     | 0.5     | 21.18       |   |
| -23.88                                  | 0.25        | 18.38             | 0.00    | 0.00               | 35.00     | 0.5     | 21.80       |   |
| -23.63                                  | 0.25        | 18.60             | 0.00    | 0.00               | 35.00     | 0.5     | 22.41       |   |
| -23.38                                  | 0.25        | 18.79             | 0.00    | 0.00               | 35.00     | 5.0     | 23.03       |   |
| -23.13                                  | 0.25        | 18.96             | 0.00    | 0.00               | 35.00     | 5.0     | 23.66       |   |
| -22.88                                  | 0.25        | 19.12             | 0.00    | 0.00               | 35.00     | 5.0     | 24.28       |   |
| -22.63                                  | 0.25        | 19.26             | 0.00    | 0.00               | 35.00     | 5.0     | 24.91       |   |
| -22.38                                  | 0.25        | 19.39             | 0.00    | 0.00               | 35.00     | 5.0     | 25.54       |   |
| -22.13                                  | 0.25        | 19.50             | 0.00    | 0.00               | 35.00     | 5.0     | 26.17       |   |
| -21.88                                  | 0.25        | 19.59             | 0.00    | 0.00               | 35.00     | 5.0     | 26.81       |   |
| -21.63                                  | 0.25        | 19.66             | 0.00    | 0.00               | 35.00     | 5.0     | 27.45       |   |
| -21.38                                  | 0.25        | 19.72             | 0.00    | 0.00               | 35.00     | 5.0     | 28.10       |   |
| -21.13                                  | 0.25        | 19.76             | 0.00    | 0.00               | 35.00     | 5.0     | 28.75       |   |
| -20.88                                  | 0.25        | 19.78             | 0.00    | 0.00               | 35.00     | 5.0     | 29.40       |   |
| -20.63                                  | 0.25        | 19.78             | 0.00    | 0.00               | 35.00     | 5.0     | 30.06       |   |
| -20.37                                  | 0.25        | 19.76             | 0.00    | 0.00               | 35.00     | 5.0     | 30.72       |   |
| -20.12                                  | 0.25        | 19.72             | 0.00    | 0.00               | 35.00     | 5.0     | 31.39       |   |
| -19.87                                  | 0.25        | 19.66             | 0.00    | 0.00               | 35.00     | 5.0     | 32.06       |   |
| -19.62                                  | 0.25        | 19.58             | 0.00    | 0.00               | 35.00     | 5.0     | 32.74       |   |

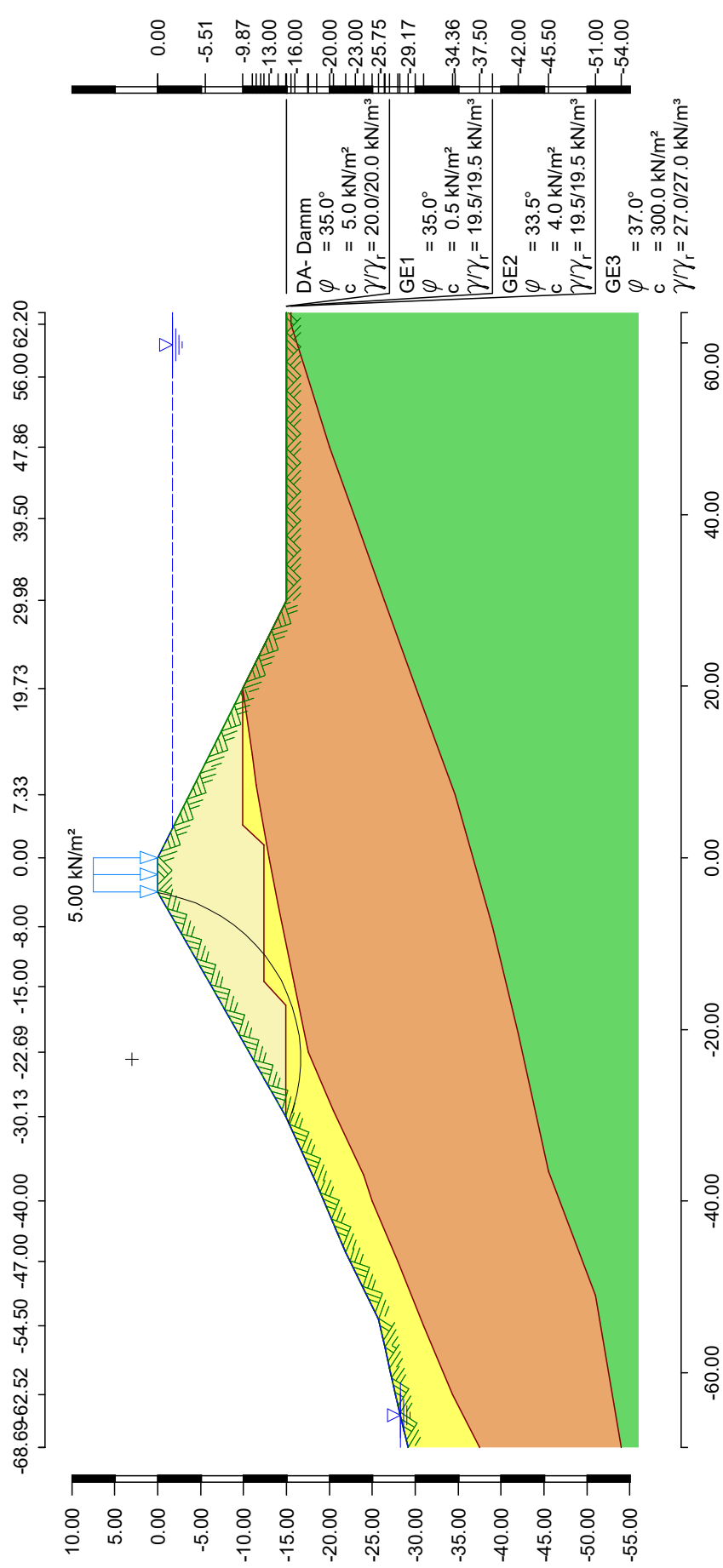
|                                         |             |                   |         |                    |           |                      |                            |   |
|-----------------------------------------|-------------|-------------------|---------|--------------------|-----------|----------------------|----------------------------|---|
|                                         |             |                   |         |                    |           |                      | Seite                      | 5 |
| Programm DC-Böschung/Win Version 24.2.0 |             |                   |         |                    |           |                      |                            |   |
| D-L_LFK1                                |             |                   |         |                    |           |                      | Lastfall                   | G |
|                                         |             |                   |         |                    |           |                      |                            |   |
| $x_M$                                   | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c                    | $\vartheta$                |   |
| [m]                                     | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]                     |   |
| -19.37                                  | 0.25        | 19.48             | 0.00    | 0.00               | 35.00     | 5.0                  | 33.42                      |   |
| -19.12                                  | 0.25        | 19.36             | 0.00    | 0.00               | 35.00     | 5.0                  | 34.11                      |   |
| -18.87                                  | 0.25        | 19.22             | 0.00    | 0.00               | 35.00     | 5.0                  | 34.80                      |   |
| -18.62                                  | 0.25        | 19.05             | 0.00    | 0.00               | 35.00     | 5.0                  | 35.50                      |   |
| -18.37                                  | 0.25        | 18.86             | 0.00    | 0.00               | 35.00     | 5.0                  | 36.20                      |   |
| -18.12                                  | 0.25        | 18.65             | 0.00    | 0.00               | 35.00     | 5.0                  | 36.91                      |   |
| -17.87                                  | 0.25        | 18.41             | 0.00    | 0.00               | 35.00     | 5.0                  | 37.63                      |   |
| -17.62                                  | 0.25        | 18.15             | 0.00    | 0.00               | 35.00     | 5.0                  | 38.36                      |   |
| -17.37                                  | 0.25        | 17.86             | 0.00    | 0.00               | 35.00     | 5.0                  | 39.09                      |   |
| -17.12                                  | 0.25        | 17.55             | 0.00    | 0.00               | 35.00     | 5.0                  | 39.83                      |   |
| -16.87                                  | 0.25        | 17.21             | 0.00    | 0.00               | 35.00     | 5.0                  | 40.58                      |   |
| -16.62                                  | 0.25        | 16.84             | 0.00    | 0.00               | 35.00     | 5.0                  | 41.33                      |   |
| -16.37                                  | 0.25        | 16.44             | 0.00    | 0.00               | 35.00     | 5.0                  | 42.10                      |   |
| -16.12                                  | 0.25        | 16.00             | 0.00    | 0.00               | 35.00     | 5.0                  | 42.87                      |   |
| -15.88                                  | 0.25        | 15.54             | 0.00    | 0.00               | 35.00     | 5.0                  | 43.66                      |   |
| -15.63                                  | 0.25        | 15.05             | 0.00    | 0.00               | 35.00     | 5.0                  | 44.45                      |   |
| -15.38                                  | 0.25        | 14.52             | 0.00    | 0.00               | 35.00     | 5.0                  | 45.26                      |   |
| -15.13                                  | 0.25        | 13.95             | 0.00    | 0.00               | 35.00     | 5.0                  | 46.07                      |   |
| -14.88                                  | 0.25        | 13.35             | 0.00    | 0.00               | 35.00     | 5.0                  | 46.90                      |   |
| -14.63                                  | 0.25        | 12.71             | 0.00    | 0.00               | 35.00     | 5.0                  | 47.75                      |   |
| -14.38                                  | 0.25        | 12.03             | 0.00    | 0.00               | 35.00     | 5.0                  | 48.60                      |   |
| -14.13                                  | 0.25        | 11.30             | 0.00    | 0.00               | 35.00     | 5.0                  | 49.47                      |   |
| -13.88                                  | 0.25        | 10.53             | 0.00    | 0.00               | 35.00     | 5.0                  | 50.36                      |   |
| -13.63                                  | 0.25        | 9.71              | 0.00    | 0.00               | 35.00     | 5.0                  | 51.26                      |   |
| -13.38                                  | 0.25        | 8.84              | 0.00    | 0.00               | 35.00     | 5.0                  | 52.19                      |   |
| -13.13                                  | 0.25        | 7.92              | 0.00    | 0.00               | 35.00     | 5.0                  | 53.13                      |   |
| -12.88                                  | 0.25        | 6.93              | 0.00    | 0.00               | 35.00     | 5.0                  | 54.09                      |   |
| -12.63                                  | 0.25        | 5.89              | 0.00    | 0.00               | 35.00     | 5.0                  | 55.08                      |   |
| -12.38                                  | 0.25        | 4.78              | 0.00    | 0.00               | 35.00     | 5.0                  | 56.09                      |   |
| -12.13                                  | 0.25        | 3.60              | 0.00    | 0.00               | 35.00     | 5.0                  | 57.12                      |   |
| -11.88                                  | 0.25        | 2.34              | 0.00    | 0.00               | 35.00     | 5.0                  | 58.19                      |   |
| -11.63                                  | 0.25        | 0.99              | 0.00    | 0.00               | 35.00     | 5.0                  | 59.29                      |   |
| -11.47                                  | 0.05        | 0.03              | 0.00    | 0.00               | 35.00     | 5.0                  | 59.97                      |   |
| $x_M$                                   |             |                   |         |                    |           | R*T <sub>i</sub>     | R*G*<br>sin( $\vartheta$ ) |   |
| [m]                                     |             |                   |         |                    |           | [kNm/m]              | [kNm/m]                    |   |
| -34.26                                  |             |                   |         |                    |           | 0.14                 | 0.00                       |   |
| -34.13                                  |             |                   |         |                    |           | 6.67                 | -0.31                      |   |
| -33.88                                  |             |                   |         |                    |           | 14.31                | -0.64                      |   |
| -33.63                                  |             |                   |         |                    |           | 21.71                | -0.66                      |   |
| -33.38                                  |             |                   |         |                    |           | 28.87                | -0.39                      |   |
| -33.13                                  |             |                   |         |                    |           | 35.82                | 0.16                       |   |
| -32.88                                  |             |                   |         |                    |           | 42.54                | 0.99                       |   |
| -32.63                                  |             |                   |         |                    |           | 49.05                | 2.08                       |   |
| -32.38                                  |             |                   |         |                    |           | 55.35                | 3.43                       |   |
| -32.13                                  |             |                   |         |                    |           | 61.45                | 5.03                       |   |
| -31.88                                  |             |                   |         |                    |           | 67.34                | 6.86                       |   |
| -31.63                                  |             |                   |         |                    |           | 73.04                | 8.92                       |   |
| -31.38                                  |             |                   |         |                    |           | 78.55                | 11.20                      |   |
| -31.13                                  |             |                   |         |                    |           | 83.87                | 13.69                      |   |
| -30.88                                  |             |                   |         |                    |           | 89.00                | 16.38                      |   |
| -30.63                                  |             |                   |         |                    |           | 93.96                | 19.26                      |   |
| -30.38                                  |             |                   |         |                    |           | 98.73                | 22.33                      |   |
| -30.13                                  |             |                   |         |                    |           | 103.57               | 25.62                      |   |
| -29.88                                  |             |                   |         |                    |           | 109.70               | 29.50                      |   |
| -29.63                                  |             |                   |         |                    |           | 115.90               | 33.67                      |   |
| -29.38                                  |             |                   |         |                    |           | 121.91               | 38.06                      |   |

|                                         |  |               | Seite                           | 6 |
|-----------------------------------------|--|---------------|---------------------------------|---|
| Programm DC-Böschung/Win Version 24.2.0 |  |               | Lastfall                        | G |
| D-L_LFK1                                |  |               |                                 |   |
| $x_M$                                   |  | $R \cdot T_i$ | $R \cdot G \cdot \sin(\varphi)$ |   |
| [m]                                     |  | [kNm/m]       | [kNm/m]                         |   |
| -29.13                                  |  | 127.75        | 42.67                           |   |
| -28.88                                  |  | 133.41        | 47.49                           |   |
| -28.63                                  |  | 138.89        | 52.50                           |   |
| -28.38                                  |  | 144.21        | 57.70                           |   |
| -28.13                                  |  | 149.36        | 63.08                           |   |
| -27.88                                  |  | 154.35        | 68.62                           |   |
| -27.63                                  |  | 159.17        | 74.31                           |   |
| -27.38                                  |  | 163.82        | 80.15                           |   |
| -27.13                                  |  | 168.32        | 86.13                           |   |
| -26.88                                  |  | 172.66        | 92.23                           |   |
| -26.63                                  |  | 176.84        | 98.45                           |   |
| -26.38                                  |  | 180.86        | 104.77                          |   |
| -26.13                                  |  | 184.73        | 111.18                          |   |
| -25.88                                  |  | 188.44        | 117.67                          |   |
| -25.63                                  |  | 192.00        | 124.24                          |   |
| -25.38                                  |  | 195.41        | 130.86                          |   |
| -25.13                                  |  | 198.66        | 137.53                          |   |
| -24.88                                  |  | 201.76        | 144.23                          |   |
| -24.63                                  |  | 204.70        | 150.95                          |   |
| -24.38                                  |  | 207.49        | 157.69                          |   |
| -24.13                                  |  | 210.13        | 164.42                          |   |
| -23.88                                  |  | 212.62        | 171.14                          |   |
| -23.63                                  |  | 214.93        | 177.82                          |   |
| -23.38                                  |  | 235.36        | 184.36                          |   |
| -23.13                                  |  | 237.21        | 190.82                          |   |
| -22.88                                  |  | 238.90        | 197.20                          |   |
| -22.63                                  |  | 240.44        | 203.48                          |   |
| -22.38                                  |  | 241.80        | 209.65                          |   |
| -22.13                                  |  | 243.00        | 215.70                          |   |
| -21.88                                  |  | 244.04        | 221.60                          |   |
| -21.63                                  |  | 244.91        | 227.35                          |   |
| -21.38                                  |  | 245.60        | 232.93                          |   |
| -21.13                                  |  | 246.12        | 238.31                          |   |
| -20.88                                  |  | 246.46        | 243.49                          |   |
| -20.63                                  |  | 246.62        | 248.44                          |   |
| -20.37                                  |  | 246.59        | 253.14                          |   |
| -20.12                                  |  | 246.37        | 257.58                          |   |
| -19.87                                  |  | 245.96        | 261.73                          |   |
| -19.62                                  |  | 245.34        | 265.57                          |   |
| -19.37                                  |  | 244.53        | 269.09                          |   |
| -19.12                                  |  | 243.50        | 272.25                          |   |
| -18.87                                  |  | 242.25        | 275.04                          |   |
| -18.62                                  |  | 240.77        | 277.43                          |   |
| -18.37                                  |  | 239.07        | 279.40                          |   |
| -18.12                                  |  | 237.12        | 280.91                          |   |
| -17.87                                  |  | 234.92        | 281.94                          |   |
| -17.62                                  |  | 232.47        | 282.47                          |   |
| -17.37                                  |  | 229.74        | 282.45                          |   |
| -17.12                                  |  | 226.73        | 281.87                          |   |
| -16.87                                  |  | 223.41        | 280.67                          |   |
| -16.62                                  |  | 219.80        | 278.83                          |   |
| -16.37                                  |  | 215.85        | 276.32                          |   |
| -16.12                                  |  | 211.56        | 273.08                          |   |
| -15.88                                  |  | 206.91        | 269.08                          |   |
| -15.63                                  |  | 201.87        | 264.27                          |   |
| -15.38                                  |  | 196.43        | 258.60                          |   |
| -15.13                                  |  | 190.56        | 252.02                          |   |
| -14.88                                  |  | 184.23        | 244.48                          |   |



|                                         |         |                          |               |                                   |
|-----------------------------------------|---------|--------------------------|---------------|-----------------------------------|
|                                         |         |                          | Seite         | 7                                 |
| Programm DC-Böschung/Win Version 24.2.0 |         |                          |               |                                   |
| D-L_LFK1                                |         |                          | Lastfall      | G                                 |
|                                         |         |                          |               |                                   |
| $x_M$                                   |         |                          | $R \cdot T_i$ | $R \cdot G \cdot \sin(\vartheta)$ |
| [m]                                     |         |                          | [kNm/m]       | [kNm/m]                           |
| -14.63                                  |         |                          | 177.40        | 235.91                            |
| -14.38                                  |         |                          | 170.05        | 226.25                            |
| -14.13                                  |         |                          | 162.13        | 215.42                            |
| -13.88                                  |         |                          | 153.59        | 203.35                            |
| -13.63                                  |         |                          | 144.39        | 189.96                            |
| -13.38                                  |         |                          | 134.47        | 175.14                            |
| -13.13                                  |         |                          | 123.77        | 158.81                            |
| -12.88                                  |         |                          | 112.20        | 140.85                            |
| -12.63                                  |         |                          | 99.67         | 121.12                            |
| -12.38                                  |         |                          | 86.09         | 99.48                             |
| -12.13                                  |         |                          | 71.33         | 75.78                             |
| -11.88                                  |         |                          | 55.24         | 49.82                             |
| -11.63                                  |         |                          | 37.67         | 21.39                             |
| -11.47                                  |         |                          | 5.30          | 0.63                              |
|                                         |         |                          |               |                                   |
| Summen:                                 |         |                          | 15081.72      | 13436.47                          |
|                                         |         |                          |               |                                   |
| Einwirkungen                            | $E_d =$ | 13436.47 kN              |               |                                   |
| Widerstände                             | $R_d =$ | 15081.72 kN              |               |                                   |
|                                         |         |                          |               |                                   |
| $E_d/R_d = 0.89 < 1.0$                  |         | *** Nachweis erfüllt *** |               |                                   |





Eingabedatei: M:\Projekte\2023\

23020\_P-BL-S-SK-K\_Speicher-Bodensee\_Kronplatz\Berechnungen\D-L\_LFK2.dbb

## Berechnung nach: NTC 2018 (Eurocode 7)

Berechnung mit Nachweisverfahren 1

Kombination mit Teilsicherheitsbeiwerten der Gruppen A2 + M2 + R2

| Schichtdaten                          |                      | DA- Damm<br>GE3       | GE1   | GE2   |
|---------------------------------------|----------------------|-----------------------|-------|-------|
| Innere Reibung $\text{cal } \varphi'$ | [Grad]               | 35.00<br>37.00        | 35.00 | 33.50 |
| Kohäsion $\text{cal } c'$             | [kN/m <sup>2</sup> ] | 5.0                   | 0.5   | 4.0   |
| Wichte Boden                          | [kN/m <sup>3</sup> ] | 300.0<br>20.0<br>27.0 | 19.5  | 19.5  |
| Wichte wassergesättigt                | [kN/m <sup>3</sup> ] | 20.0<br>27.0          | 19.5  | 19.5  |
| Wichte unter Auftrieb                 | [kN/m <sup>3</sup> ] | 10.0<br>17.0          | 9.5   | 9.5   |

### Geländeverlauf und Schichten

|           |           |        |        |        |        |        |
|-----------|-----------|--------|--------|--------|--------|--------|
| x [m]     |           | -68.69 | -64.72 | -62.53 | -59.50 | -57.00 |
|           |           | -54.50 | -53.74 | -51.00 | -47.00 | -45.97 |
|           |           | -40.00 | -38.00 | -37.00 | -36.50 | -30.12 |
|           |           | -29.50 | -22.69 | -20.50 | -17.16 | -15.00 |
|           |           | -14.37 | -8.00  | -5.50  | -4.00  | 0.00   |
|           |           | 1.52   | 3.86   | 5.50   | 7.33   | 8.50   |
|           |           | 11.03  | 12.00  | 19.73  | 20.00  | 29.98  |
|           |           | 30.00  | 39.50  | 47.86  | 56.00  | 62.20  |
|           |           | 63.50  |        |        |        |        |
|           | z Gelände | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |           | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |           | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |           | -14.57 | -10.68 | -9.43  | -7.52  | -6.29  |
|           |           | -5.93  | -2.29  | -0.86  | 0.00   | 0.00   |
|           |           | -0.76  | -1.93  | -2.75  | -3.67  | -4.25  |
|           |           | -5.51  | -6.00  | -9.87  | -10.00 | -14.99 |
|           |           | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |           | -15.00 |        |        |        |        |
|           |           | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
| z Schicht | DA- Damm  | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |           | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |           | -14.93 | -14.93 | -14.93 | -14.93 | -12.94 |
|           |           | -12.37 | -12.37 | -12.37 | -12.37 | -12.37 |
|           |           | -12.37 | -9.87  | -9.87  | -9.87  | -9.87  |
|           |           | -9.87  | -9.87  | -9.87  | -10.00 | -14.99 |
|           |           | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |           | -15.00 |        |        |        |        |
|           |           | -37.50 | -35.48 | -34.36 | -33.09 | -32.05 |
|           |           | -31.00 | -30.70 | -29.60 | -28.00 | -27.56 |
| z Schicht | GE1       | -25.00 | -24.33 | -24.00 | -23.77 | -20.79 |
|           |           | -20.50 | -17.56 | -17.12 | -16.44 | -16.00 |
|           |           | -15.87 | -14.53 | -14.00 | -13.73 | -13.00 |
|           |           | -12.72 | -12.30 | -12.00 | -11.69 | -11.50 |
|           |           | -11.14 | -11.00 | -9.87  | -10.00 | -14.99 |
|           |           | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |           | -15.00 |        |        |        |        |
|           |           | -15.00 |        |        |        |        |



**Bestimmung der Sicherheit nach Krey-Bishop**

Gleitkreis mit Iteration des Mittelpunktes:

Startpunkt:  $x_M = -23.50$  m,  $z_M = 3.00$  m, $\Delta x = 1.00$  m,  $\Delta z = 1.00$  m,mit Iteration des Radius:  $\Delta R = 1.00$  m ab  $R = 19.70$  m**Lastfallkomb. G**Gleitkörper von  $x = -34.26$  bis  $-11.45$  mGleitkreis:  $x_M = -33.19$  m,  $z_M = 8.25$  m,  $R = 25.08$  m**Bestimmung der Lamellen-Anteile**

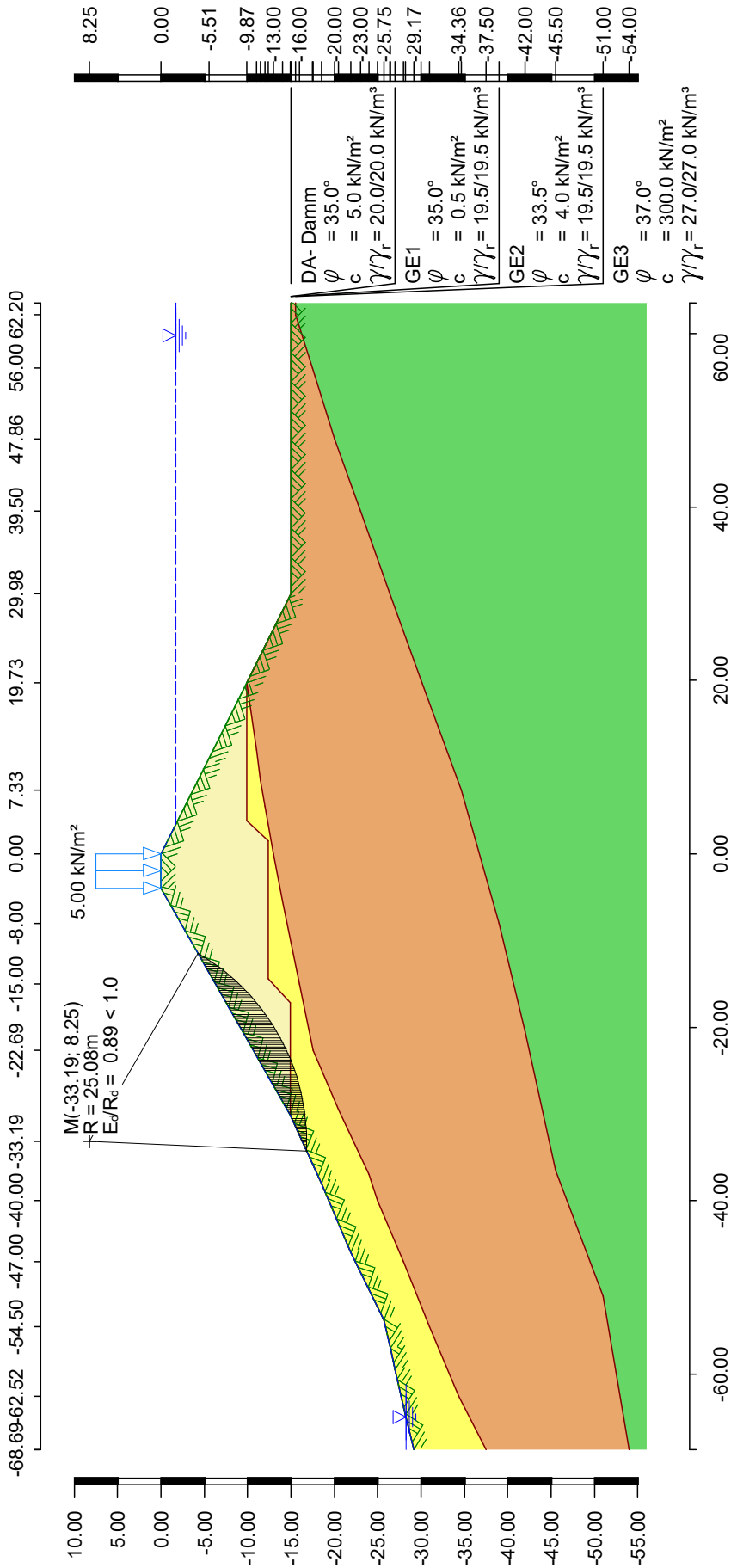
| $x_M$  | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c                    | $\vartheta$ |
|--------|-------------|-------------------|---------|--------------------|-----------|----------------------|-------------|
| [m]    | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]      |
| -34.26 | 0.01        | 0.00              | 0.00    | 0.00               | 35.00     | 0.5                  | -2.44       |
| -34.13 | 0.25        | 0.33              | 0.00    | 0.00               | 35.00     | 0.5                  | -2.14       |
| -33.88 | 0.25        | 0.93              | 0.00    | 0.00               | 35.00     | 0.5                  | -1.57       |
| -33.63 | 0.25        | 1.51              | 0.00    | 0.00               | 35.00     | 0.5                  | -1.00       |
| -33.38 | 0.25        | 2.07              | 0.00    | 0.00               | 35.00     | 0.5                  | -0.43       |
| -33.13 | 0.25        | 2.63              | 0.00    | 0.00               | 35.00     | 0.5                  | 0.14        |
| -32.88 | 0.25        | 3.17              | 0.00    | 0.00               | 35.00     | 0.5                  | 0.71        |
| -32.63 | 0.25        | 3.70              | 0.00    | 0.00               | 35.00     | 0.5                  | 1.29        |
| -32.38 | 0.25        | 4.22              | 0.00    | 0.00               | 35.00     | 0.5                  | 1.86        |
| -32.13 | 0.25        | 4.73              | 0.00    | 0.00               | 35.00     | 0.5                  | 2.43        |
| -31.88 | 0.25        | 5.23              | 0.00    | 0.00               | 35.00     | 0.5                  | 3.00        |
| -31.63 | 0.25        | 5.71              | 0.00    | 0.00               | 35.00     | 0.5                  | 3.57        |
| -31.38 | 0.25        | 6.18              | 0.00    | 0.00               | 35.00     | 0.5                  | 4.14        |
| -31.13 | 0.25        | 6.64              | 0.00    | 0.00               | 35.00     | 0.5                  | 4.72        |
| -30.88 | 0.25        | 7.08              | 0.00    | 0.00               | 35.00     | 0.5                  | 5.29        |
| -30.63 | 0.25        | 7.52              | 0.00    | 0.00               | 35.00     | 0.5                  | 5.86        |
| -30.38 | 0.25        | 7.94              | 0.00    | 0.00               | 35.00     | 0.5                  | 6.44        |
| -30.13 | 0.25        | 8.37              | 0.00    | 0.00               | 35.00     | 0.5                  | 7.01        |
| -29.88 | 0.25        | 8.90              | 0.00    | 0.00               | 35.00     | 0.5                  | 7.59        |
| -29.63 | 0.25        | 9.45              | 0.00    | 0.00               | 35.00     | 0.5                  | 8.17        |
| -29.38 | 0.25        | 9.98              | 0.00    | 0.00               | 35.00     | 0.5                  | 8.74        |
| -29.13 | 0.25        | 10.50             | 0.00    | 0.00               | 35.00     | 0.5                  | 9.32        |
| -28.88 | 0.25        | 11.01             | 0.00    | 0.00               | 35.00     | 0.5                  | 9.90        |
| -28.63 | 0.25        | 11.51             | 0.00    | 0.00               | 35.00     | 0.5                  | 10.48       |
| -28.38 | 0.25        | 11.99             | 0.00    | 0.00               | 35.00     | 0.5                  | 11.06       |
| -28.13 | 0.25        | 12.46             | 0.00    | 0.00               | 35.00     | 0.5                  | 11.65       |
| -27.88 | 0.25        | 12.92             | 0.00    | 0.00               | 35.00     | 0.5                  | 12.23       |
| -27.63 | 0.25        | 13.36             | 0.00    | 0.00               | 35.00     | 0.5                  | 12.81       |
| -27.38 | 0.25        | 13.79             | 0.00    | 0.00               | 35.00     | 0.5                  | 13.40       |
| -27.13 | 0.25        | 14.21             | 0.00    | 0.00               | 35.00     | 0.5                  | 13.99       |
| -26.88 | 0.25        | 14.61             | 0.00    | 0.00               | 35.00     | 0.5                  | 14.58       |
| -26.63 | 0.25        | 15.00             | 0.00    | 0.00               | 35.00     | 0.5                  | 15.17       |
| -26.38 | 0.25        | 15.38             | 0.00    | 0.00               | 35.00     | 0.5                  | 15.76       |
| -26.13 | 0.25        | 15.74             | 0.00    | 0.00               | 35.00     | 0.5                  | 16.36       |
| -25.88 | 0.25        | 16.09             | 0.00    | 0.00               | 35.00     | 0.5                  | 16.95       |
| -25.63 | 0.25        | 16.43             | 0.00    | 0.00               | 35.00     | 0.5                  | 17.55       |
| -25.38 | 0.25        | 16.75             | 0.00    | 0.00               | 35.00     | 0.5                  | 18.15       |
| -25.13 | 0.25        | 17.06             | 0.00    | 0.00               | 35.00     | 0.5                  | 18.75       |
| -24.88 | 0.25        | 17.35             | 0.00    | 0.00               | 35.00     | 0.5                  | 19.36       |
| -24.63 | 0.25        | 17.63             | 0.00    | 0.00               | 35.00     | 0.5                  | 19.96       |
| -24.38 | 0.25        | 17.89             | 0.00    | 0.00               | 35.00     | 0.5                  | 20.57       |
| -24.13 | 0.25        | 18.14             | 0.00    | 0.00               | 35.00     | 0.5                  | 21.18       |
| -23.88 | 0.25        | 18.38             | 0.00    | 0.00               | 35.00     | 0.5                  | 21.80       |
| -23.63 | 0.25        | 18.60             | 0.00    | 0.00               | 35.00     | 0.5                  | 22.41       |
| -23.38 | 0.25        | 18.79             | 0.00    | 0.00               | 35.00     | 5.0                  | 23.03       |
| -23.13 | 0.25        | 18.96             | 0.00    | 0.00               | 35.00     | 5.0                  | 23.66       |
| -22.88 | 0.25        | 19.12             | 0.00    | 0.00               | 35.00     | 5.0                  | 24.28       |

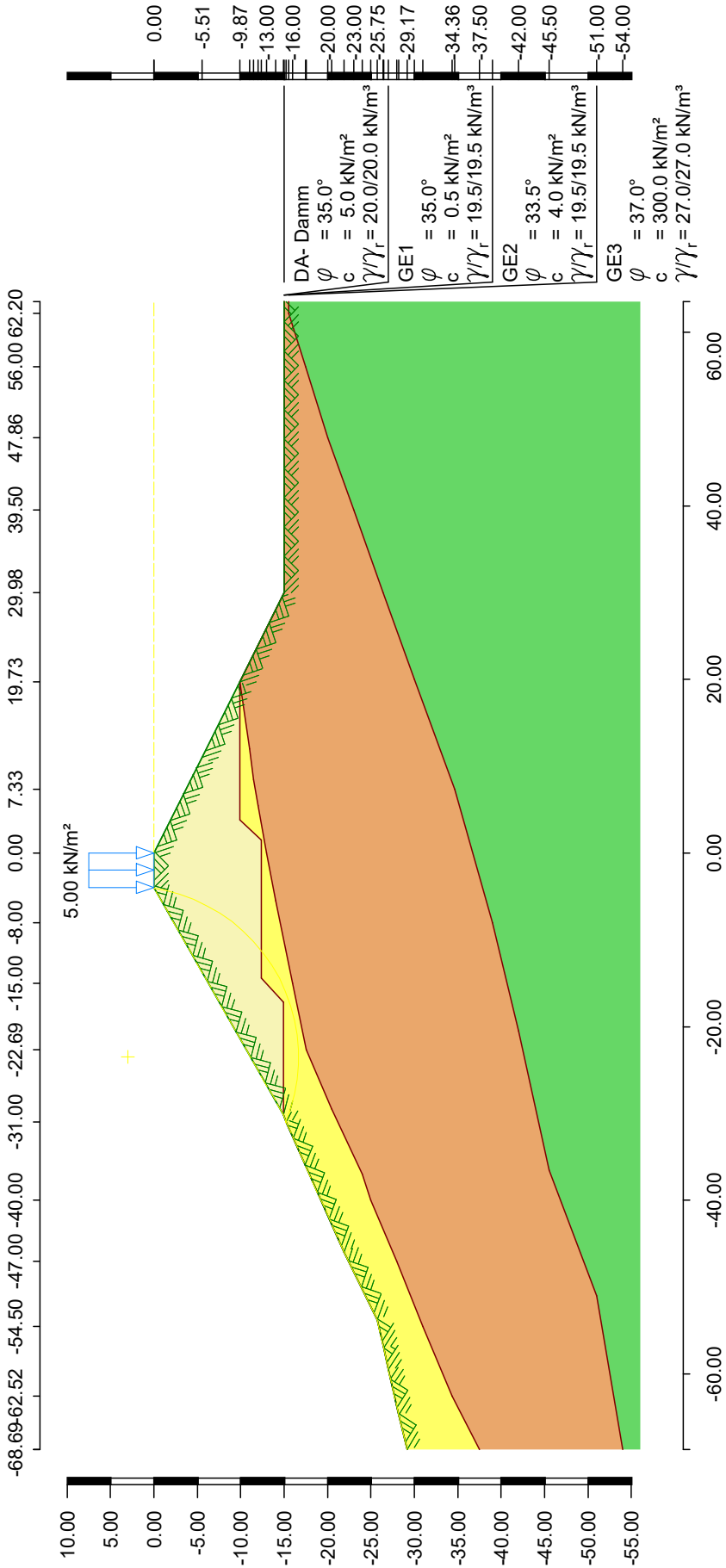
|                                         |             |                   |         |                    |           |                      | Seite                      | 5 |
|-----------------------------------------|-------------|-------------------|---------|--------------------|-----------|----------------------|----------------------------|---|
| Programm DC-Böschung/Win Version 24.2.0 |             |                   |         |                    |           |                      | Lastfall                   | G |
| D-L_LFK2                                |             |                   |         |                    |           |                      |                            |   |
| $x_M$                                   | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c                    | $\vartheta$                |   |
| [m]                                     | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]                     |   |
| -22.63                                  | 0.25        | 19.26             | 0.00    | 0.00               | 35.00     | 5.0                  | 24.91                      |   |
| -22.38                                  | 0.25        | 19.39             | 0.00    | 0.00               | 35.00     | 5.0                  | 25.54                      |   |
| -22.13                                  | 0.25        | 19.50             | 0.00    | 0.00               | 35.00     | 5.0                  | 26.17                      |   |
| -21.88                                  | 0.25        | 19.59             | 0.00    | 0.00               | 35.00     | 5.0                  | 26.81                      |   |
| -21.63                                  | 0.25        | 19.66             | 0.00    | 0.00               | 35.00     | 5.0                  | 27.45                      |   |
| -21.38                                  | 0.25        | 19.72             | 0.00    | 0.00               | 35.00     | 5.0                  | 28.10                      |   |
| -21.13                                  | 0.25        | 19.76             | 0.00    | 0.00               | 35.00     | 5.0                  | 28.75                      |   |
| -20.88                                  | 0.25        | 19.78             | 0.00    | 0.00               | 35.00     | 5.0                  | 29.40                      |   |
| -20.63                                  | 0.25        | 19.78             | 0.00    | 0.00               | 35.00     | 5.0                  | 30.06                      |   |
| -20.37                                  | 0.25        | 19.76             | 0.00    | 0.00               | 35.00     | 5.0                  | 30.72                      |   |
| -20.12                                  | 0.25        | 19.72             | 0.00    | 0.00               | 35.00     | 5.0                  | 31.39                      |   |
| -19.87                                  | 0.25        | 19.66             | 0.00    | 0.00               | 35.00     | 5.0                  | 32.06                      |   |
| -19.62                                  | 0.25        | 19.58             | 0.00    | 0.00               | 35.00     | 5.0                  | 32.74                      |   |
| -19.37                                  | 0.25        | 19.48             | 0.00    | 0.00               | 35.00     | 5.0                  | 33.42                      |   |
| -19.12                                  | 0.25        | 19.36             | 0.00    | 0.00               | 35.00     | 5.0                  | 34.11                      |   |
| -18.87                                  | 0.25        | 19.22             | 0.00    | 0.00               | 35.00     | 5.0                  | 34.80                      |   |
| -18.62                                  | 0.25        | 19.05             | 0.00    | 0.00               | 35.00     | 5.0                  | 35.50                      |   |
| -18.37                                  | 0.25        | 18.86             | 0.00    | 0.00               | 35.00     | 5.0                  | 36.20                      |   |
| -18.12                                  | 0.25        | 18.65             | 0.00    | 0.00               | 35.00     | 5.0                  | 36.91                      |   |
| -17.87                                  | 0.25        | 18.41             | 0.00    | 0.00               | 35.00     | 5.0                  | 37.63                      |   |
| -17.62                                  | 0.25        | 18.15             | 0.00    | 0.00               | 35.00     | 5.0                  | 38.36                      |   |
| -17.37                                  | 0.25        | 17.86             | 0.00    | 0.00               | 35.00     | 5.0                  | 39.09                      |   |
| -17.12                                  | 0.25        | 17.55             | 0.00    | 0.00               | 35.00     | 5.0                  | 39.83                      |   |
| -16.87                                  | 0.25        | 17.21             | 0.00    | 0.00               | 35.00     | 5.0                  | 40.58                      |   |
| -16.62                                  | 0.25        | 16.84             | 0.00    | 0.00               | 35.00     | 5.0                  | 41.33                      |   |
| -16.37                                  | 0.25        | 16.44             | 0.00    | 0.00               | 35.00     | 5.0                  | 42.10                      |   |
| -16.12                                  | 0.25        | 16.00             | 0.00    | 0.00               | 35.00     | 5.0                  | 42.87                      |   |
| -15.88                                  | 0.25        | 15.54             | 0.00    | 0.00               | 35.00     | 5.0                  | 43.66                      |   |
| -15.63                                  | 0.25        | 15.05             | 0.00    | 0.00               | 35.00     | 5.0                  | 44.45                      |   |
| -15.38                                  | 0.25        | 14.52             | 0.00    | 0.00               | 35.00     | 5.0                  | 45.26                      |   |
| -15.13                                  | 0.25        | 13.95             | 0.00    | 0.00               | 35.00     | 5.0                  | 46.07                      |   |
| -14.88                                  | 0.25        | 13.35             | 0.00    | 0.00               | 35.00     | 5.0                  | 46.90                      |   |
| -14.63                                  | 0.25        | 12.71             | 0.00    | 0.00               | 35.00     | 5.0                  | 47.75                      |   |
| -14.38                                  | 0.25        | 12.03             | 0.00    | 0.00               | 35.00     | 5.0                  | 48.60                      |   |
| -14.13                                  | 0.25        | 11.30             | 0.00    | 0.00               | 35.00     | 5.0                  | 49.47                      |   |
| -13.88                                  | 0.25        | 10.53             | 0.00    | 0.00               | 35.00     | 5.0                  | 50.36                      |   |
| -13.63                                  | 0.25        | 9.71              | 0.00    | 0.00               | 35.00     | 5.0                  | 51.26                      |   |
| -13.38                                  | 0.25        | 8.84              | 0.00    | 0.00               | 35.00     | 5.0                  | 52.19                      |   |
| -13.13                                  | 0.25        | 7.92              | 0.00    | 0.00               | 35.00     | 5.0                  | 53.13                      |   |
| -12.88                                  | 0.25        | 6.93              | 0.00    | 0.00               | 35.00     | 5.0                  | 54.09                      |   |
| -12.63                                  | 0.25        | 5.89              | 0.00    | 0.00               | 35.00     | 5.0                  | 55.08                      |   |
| -12.38                                  | 0.25        | 4.78              | 0.00    | 0.00               | 35.00     | 5.0                  | 56.09                      |   |
| -12.13                                  | 0.25        | 3.60              | 0.00    | 0.00               | 35.00     | 5.0                  | 57.12                      |   |
| -11.88                                  | 0.25        | 2.34              | 0.00    | 0.00               | 35.00     | 5.0                  | 58.19                      |   |
| -11.63                                  | 0.25        | 0.99              | 0.00    | 0.00               | 35.00     | 5.0                  | 59.29                      |   |
| -11.47                                  | 0.05        | 0.03              | 0.00    | 0.00               | 35.00     | 5.0                  | 59.97                      |   |
| $x_M$                                   |             |                   |         |                    |           | R*T <sub>i</sub>     | R*G*<br>sin( $\vartheta$ ) |   |
| [m]                                     |             |                   |         |                    |           | [kNm/m]              | [kNm/m]                    |   |
| -34.26                                  |             |                   |         |                    |           | 0.14                 | 0.00                       |   |
| -34.13                                  |             |                   |         |                    |           | 6.67                 | -0.31                      |   |
| -33.88                                  |             |                   |         |                    |           | 14.31                | -0.64                      |   |
| -33.63                                  |             |                   |         |                    |           | 21.71                | -0.66                      |   |
| -33.38                                  |             |                   |         |                    |           | 28.87                | -0.39                      |   |
| -33.13                                  |             |                   |         |                    |           | 35.82                | 0.16                       |   |
| -32.88                                  |             |                   |         |                    |           | 42.54                | 0.99                       |   |
| -32.63                                  |             |                   |         |                    |           | 49.05                | 2.08                       |   |

|                                         |  |               | Seite                           | 6 |
|-----------------------------------------|--|---------------|---------------------------------|---|
| Programm DC-Böschung/Win Version 24.2.0 |  |               | Lastfall                        | G |
| D-L_LFK2                                |  |               |                                 |   |
| $x_M$                                   |  | $R \cdot T_i$ | $R \cdot G \cdot \sin(\varphi)$ |   |
| [m]                                     |  | [kNm/m]       | [kNm/m]                         |   |
| -32.38                                  |  | 55.35         | 3.43                            |   |
| -32.13                                  |  | 61.45         | 5.03                            |   |
| -31.88                                  |  | 67.34         | 6.86                            |   |
| -31.63                                  |  | 73.04         | 8.92                            |   |
| -31.38                                  |  | 78.55         | 11.20                           |   |
| -31.13                                  |  | 83.87         | 13.69                           |   |
| -30.88                                  |  | 89.00         | 16.38                           |   |
| -30.63                                  |  | 93.96         | 19.26                           |   |
| -30.38                                  |  | 98.73         | 22.33                           |   |
| -30.13                                  |  | 103.57        | 25.62                           |   |
| -29.88                                  |  | 109.70        | 29.50                           |   |
| -29.63                                  |  | 115.90        | 33.67                           |   |
| -29.38                                  |  | 121.91        | 38.06                           |   |
| -29.13                                  |  | 127.75        | 42.67                           |   |
| -28.88                                  |  | 133.41        | 47.49                           |   |
| -28.63                                  |  | 138.89        | 52.50                           |   |
| -28.38                                  |  | 144.21        | 57.70                           |   |
| -28.13                                  |  | 149.36        | 63.08                           |   |
| -27.88                                  |  | 154.35        | 68.62                           |   |
| -27.63                                  |  | 159.17        | 74.31                           |   |
| -27.38                                  |  | 163.82        | 80.15                           |   |
| -27.13                                  |  | 168.32        | 86.13                           |   |
| -26.88                                  |  | 172.66        | 92.23                           |   |
| -26.63                                  |  | 176.84        | 98.45                           |   |
| -26.38                                  |  | 180.86        | 104.77                          |   |
| -26.13                                  |  | 184.73        | 111.18                          |   |
| -25.88                                  |  | 188.44        | 117.67                          |   |
| -25.63                                  |  | 192.00        | 124.24                          |   |
| -25.38                                  |  | 195.41        | 130.86                          |   |
| -25.13                                  |  | 198.66        | 137.53                          |   |
| -24.88                                  |  | 201.76        | 144.23                          |   |
| -24.63                                  |  | 204.70        | 150.95                          |   |
| -24.38                                  |  | 207.49        | 157.69                          |   |
| -24.13                                  |  | 210.13        | 164.42                          |   |
| -23.88                                  |  | 212.62        | 171.14                          |   |
| -23.63                                  |  | 214.93        | 177.82                          |   |
| -23.38                                  |  | 235.36        | 184.36                          |   |
| -23.13                                  |  | 237.21        | 190.82                          |   |
| -22.88                                  |  | 238.90        | 197.20                          |   |
| -22.63                                  |  | 240.44        | 203.48                          |   |
| -22.38                                  |  | 241.80        | 209.65                          |   |
| -22.13                                  |  | 243.00        | 215.70                          |   |
| -21.88                                  |  | 244.04        | 221.60                          |   |
| -21.63                                  |  | 244.91        | 227.35                          |   |
| -21.38                                  |  | 245.60        | 232.93                          |   |
| -21.13                                  |  | 246.12        | 238.31                          |   |
| -20.88                                  |  | 246.46        | 243.49                          |   |
| -20.63                                  |  | 246.62        | 248.44                          |   |
| -20.37                                  |  | 246.59        | 253.14                          |   |
| -20.12                                  |  | 246.37        | 257.58                          |   |
| -19.87                                  |  | 245.96        | 261.73                          |   |
| -19.62                                  |  | 245.34        | 265.57                          |   |
| -19.37                                  |  | 244.53        | 269.09                          |   |
| -19.12                                  |  | 243.50        | 272.25                          |   |
| -18.87                                  |  | 242.25        | 275.04                          |   |
| -18.62                                  |  | 240.77        | 277.43                          |   |
| -18.37                                  |  | 239.07        | 279.40                          |   |
| -18.12                                  |  | 237.12        | 280.91                          |   |



|                                         |  |               |                                   |          |
|-----------------------------------------|--|---------------|-----------------------------------|----------|
|                                         |  |               | Seite                             | 7        |
|                                         |  |               |                                   |          |
| Programm DC-Böschung/Win Version 24.2.0 |  |               | Lastfall                          | G        |
| D-L_LFK2                                |  |               |                                   |          |
| $x_M$                                   |  | $R \cdot T_i$ | $R \cdot G \cdot \sin(\vartheta)$ |          |
| [m]                                     |  | [kNm/m]       | [kNm/m]                           |          |
| -17.87                                  |  | 234.92        | 281.94                            |          |
| -17.62                                  |  | 232.47        | 282.47                            |          |
| -17.37                                  |  | 229.74        | 282.45                            |          |
| -17.12                                  |  | 226.73        | 281.87                            |          |
| -16.87                                  |  | 223.41        | 280.67                            |          |
| -16.62                                  |  | 219.80        | 278.83                            |          |
| -16.37                                  |  | 215.85        | 276.32                            |          |
| -16.12                                  |  | 211.56        | 273.08                            |          |
| -15.88                                  |  | 206.91        | 269.08                            |          |
| -15.63                                  |  | 201.87        | 264.27                            |          |
| -15.38                                  |  | 196.43        | 258.60                            |          |
| -15.13                                  |  | 190.56        | 252.02                            |          |
| -14.88                                  |  | 184.23        | 244.48                            |          |
| -14.63                                  |  | 177.40        | 235.91                            |          |
| -14.38                                  |  | 170.05        | 226.25                            |          |
| -14.13                                  |  | 162.13        | 215.42                            |          |
| -13.88                                  |  | 153.59        | 203.35                            |          |
| -13.63                                  |  | 144.39        | 189.96                            |          |
| -13.38                                  |  | 134.47        | 175.14                            |          |
| -13.13                                  |  | 123.77        | 158.81                            |          |
| -12.88                                  |  | 112.20        | 140.85                            |          |
| -12.63                                  |  | 99.67         | 121.12                            |          |
| -12.38                                  |  | 86.09         | 99.48                             |          |
| -12.13                                  |  | 71.33         | 75.78                             |          |
| -11.88                                  |  | 55.24         | 49.82                             |          |
| -11.63                                  |  | 37.67         | 21.39                             |          |
| -11.47                                  |  | 5.30          | 0.63                              |          |
| Summen:                                 |  |               | 15081.72                          | 13436.47 |
| Einwirkungen $E_d = 13436.47$ kN        |  |               |                                   |          |
| Widerstände $R_d = 15081.72$ kN         |  |               |                                   |          |
| $E_d/R_d = 0.89 < 1.0$                  |  |               |                                   |          |
| *** Nachweis erfüllt ***                |  |               |                                   |          |





Eingabedatei: M:\Projekte\2023\

23020\_P-BL-S-SK-K\_Speicher-Bodensee\_Kronplatz\Berechnungen\D-L\_LFK3.dbb

## Berechnung nach: NTC 2018 (Eurocode 7)

Berechnung mit Nachweisverfahren 1

Kombination mit Teilsicherheitsbeiwerten der Gruppen A2 + M2 + R2

| Schichtdaten                       |                      | DA- Damm<br>GE3      | GE1   | GE2   |
|------------------------------------|----------------------|----------------------|-------|-------|
| Innere Reibung $\text{cal } \phi'$ | [Grad]               | 35.00<br>37.00       | 35.00 | 33.50 |
| Kohäsion $\text{cal } c'$          | [kN/m <sup>2</sup> ] | 5.0                  | 0.5   | 4.0   |
| Wichte Boden                       | [kN/m <sup>3</sup> ] | 300.0<br>20.0        | 19.5  | 19.5  |
| Wichte wassergesättigt             | [kN/m <sup>3</sup> ] | 27.0<br>20.0         | 19.5  | 19.5  |
| Wichte unter Auftrieb              | [kN/m <sup>3</sup> ] | 27.0<br>10.0<br>17.0 | 9.5   | 9.5   |

### Geländeverlauf und Schichten

|           |          |        |        |        |        |        |
|-----------|----------|--------|--------|--------|--------|--------|
| x [m]     |          | -68.69 | -64.72 | -62.53 | -59.50 | -57.00 |
|           |          | -54.50 | -53.74 | -51.00 | -47.00 | -45.97 |
|           |          | -40.00 | -37.00 | -36.50 | -31.00 | -30.12 |
|           |          | -29.50 | -22.69 | -20.50 | -17.16 | -15.00 |
|           |          | -14.37 | -8.00  | -5.50  | -4.00  | 0.00   |
|           |          | 1.52   | 3.86   | 5.50   | 7.33   | 8.50   |
|           |          | 11.03  | 12.00  | 19.73  | 20.00  | 29.98  |
|           |          | 30.00  | 39.50  | 47.86  | 56.00  | 62.20  |
|           |          | 63.50  |        |        |        |        |
| z Gelände |          | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |          | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |          | -19.25 | -17.90 | -17.67 | -15.21 | -14.93 |
|           |          | -14.57 | -10.68 | -9.43  | -7.52  | -6.29  |
|           |          | -5.93  | -2.29  | -0.86  | 0.00   | 0.00   |
|           |          | -0.76  | -1.93  | -2.75  | -3.67  | -4.25  |
|           |          | -5.51  | -6.00  | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |          | -15.00 |        |        |        |        |
| z Schicht | DA- Damm | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |          | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |          | -19.25 | -17.90 | -17.67 | -15.21 | -14.93 |
|           |          | -14.93 | -14.93 | -14.93 | -14.93 | -12.94 |
|           |          | -12.37 | -12.37 | -12.37 | -12.37 | -12.37 |
|           |          | -12.37 | -9.87  | -9.87  | -9.87  | -9.87  |
|           |          | -9.87  | -9.87  | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |          | -15.00 |        |        |        |        |
| z Schicht | GE1      | -37.50 | -35.48 | -34.36 | -33.09 | -32.05 |
|           |          | -31.00 | -30.70 | -29.60 | -28.00 | -27.56 |
|           |          | -25.00 | -24.00 | -23.77 | -21.20 | -20.79 |
|           |          | -20.50 | -17.56 | -17.12 | -16.44 | -16.00 |
|           |          | -15.87 | -14.53 | -14.00 | -13.73 | -13.00 |
|           |          | -12.72 | -12.30 | -12.00 | -11.69 | -11.50 |
|           |          | -11.14 | -11.00 | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |          | -15.00 |        |        |        |        |

|                                                     |                                   |                |                |                |          |          |                |                |                |      |
|-----------------------------------------------------|-----------------------------------|----------------|----------------|----------------|----------|----------|----------------|----------------|----------------|------|
|                                                     |                                   |                |                |                |          |          | Seite          | 3              |                |      |
| Programm DC-Böschung/Win Version 24.2.0<br>D-L_LFK3 |                                   |                |                |                |          |          | Lastfall       | G              |                |      |
|                                                     |                                   |                |                |                |          |          |                |                |                |      |
| z Schicht                                           | GE2                               | -54.00         | -53.33         | -52.95         | -52.44   | -52.02   |                |                |                |      |
|                                                     |                                   | -51.59         | -51.46         | -51.00         | -49.48   | -49.09   |                |                |                |      |
|                                                     |                                   | -46.83         | -45.69         | -45.50         | -44.30   | -44.11   |                |                |                |      |
|                                                     |                                   | -43.97         | -42.48         | -42.00         | -41.20   | -40.68   |                |                |                |      |
|                                                     |                                   | -40.53         | -39.00         | -38.29         | -37.86   | -36.72   |                |                |                |      |
|                                                     |                                   | -36.29         | -35.62         | -35.15         | -34.63   | -34.20   |                |                |                |      |
|                                                     |                                   | -33.28         | -32.92         | -30.10         | -30.00   | -26.39   |                |                |                |      |
|                                                     |                                   | -26.38         | -23.00         | -20.00         | -17.50   | -15.49   |                |                |                |      |
|                                                     |                                   | -15.49         |                |                |          |          |                |                |                |      |
| z Schicht                                           | GE3                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                                   | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
| Verlauf des Grundwasserspiegels                     |                                   |                |                |                |          |          |                |                |                |      |
| x [m]                                               | z [m]                             |                |                |                |          |          |                |                |                |      |
| -68.69                                              | -29.17                            |                |                |                |          |          |                |                |                |      |
| -64.72                                              | -28.19                            |                |                |                |          |          |                |                |                |      |
| -59.50                                              | -27.00                            |                |                |                |          |          |                |                |                |      |
| -57.00                                              | -26.50                            |                |                |                |          |          |                |                |                |      |
| -53.74                                              | -25.75                            |                |                |                |          |          |                |                |                |      |
| -45.97                                              | -21.92                            |                |                |                |          |          |                |                |                |      |
| -31.00                                              | -15.21                            |                |                |                |          |          |                |                |                |      |
| -30.13                                              | -14.93                            |                |                |                |          |          |                |                |                |      |
| -4.00                                               | 0.00                              |                |                |                |          |          |                |                |                |      |
| 0.00                                                | 0.00                              |                |                |                |          |          |                |                |                |      |
| 3.48                                                | 0.00                              |                |                |                |          |          |                |                |                |      |
| 52.00                                               | 0.00                              |                |                |                |          |          |                |                |                |      |
| 63.50                                               | 0.00                              |                |                |                |          |          |                |                |                |      |
| Streckenlasten                                      |                                   |                |                |                |          |          |                |                |                |      |
| Alle Lasten beziehen sich auf 1 m Länge             |                                   |                |                |                |          |          |                |                |                |      |
| LF-Komb.                                            | q                                 | x <sub>A</sub> | x <sub>E</sub> | z <sub>Q</sub> | γ        | ψ        |                |                |                |      |
| G                                                   | Q                                 | 5.0            | -4.0           | 0.0            | 0.00     | 1.30     | 1.00           |                |                |      |
| Lamellenbreiten                                     |                                   |                |                |                |          |          |                |                |                |      |
| Von x [m]                                           |                                   | bis x [m]      |                | Breite [m]     |          |          |                |                |                |      |
| -10000.00                                           |                                   | 10000.00       |                | 0.25           |          |          |                |                |                |      |
| Teilsicherheitsbeiwerte (GEO) für NW-Verf. 1        |                                   |                |                |                |          |          |                |                |                |      |
| γ-                                                  | G                                 | Q              | W              | E              | φ        | c        | c <sub>u</sub> | R <sub>a</sub> | R <sub>b</sub> | R    |
|                                                     | 1.00                              | 1.30           | 1.00           | 1.30           | 1.25     | 1.25     | 1.40           | 1.20           | 1.20           | 1.20 |
| γ-                                                  | Teilsicherheitsbeiwert für...     |                |                |                |          |          |                |                |                |      |
| G                                                   | Ständige Lasten                   |                |                |                |          |          |                |                |                |      |
| Q                                                   | Veränderliche Lasten              |                |                |                |          |          |                |                |                |      |
| W                                                   | Wasserdruck                       |                |                |                |          |          |                |                |                |      |
| E                                                   | Erdbeben                          |                |                |                |          |          |                |                |                |      |
| φ                                                   | Reibungsbeiwert tan(φ)            |                |                |                |          |          |                |                |                |      |
| c                                                   | Kohäsion c                        |                |                |                |          |          |                |                |                |      |
| c <sub>u</sub>                                      | Kohäsion undränirt c <sub>u</sub> |                |                |                |          |          |                |                |                |      |
| R <sub>a</sub>                                      | Anker                             |                |                |                |          |          |                |                |                |      |
| R <sub>b</sub>                                      | Bauteile                          |                |                |                |          |          |                |                |                |      |
| R                                                   | Widerstände                       |                |                |                |          |          |                |                |                |      |

**Bestimmung der Sicherheit nach Krey-Bishop**

Gleitkreis mit Iteration des Mittelpunktes:

Startpunkt:  $x_M = -23.50$  m,  $z_M = 3.00$  m, $\Delta x = 1.00$  m,  $\Delta z = 1.00$  m,mit Iteration des Radius:  $\Delta R = 1.00$  m ab  $R = 19.70$  m**Lastfallkomb. G**Gleitkörper von  $x = -33.26$  bis  $-9.53$  mGleitkreis:  $x_M = -31.75$  m,  $z_M = 9.13$  m,  $R = 25.39$  m**Bestimmung der Lamellen-Anteile**

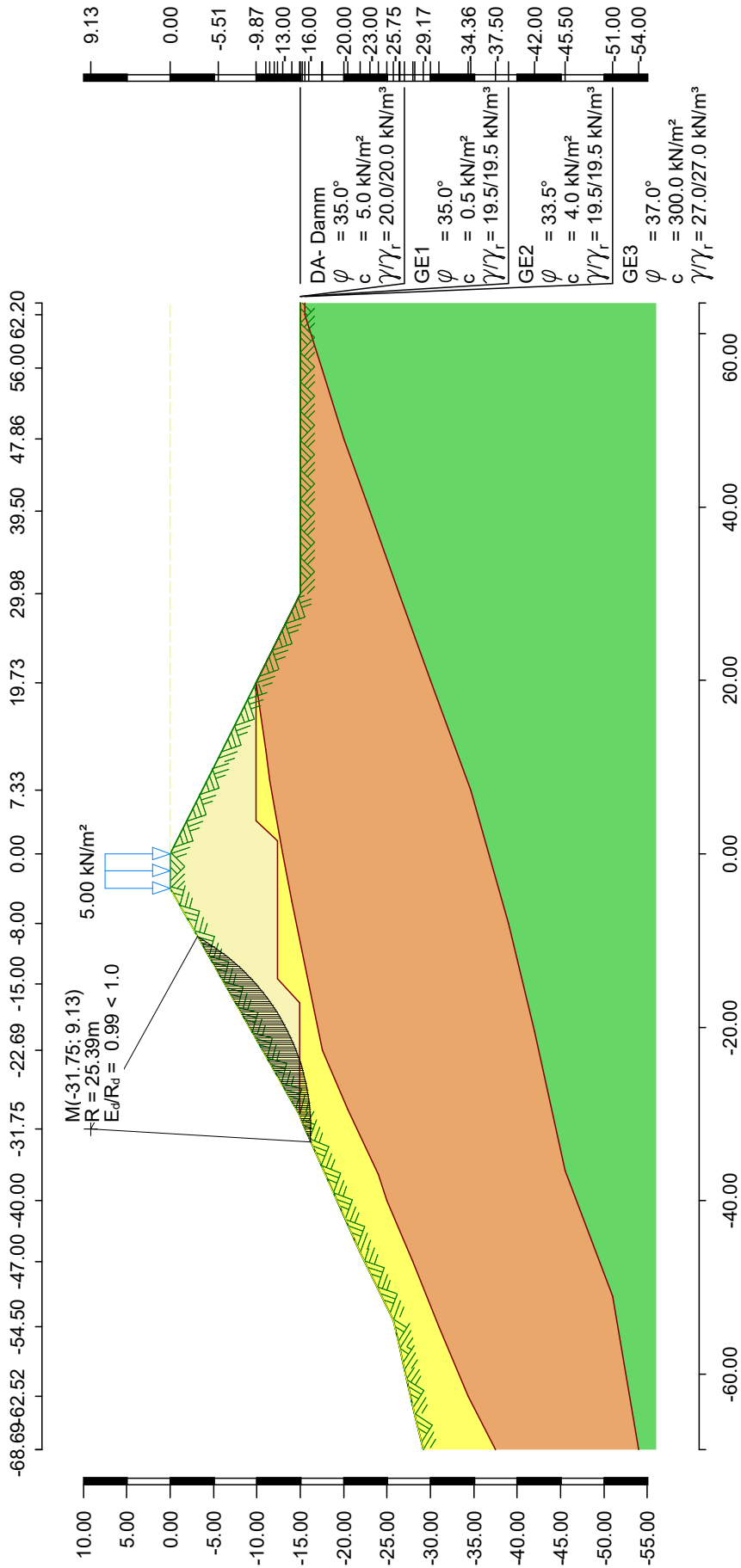
| $x_M$  | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c                    | $\vartheta$ |
|--------|-------------|-------------------|---------|--------------------|-----------|----------------------|-------------|
| [m]    | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]      |
| -33.26 | 0.01        | 0.00              | 0.00    | 0.00               | 35.00     | 0.5                  | -3.40       |
| -33.13 | 0.25        | 0.33              | 0.00    | 0.00               | 35.00     | 0.5                  | -3.10       |
| -32.88 | 0.25        | 0.94              | 0.00    | 0.00               | 35.00     | 0.5                  | -2.54       |
| -32.63 | 0.25        | 1.54              | 0.00    | 0.00               | 35.00     | 0.5                  | -1.97       |
| -32.38 | 0.25        | 2.12              | 0.00    | 0.00               | 35.00     | 0.5                  | -1.41       |
| -32.13 | 0.25        | 2.69              | 0.00    | 0.00               | 35.00     | 0.5                  | -0.85       |
| -31.88 | 0.25        | 3.25              | 0.00    | 0.00               | 35.00     | 0.5                  | -0.28       |
| -31.63 | 0.25        | 3.80              | 0.00    | 0.00               | 35.00     | 0.5                  | 0.28        |
| -31.38 | 0.25        | 4.33              | 0.00    | 0.00               | 35.00     | 0.5                  | 0.85        |
| -31.13 | 0.25        | 4.85              | 0.00    | 0.00               | 35.00     | 0.5                  | 1.41        |
| -30.88 | 0.25        | 5.28              | 0.00    | 0.00               | 35.00     | 0.5                  | 1.97        |
| -30.63 | 0.25        | 5.62              | 0.00    | 0.00               | 35.00     | 0.5                  | 2.54        |
| -30.38 | 0.25        | 5.95              | 0.00    | 0.00               | 35.00     | 0.5                  | 3.10        |
| -30.13 | 0.25        | 6.31              | 0.00    | 0.00               | 35.00     | 0.5                  | 3.67        |
| -29.88 | 0.25        | 6.90              | 0.00    | 0.00               | 35.00     | 0.5                  | 4.23        |
| -29.63 | 0.25        | 7.51              | 0.00    | 0.00               | 35.00     | 0.5                  | 4.80        |
| -29.38 | 0.25        | 8.12              | 0.00    | 0.00               | 35.00     | 0.5                  | 5.37        |
| -29.13 | 0.25        | 8.71              | 0.00    | 0.00               | 35.00     | 0.5                  | 5.93        |
| -28.88 | 0.25        | 9.30              | 0.00    | 0.00               | 35.00     | 0.5                  | 6.50        |
| -28.63 | 0.25        | 9.86              | 0.00    | 0.00               | 35.00     | 0.5                  | 7.07        |
| -28.38 | 0.25        | 10.42             | 0.00    | 0.00               | 35.00     | 0.5                  | 7.64        |
| -28.13 | 0.25        | 10.97             | 0.00    | 0.00               | 35.00     | 0.5                  | 8.21        |
| -27.88 | 0.25        | 11.50             | 0.00    | 0.00               | 35.00     | 0.5                  | 8.78        |
| -27.63 | 0.25        | 12.02             | 0.00    | 0.00               | 35.00     | 0.5                  | 9.35        |
| -27.38 | 0.25        | 12.53             | 0.00    | 0.00               | 35.00     | 0.5                  | 9.92        |
| -27.13 | 0.25        | 13.02             | 0.00    | 0.00               | 35.00     | 0.5                  | 10.49       |
| -26.88 | 0.25        | 13.50             | 0.00    | 0.00               | 35.00     | 0.5                  | 11.07       |
| -26.63 | 0.25        | 13.97             | 0.00    | 0.00               | 35.00     | 0.5                  | 11.64       |
| -26.38 | 0.25        | 14.43             | 0.00    | 0.00               | 35.00     | 0.5                  | 12.22       |
| -26.13 | 0.25        | 14.87             | 0.00    | 0.00               | 35.00     | 0.5                  | 12.80       |
| -25.88 | 0.25        | 15.30             | 0.00    | 0.00               | 35.00     | 0.5                  | 13.38       |
| -25.63 | 0.25        | 15.72             | 0.00    | 0.00               | 35.00     | 0.5                  | 13.96       |
| -25.38 | 0.25        | 16.13             | 0.00    | 0.00               | 35.00     | 0.5                  | 14.54       |
| -25.13 | 0.25        | 16.52             | 0.00    | 0.00               | 35.00     | 0.5                  | 15.12       |
| -24.88 | 0.25        | 16.90             | 0.00    | 0.00               | 35.00     | 0.5                  | 15.71       |
| -24.63 | 0.25        | 17.26             | 0.00    | 0.00               | 35.00     | 0.5                  | 16.30       |
| -24.38 | 0.25        | 17.61             | 0.00    | 0.00               | 35.00     | 0.5                  | 16.88       |
| -24.13 | 0.25        | 17.95             | 0.00    | 0.00               | 35.00     | 0.5                  | 17.48       |
| -23.88 | 0.25        | 18.27             | 0.00    | 0.00               | 35.00     | 0.5                  | 18.07       |
| -23.63 | 0.25        | 18.58             | 0.00    | 0.00               | 35.00     | 0.5                  | 18.66       |
| -23.38 | 0.25        | 18.87             | 0.00    | 0.00               | 35.00     | 5.0                  | 19.26       |
| -23.13 | 0.25        | 19.14             | 0.00    | 0.00               | 35.00     | 5.0                  | 19.86       |
| -22.88 | 0.25        | 19.39             | 0.00    | 0.00               | 35.00     | 5.0                  | 20.46       |
| -22.63 | 0.25        | 19.63             | 0.00    | 0.00               | 35.00     | 5.0                  | 21.06       |
| -22.38 | 0.25        | 19.86             | 0.00    | 0.00               | 35.00     | 5.0                  | 21.67       |
| -22.13 | 0.25        | 20.07             | 0.00    | 0.00               | 35.00     | 5.0                  | 22.28       |
| -21.88 | 0.25        | 20.26             | 0.00    | 0.00               | 35.00     | 5.0                  | 22.89       |

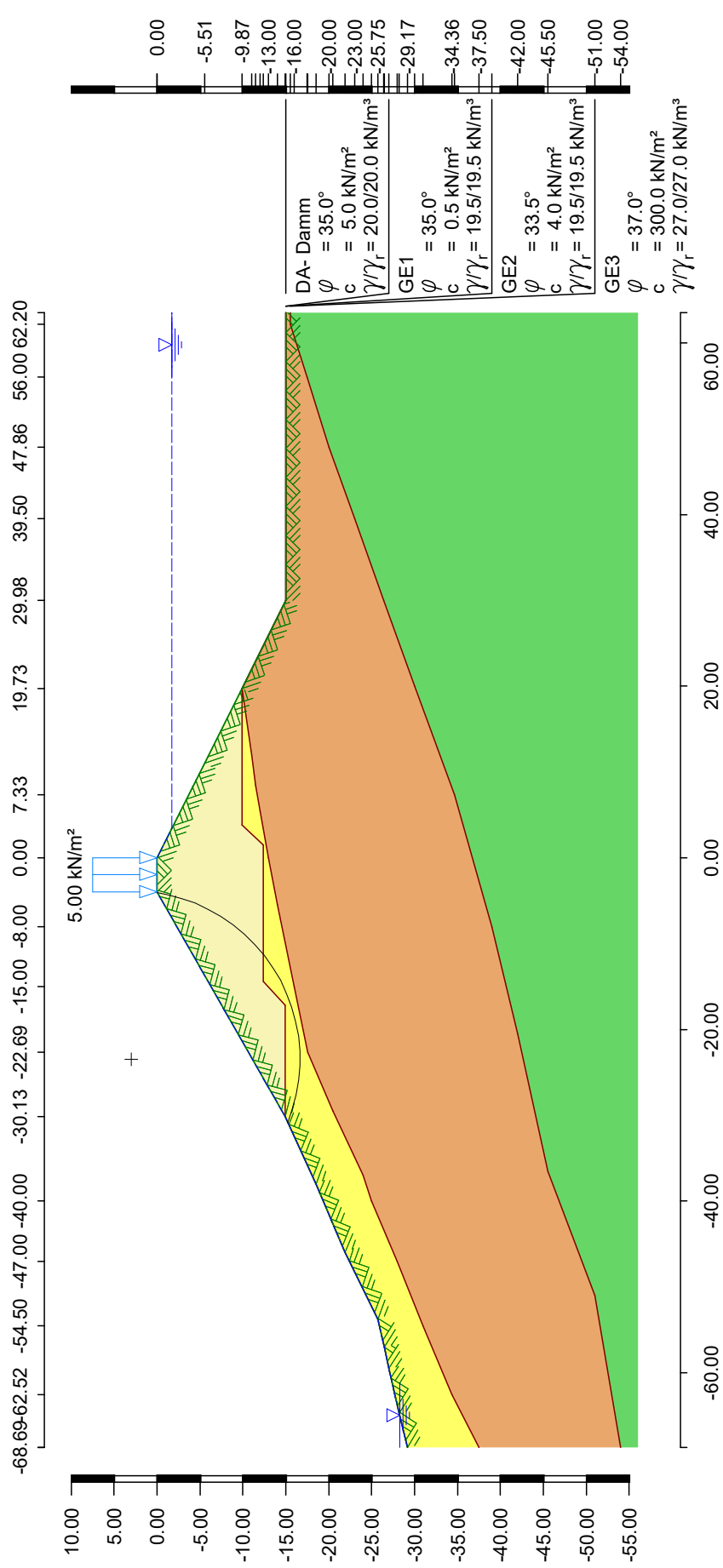
|                                         |             |                   |         |                    |           |                      | Seite              | 5 |
|-----------------------------------------|-------------|-------------------|---------|--------------------|-----------|----------------------|--------------------|---|
| Programm DC-Böschung/Win Version 24.2.0 |             |                   |         |                    |           |                      | Lastfall           | G |
| D-L_LFK3                                |             |                   |         |                    |           |                      |                    |   |
| $x_M$                                   | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c                    | $\vartheta$        |   |
| [m]                                     | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]             |   |
| -21.63                                  | 0.25        | 20.44             | 0.00    | 0.00               | 35.00     | 5.0                  | 23.50              |   |
| -21.38                                  | 0.25        | 20.61             | 0.00    | 0.00               | 35.00     | 5.0                  | 24.12              |   |
| -21.13                                  | 0.25        | 20.75             | 0.00    | 0.00               | 35.00     | 5.0                  | 24.74              |   |
| -20.88                                  | 0.25        | 20.88             | 0.00    | 0.00               | 35.00     | 5.0                  | 25.36              |   |
| -20.63                                  | 0.25        | 21.00             | 0.00    | 0.00               | 35.00     | 5.0                  | 25.99              |   |
| -20.37                                  | 0.25        | 21.09             | 0.00    | 0.00               | 35.00     | 5.0                  | 26.61              |   |
| -20.12                                  | 0.25        | 21.17             | 0.00    | 0.00               | 35.00     | 5.0                  | 27.25              |   |
| -19.87                                  | 0.25        | 21.23             | 0.00    | 0.00               | 35.00     | 5.0                  | 27.88              |   |
| -19.62                                  | 0.25        | 21.28             | 0.00    | 0.00               | 35.00     | 5.0                  | 28.52              |   |
| -19.37                                  | 0.25        | 21.30             | 0.00    | 0.00               | 35.00     | 5.0                  | 29.17              |   |
| -19.12                                  | 0.25        | 21.31             | 0.00    | 0.00               | 35.00     | 5.0                  | 29.82              |   |
| -18.87                                  | 0.25        | 21.30             | 0.00    | 0.00               | 35.00     | 5.0                  | 30.47              |   |
| -18.62                                  | 0.25        | 21.27             | 0.00    | 0.00               | 35.00     | 5.0                  | 31.12              |   |
| -18.37                                  | 0.25        | 21.22             | 0.00    | 0.00               | 35.00     | 5.0                  | 31.79              |   |
| -18.12                                  | 0.25        | 21.15             | 0.00    | 0.00               | 35.00     | 5.0                  | 32.45              |   |
| -17.87                                  | 0.25        | 21.06             | 0.00    | 0.00               | 35.00     | 5.0                  | 33.12              |   |
| -17.62                                  | 0.25        | 20.94             | 0.00    | 0.00               | 35.00     | 5.0                  | 33.80              |   |
| -17.37                                  | 0.25        | 20.81             | 0.00    | 0.00               | 35.00     | 5.0                  | 34.48              |   |
| -17.12                                  | 0.25        | 20.66             | 0.00    | 0.00               | 35.00     | 5.0                  | 35.17              |   |
| -16.87                                  | 0.25        | 20.48             | 0.00    | 0.00               | 35.00     | 5.0                  | 35.86              |   |
| -16.62                                  | 0.25        | 20.28             | 0.00    | 0.00               | 35.00     | 5.0                  | 36.56              |   |
| -16.37                                  | 0.25        | 20.05             | 0.00    | 0.00               | 35.00     | 5.0                  | 37.27              |   |
| -16.12                                  | 0.25        | 19.80             | 0.00    | 0.00               | 35.00     | 5.0                  | 37.98              |   |
| -15.88                                  | 0.25        | 19.53             | 0.00    | 0.00               | 35.00     | 5.0                  | 38.70              |   |
| -15.63                                  | 0.25        | 19.23             | 0.00    | 0.00               | 35.00     | 5.0                  | 39.42              |   |
| -15.38                                  | 0.25        | 18.90             | 0.00    | 0.00               | 35.00     | 5.0                  | 40.16              |   |
| -15.13                                  | 0.25        | 18.55             | 0.00    | 0.00               | 35.00     | 5.0                  | 40.90              |   |
| -14.88                                  | 0.25        | 18.16             | 0.00    | 0.00               | 35.00     | 5.0                  | 41.65              |   |
| -14.63                                  | 0.25        | 17.75             | 0.00    | 0.00               | 35.00     | 5.0                  | 42.41              |   |
| -14.38                                  | 0.25        | 17.31             | 0.00    | 0.00               | 35.00     | 5.0                  | 43.18              |   |
| -14.13                                  | 0.25        | 16.83             | 0.00    | 0.00               | 35.00     | 5.0                  | 43.96              |   |
| -13.88                                  | 0.25        | 16.33             | 0.00    | 0.00               | 35.00     | 5.0                  | 44.75              |   |
| -13.63                                  | 0.25        | 15.78             | 0.00    | 0.00               | 35.00     | 5.0                  | 45.55              |   |
| -13.38                                  | 0.25        | 15.21             | 0.00    | 0.00               | 35.00     | 5.0                  | 46.36              |   |
| -13.13                                  | 0.25        | 14.59             | 0.00    | 0.00               | 35.00     | 5.0                  | 47.18              |   |
| -12.88                                  | 0.25        | 13.94             | 0.00    | 0.00               | 35.00     | 5.0                  | 48.02              |   |
| -12.63                                  | 0.25        | 13.24             | 0.00    | 0.00               | 35.00     | 5.0                  | 48.87              |   |
| -12.38                                  | 0.25        | 12.50             | 0.00    | 0.00               | 35.00     | 5.0                  | 49.73              |   |
| -12.13                                  | 0.25        | 11.72             | 0.00    | 0.00               | 35.00     | 5.0                  | 50.61              |   |
| -11.88                                  | 0.25        | 10.88             | 0.00    | 0.00               | 35.00     | 5.0                  | 51.51              |   |
| -11.63                                  | 0.25        | 10.00             | 0.00    | 0.00               | 35.00     | 5.0                  | 52.43              |   |
| -11.38                                  | 0.25        | 9.06              | 0.00    | 0.00               | 35.00     | 5.0                  | 53.36              |   |
| -11.13                                  | 0.25        | 8.06              | 0.00    | 0.00               | 35.00     | 5.0                  | 54.32              |   |
| -10.88                                  | 0.25        | 7.01              | 0.00    | 0.00               | 35.00     | 5.0                  | 55.30              |   |
| -10.63                                  | 0.25        | 5.88              | 0.00    | 0.00               | 35.00     | 5.0                  | 56.30              |   |
| -10.38                                  | 0.25        | 4.68              | 0.00    | 0.00               | 35.00     | 5.0                  | 57.33              |   |
| -10.13                                  | 0.25        | 3.41              | 0.00    | 0.00               | 35.00     | 5.0                  | 58.39              |   |
| -9.88                                   | 0.25        | 2.04              | 0.00    | 0.00               | 35.00     | 5.0                  | 59.49              |   |
| -9.64                                   | 0.22        | 0.60              | 0.00    | 0.00               | 35.00     | 5.0                  | 60.55              |   |
| $x_M$                                   |             |                   |         |                    |           | R*T <sub>i</sub>     | R*G*               |   |
| [m]                                     |             |                   |         |                    |           | [kNm/m]              | sin( $\vartheta$ ) |   |
| -33.26                                  |             |                   |         |                    |           | 0.10                 | 0.00               |   |
| -33.13                                  |             |                   |         |                    |           | 6.28                 | -0.46              |   |
| -32.88                                  |             |                   |         |                    |           | 13.62                | -1.06              |   |
| -32.63                                  |             |                   |         |                    |           | 20.73                | -1.34              |   |
| -32.38                                  |             |                   |         |                    |           | 27.62                | -1.32              |   |

|                                         |  |               |                                   |   |
|-----------------------------------------|--|---------------|-----------------------------------|---|
|                                         |  |               | Seite                             | 6 |
| Programm DC-Böschung/Win Version 24.2.0 |  |               |                                   |   |
| D-L_LFK3                                |  |               | Lastfall                          | G |
|                                         |  |               |                                   |   |
| $x_M$                                   |  | $R \cdot T_i$ | $R \cdot G \cdot \sin(\vartheta)$ |   |
| [m]                                     |  | [kNm/m]       | [kNm/m]                           |   |
| -32.13                                  |  | 34.29         | -1.01                             |   |
| -31.88                                  |  | 40.74         | -0.41                             |   |
| -31.63                                  |  | 46.98         | 0.47                              |   |
| -31.38                                  |  | 53.02         | 1.62                              |   |
| -31.13                                  |  | 58.86         | 3.03                              |   |
| -30.88                                  |  | 63.57         | 4.62                              |   |
| -30.63                                  |  | 67.19         | 6.33                              |   |
| -30.38                                  |  | 70.63         | 8.18                              |   |
| -30.13                                  |  | 74.38         | 10.25                             |   |
| -29.88                                  |  | 80.77         | 12.93                             |   |
| -29.63                                  |  | 87.43         | 15.97                             |   |
| -29.38                                  |  | 93.90         | 19.28                             |   |
| -29.13                                  |  | 100.19        | 22.87                             |   |
| -28.88                                  |  | 106.30        | 26.72                             |   |
| -28.63                                  |  | 112.23        | 30.83                             |   |
| -28.38                                  |  | 117.99        | 35.17                             |   |
| -28.13                                  |  | 123.58        | 39.75                             |   |
| -27.88                                  |  | 129.00        | 44.56                             |   |
| -27.63                                  |  | 134.26        | 49.58                             |   |
| -27.38                                  |  | 139.36        | 54.80                             |   |
| -27.13                                  |  | 144.29        | 60.22                             |   |
| -26.88                                  |  | 149.07        | 65.83                             |   |
| -26.63                                  |  | 153.70        | 71.61                             |   |
| -26.38                                  |  | 158.17        | 77.56                             |   |
| -26.13                                  |  | 162.49        | 83.66                             |   |
| -25.88                                  |  | 166.66        | 89.91                             |   |
| -25.63                                  |  | 170.68        | 96.30                             |   |
| -25.38                                  |  | 174.56        | 102.81                            |   |
| -25.13                                  |  | 178.29        | 109.43                            |   |
| -24.88                                  |  | 181.88        | 116.16                            |   |
| -24.63                                  |  | 185.33        | 122.98                            |   |
| -24.38                                  |  | 188.64        | 129.89                            |   |
| -24.13                                  |  | 191.80        | 136.87                            |   |
| -23.88                                  |  | 194.82        | 143.90                            |   |
| -23.63                                  |  | 197.70        | 150.98                            |   |
| -23.38                                  |  | 217.24        | 158.02                            |   |
| -23.13                                  |  | 219.70        | 165.07                            |   |
| -22.88                                  |  | 222.02        | 172.12                            |   |
| -22.63                                  |  | 224.20        | 179.16                            |   |
| -22.38                                  |  | 226.24        | 186.18                            |   |
| -22.13                                  |  | 228.14        | 193.17                            |   |
| -21.88                                  |  | 229.89        | 200.11                            |   |
| -21.63                                  |  | 231.50        | 206.98                            |   |
| -21.38                                  |  | 232.97        | 213.78                            |   |
| -21.13                                  |  | 234.29        | 220.49                            |   |
| -20.88                                  |  | 235.47        | 227.09                            |   |
| -20.63                                  |  | 236.50        | 233.58                            |   |
| -20.37                                  |  | 237.37        | 239.92                            |   |
| -20.12                                  |  | 238.10        | 246.12                            |   |
| -19.87                                  |  | 238.68        | 252.14                            |   |
| -19.62                                  |  | 239.10        | 257.98                            |   |
| -19.37                                  |  | 239.36        | 263.62                            |   |
| -19.12                                  |  | 239.45        | 269.04                            |   |
| -18.87                                  |  | 239.39        | 274.22                            |   |
| -18.62                                  |  | 239.16        | 279.14                            |   |
| -18.37                                  |  | 238.75        | 283.78                            |   |
| -18.12                                  |  | 238.17        | 288.13                            |   |
| -17.87                                  |  | 237.41        | 292.15                            |   |



|                                         |  |               |                               |          |
|-----------------------------------------|--|---------------|-------------------------------|----------|
|                                         |  |               | Seite                         | 7        |
| Programm DC-Böschung/Win Version 24.2.0 |  |               |                               |          |
| D-L_LFK3                                |  |               | Lastfall                      | G        |
|                                         |  |               |                               |          |
| $x_M$                                   |  | $R \cdot T_i$ | $R \cdot G^* \sin(\vartheta)$ |          |
| [m]                                     |  | [kNm/m]       | [kNm/m]                       |          |
| -17.62                                  |  | 236.47        | 295.84                        |          |
| -17.37                                  |  | 235.33        | 299.16                        |          |
| -17.12                                  |  | 234.00        | 302.09                        |          |
| -16.87                                  |  | 232.47        | 304.61                        |          |
| -16.62                                  |  | 230.72        | 306.69                        |          |
| -16.37                                  |  | 228.77        | 308.30                        |          |
| -16.12                                  |  | 226.58        | 309.42                        |          |
| -15.88                                  |  | 224.17        | 310.02                        |          |
| -15.63                                  |  | 221.51        | 310.06                        |          |
| -15.38                                  |  | 218.59        | 309.51                        |          |
| -15.13                                  |  | 215.42        | 308.35                        |          |
| -14.88                                  |  | 211.96        | 306.52                        |          |
| -14.63                                  |  | 208.22        | 304.00                        |          |
| -14.38                                  |  | 204.17        | 300.75                        |          |
| -14.13                                  |  | 199.80        | 296.70                        |          |
| -13.88                                  |  | 195.08        | 291.83                        |          |
| -13.63                                  |  | 190.01        | 286.08                        |          |
| -13.38                                  |  | 184.55        | 279.41                        |          |
| -13.13                                  |  | 178.69        | 271.74                        |          |
| -12.88                                  |  | 172.39        | 263.03                        |          |
| -12.63                                  |  | 165.62        | 253.21                        |          |
| -12.38                                  |  | 158.36        | 242.20                        |          |
| -12.13                                  |  | 150.55        | 229.92                        |          |
| -11.88                                  |  | 142.16        | 216.29                        |          |
| -11.63                                  |  | 133.14        | 201.22                        |          |
| -11.38                                  |  | 123.43        | 184.60                        |          |
| -11.13                                  |  | 112.96        | 166.31                        |          |
| -10.88                                  |  | 101.65        | 146.23                        |          |
| -10.63                                  |  | 89.43         | 124.21                        |          |
| -10.38                                  |  | 76.17         | 100.08                        |          |
| -10.13                                  |  | 61.77         | 73.66                         |          |
| -9.88                                   |  | 46.08         | 44.73                         |          |
| -9.64                                   |  | 26.62         | 13.24                         |          |
| Summen:                                 |  |               | 15401.07                      | 15201.48 |
| Einwirkungen $E_d =$                    |  |               | 15201.48 kN                   |          |
| Widerstände $R_d =$                     |  |               | 15401.07 kN                   |          |
| $E_d/R_d = 0.99 < 1.0$                  |  |               | *** Nachweis erfüllt ***      |          |





Eingabedatei: M:\Projekte\2023\

23020\_P-BL-S-SK-K\_Speicher-Bodensee\_Kronplatz\Berechnungen\D-L\_LFK4.dbb

## Berechnung nach: NTC 2018 (Eurocode 7)

Berechnung mit Nachweisverfahren 1

Kombination mit Teilsicherheitsbeiwerten der Gruppen A2 + M2 + R2

| Schichtdaten                       |                      | DA- Damm<br>GE3 | GE1   | GE2   |
|------------------------------------|----------------------|-----------------|-------|-------|
| Innere Reibung $\text{cal } \phi'$ | [Grad]               | 35.00<br>37.00  | 35.00 | 33.50 |
| Kohäsion $\text{cal } c'$          | [kN/m <sup>2</sup> ] | 5.0<br>300.0    | 0.5   | 4.0   |
| Wichte Boden                       | [kN/m <sup>3</sup> ] | 20.0<br>27.0    | 19.5  | 19.5  |
| Wichte wassergesättigt             | [kN/m <sup>3</sup> ] | 20.0<br>27.0    | 19.5  | 19.5  |
| Wichte unter Auftrieb              | [kN/m <sup>3</sup> ] | 10.0<br>17.0    | 9.5   | 9.5   |
| Erdbebenfaktor                     | [-]                  | 1.0<br>1.0      | 1.0   | 1.0   |

### Geländeverlauf und Schichten

|           |          |        |        |        |        |        |
|-----------|----------|--------|--------|--------|--------|--------|
| x [m]     |          | -68.69 | -64.72 | -62.53 | -59.50 | -57.00 |
|           |          | -54.50 | -53.74 | -51.00 | -47.00 | -45.97 |
|           |          | -40.00 | -38.00 | -37.00 | -36.50 | -30.12 |
|           |          | -29.50 | -22.69 | -20.50 | -17.16 | -15.00 |
|           |          | -14.37 | -8.00  | -5.50  | -4.00  | 0.00   |
|           |          | 1.52   | 3.86   | 5.50   | 7.33   | 8.50   |
|           |          | 11.03  | 12.00  | 19.73  | 20.00  | 29.98  |
|           |          | 30.00  | 39.50  | 47.86  | 56.00  | 62.20  |
|           |          | 63.50  |        |        |        |        |
| z Gelände |          | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
|           |          | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |          | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |          | -14.57 | -10.68 | -9.43  | -7.52  | -6.29  |
|           |          | -5.93  | -2.29  | -0.86  | 0.00   | 0.00   |
|           |          | -0.76  | -1.93  | -2.75  | -3.67  | -4.25  |
|           |          | -5.51  | -6.00  | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |          | -15.00 |        |        |        |        |
|           |          | -29.17 | -28.19 | -27.69 | -27.00 | -26.50 |
| z Schicht | DA- Damm | -25.93 | -25.75 | -24.40 | -22.43 | -21.92 |
|           |          | -19.36 | -18.50 | -18.05 | -17.82 | -14.93 |
|           |          | -14.93 | -14.93 | -14.93 | -14.93 | -12.94 |
|           |          | -12.37 | -12.37 | -12.37 | -12.37 | -12.37 |
|           |          | -12.37 | -9.87  | -9.87  | -9.87  | -9.87  |
|           |          | -9.87  | -9.87  | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |          | -15.00 |        |        |        |        |
|           |          | -37.50 | -35.48 | -34.36 | -33.09 | -32.05 |
|           |          | -31.00 | -30.70 | -29.60 | -28.00 | -27.56 |
| z Schicht | GE1      | -25.00 | -24.33 | -24.00 | -23.77 | -20.79 |
|           |          | -20.50 | -17.56 | -17.12 | -16.44 | -16.00 |
|           |          | -15.87 | -14.53 | -14.00 | -13.73 | -13.00 |
|           |          | -12.72 | -12.30 | -12.00 | -11.69 | -11.50 |
|           |          | -11.14 | -11.00 | -9.87  | -10.00 | -14.99 |
|           |          | -15.00 | -15.00 | -15.00 | -15.00 | -15.00 |
|           |          |        |        |        |        |        |
|           |          |        |        |        |        |        |

|                                                     |                               |                |                |                |          |          |                |                |                |      |
|-----------------------------------------------------|-------------------------------|----------------|----------------|----------------|----------|----------|----------------|----------------|----------------|------|
|                                                     |                               |                |                |                |          |          | Seite          | 3              |                |      |
| Programm DC-Böschung/Win Version 24.2.0             |                               |                |                |                |          |          | Lastfall       | G              |                |      |
| D-L_LFK4                                            |                               |                |                |                |          |          |                |                |                |      |
| z Schicht                                           | GE2                           | -15.00         |                |                |          |          |                |                |                |      |
|                                                     |                               | -54.00         | -53.33         | -52.95         | -52.44   | -52.02   |                |                |                |      |
|                                                     |                               | -51.59         | -51.46         | -51.00         | -49.48   | -49.09   |                |                |                |      |
|                                                     |                               | -46.83         | -46.07         | -45.69         | -45.50   | -44.11   |                |                |                |      |
|                                                     |                               | -43.97         | -42.48         | -42.00         | -41.20   | -40.68   |                |                |                |      |
|                                                     |                               | -40.53         | -39.00         | -38.29         | -37.86   | -36.72   |                |                |                |      |
|                                                     |                               | -36.29         | -35.62         | -35.15         | -34.63   | -34.20   |                |                |                |      |
|                                                     |                               | -33.28         | -32.92         | -30.10         | -30.00   | -26.39   |                |                |                |      |
|                                                     |                               | -26.38         | -23.00         | -20.00         | -17.50   | -15.49   |                |                |                |      |
|                                                     |                               | -15.49         |                |                |          |          |                |                |                |      |
| z Schicht                                           | GE3                           | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       | -1000.00       | -1000.00       | -1000.00 | -1000.00 |                |                |                |      |
|                                                     |                               | -1000.00       |                |                |          |          |                |                |                |      |
| Verlauf des Grundwasserspiegels                     |                               |                |                |                |          |          |                |                |                |      |
| x [m]                                               |                               | z [m]          |                |                |          |          |                |                |                |      |
| -68.69                                              |                               | -29.17         |                |                |          |          |                |                |                |      |
| -64.72                                              |                               | -28.19         |                |                |          |          |                |                |                |      |
| -59.50                                              |                               | -27.00         |                |                |          |          |                |                |                |      |
| -57.00                                              |                               | -26.50         |                |                |          |          |                |                |                |      |
| -53.74                                              |                               | -25.75         |                |                |          |          |                |                |                |      |
| -45.97                                              |                               | -21.92         |                |                |          |          |                |                |                |      |
| -38.00                                              |                               | -18.50         |                |                |          |          |                |                |                |      |
| -30.13                                              |                               | -14.93         |                |                |          |          |                |                |                |      |
| -4.00                                               |                               | 0.00           |                |                |          |          |                |                |                |      |
| 0.00                                                |                               | 0.00           |                |                |          |          |                |                |                |      |
| 3.48                                                |                               | -1.74          |                |                |          |          |                |                |                |      |
| 52.00                                               |                               | -1.74          |                |                |          |          |                |                |                |      |
| 63.50                                               |                               | -1.75          |                |                |          |          |                |                |                |      |
| Streckenlasten                                      |                               |                |                |                |          |          |                |                |                |      |
| Alle Lasten beziehen sich auf 1 m Länge             |                               |                |                |                |          |          |                |                |                |      |
| LF-Komb.                                            | q                             | x <sub>A</sub> | x <sub>E</sub> | z <sub>Q</sub> | γ        | ψ        |                |                |                |      |
| G                                                   | Q                             | 5.0            | -4.0           | 0.0            | 0.00     | 1.30     | 1.00           |                |                |      |
| Berechnung mit Erdbebenlasten nach Eurocode 8, BS-E |                               |                |                |                |          |          |                |                |                |      |
| k <sub>h</sub> /S = a <sub>g</sub> /g = 0.038       |                               |                |                |                |          |          |                |                |                |      |
| k <sub>v</sub> /S = a <sub>vg</sub> /g = 0.019      |                               |                |                |                |          |          |                |                |                |      |
| Lamellenbreiten                                     |                               |                |                |                |          |          |                |                |                |      |
| Von x [m]                                           |                               | bis x [m]      |                | Breite [m]     |          |          |                |                |                |      |
| -10000.00                                           |                               | 10000.00       |                | 0.25           |          |          |                |                |                |      |
| Teilsicherheitsbeiwerte (GEO) für NW-Verf. 1        |                               |                |                |                |          |          |                |                |                |      |
| γ-                                                  | G                             | Q              | W              | E              | φ        | c        | c <sub>u</sub> | R <sub>a</sub> | R <sub>b</sub> | R    |
| BS-E                                                | 1.00                          | 1.00           | 1.00           | 1.00           | 1.00     | 1.00     | 1.00           | 1.00           | 1.00           | 1.20 |
| γ-                                                  | Teilsicherheitsbeiwert für... |                |                |                |          |          |                |                |                |      |
| G                                                   | Ständige Lasten               |                |                |                |          |          |                |                |                |      |
| Q                                                   | Veränderliche Lasten          |                |                |                |          |          |                |                |                |      |
| W                                                   | Wasserdruck                   |                |                |                |          |          |                |                |                |      |
| E                                                   | Erdbeben                      |                |                |                |          |          |                |                |                |      |
| φ                                                   | Reibungsbeiwert tan(φ)        |                |                |                |          |          |                |                |                |      |
| c                                                   | Kohäsion c                    |                |                |                |          |          |                |                |                |      |

$c_u$  Kohäsion undränirt  $c_u$   
 $R_a$  Anker  
 $R_b$  Bauteile  
 $R$  Widerstände

**Bestimmung der Sicherheit nach Krey-Bishop**

Gleitkreis mit Iteration des Mittelpunktes:  
 Startpunkt:  $x_M = -23.50\text{ m}$ ,  $z_M = 3.00\text{ m}$ ,  
 $\Delta x = 1.00\text{ m}$ ,  $\Delta z = 1.00\text{ m}$ ,  
 mit Iteration des Radius:  $\Delta R = 1.00\text{ m}$  ab  $R = 19.70\text{ m}$

**Lastfallkomb. G**

Gleitkörper von  $x = -34.16$  bis  $-12.14\text{ m}$   
 Gleitkreis:  $x_M = -33.50\text{ m}$ ,  $z_M = 8.13\text{ m}$ ,  $R = 24.89\text{ m}$

**Bestimmung der Lamellen-Anteile**

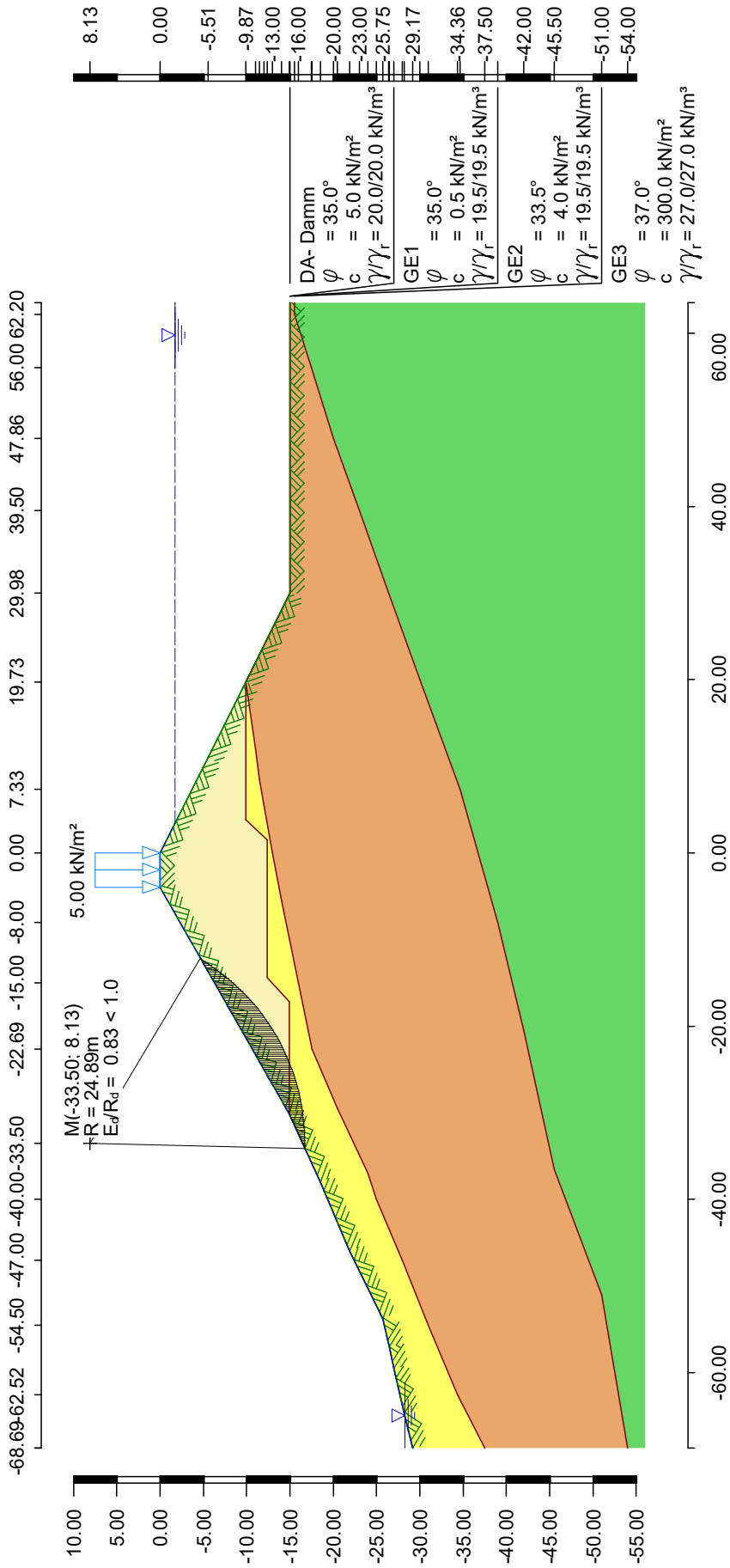
| $x_M$  | Breite | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | $c$     | $\vartheta$ |
|--------|--------|-------------------|---------|--------------------|-----------|---------|-------------|
| [m]    | [m]    | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m²] | [Grad]      |
| -34.08 | 0.16   | 0.12              | 0.00    | 0.00               | 35.00     | 0.5     | -1.33       |
| -33.88 | 0.25   | 0.65              | 0.00    | 0.00               | 35.00     | 0.5     | -0.86       |
| -33.63 | 0.25   | 1.22              | 0.00    | 0.00               | 35.00     | 0.5     | -0.29       |
| -33.38 | 0.25   | 1.77              | 0.00    | 0.00               | 35.00     | 0.5     | 0.29        |
| -33.13 | 0.25   | 2.31              | 0.00    | 0.00               | 35.00     | 0.5     | 0.86        |
| -32.88 | 0.25   | 2.84              | 0.00    | 0.00               | 35.00     | 0.5     | 1.44        |
| -32.63 | 0.25   | 3.36              | 0.00    | 0.00               | 35.00     | 0.5     | 2.01        |
| -32.38 | 0.25   | 3.86              | 0.00    | 0.00               | 35.00     | 0.5     | 2.59        |
| -32.13 | 0.25   | 4.35              | 0.00    | 0.00               | 35.00     | 0.5     | 3.17        |
| -31.88 | 0.25   | 4.83              | 0.00    | 0.00               | 35.00     | 0.5     | 3.74        |
| -31.63 | 0.25   | 5.30              | 0.00    | 0.00               | 35.00     | 0.5     | 4.32        |
| -31.38 | 0.25   | 5.75              | 0.00    | 0.00               | 35.00     | 0.5     | 4.90        |
| -31.13 | 0.25   | 6.19              | 0.00    | 0.00               | 35.00     | 0.5     | 5.48        |
| -30.88 | 0.25   | 6.62              | 0.00    | 0.00               | 35.00     | 0.5     | 6.05        |
| -30.63 | 0.25   | 7.04              | 0.00    | 0.00               | 35.00     | 0.5     | 6.63        |
| -30.38 | 0.25   | 7.44              | 0.00    | 0.00               | 35.00     | 0.5     | 7.21        |
| -30.13 | 0.25   | 7.86              | 0.00    | 0.00               | 35.00     | 0.5     | 7.79        |
| -29.88 | 0.25   | 8.38              | 0.00    | 0.00               | 35.00     | 0.5     | 8.37        |
| -29.63 | 0.25   | 8.91              | 0.00    | 0.00               | 35.00     | 0.5     | 8.96        |
| -29.38 | 0.25   | 9.42              | 0.00    | 0.00               | 35.00     | 0.5     | 9.54        |
| -29.13 | 0.25   | 9.93              | 0.00    | 0.00               | 35.00     | 0.5     | 10.12       |
| -28.88 | 0.25   | 10.42             | 0.00    | 0.00               | 35.00     | 0.5     | 10.71       |
| -28.63 | 0.25   | 10.89             | 0.00    | 0.00               | 35.00     | 0.5     | 11.29       |
| -28.38 | 0.25   | 11.36             | 0.00    | 0.00               | 35.00     | 0.5     | 11.88       |
| -28.13 | 0.25   | 11.81             | 0.00    | 0.00               | 35.00     | 0.5     | 12.47       |
| -27.88 | 0.25   | 12.25             | 0.00    | 0.00               | 35.00     | 0.5     | 13.06       |
| -27.63 | 0.25   | 12.67             | 0.00    | 0.00               | 35.00     | 0.5     | 13.65       |
| -27.38 | 0.25   | 13.08             | 0.00    | 0.00               | 35.00     | 0.5     | 14.24       |
| -27.13 | 0.25   | 13.48             | 0.00    | 0.00               | 35.00     | 0.5     | 14.84       |
| -26.88 | 0.25   | 13.87             | 0.00    | 0.00               | 35.00     | 0.5     | 15.44       |
| -26.63 | 0.25   | 14.24             | 0.00    | 0.00               | 35.00     | 0.5     | 16.03       |
| -26.38 | 0.25   | 14.59             | 0.00    | 0.00               | 35.00     | 0.5     | 16.63       |
| -26.13 | 0.25   | 14.94             | 0.00    | 0.00               | 35.00     | 0.5     | 17.23       |
| -25.88 | 0.25   | 15.27             | 0.00    | 0.00               | 35.00     | 0.5     | 17.84       |
| -25.63 | 0.25   | 15.58             | 0.00    | 0.00               | 35.00     | 0.5     | 18.44       |
| -25.38 | 0.25   | 15.88             | 0.00    | 0.00               | 35.00     | 0.5     | 19.05       |
| -25.13 | 0.25   | 16.17             | 0.00    | 0.00               | 35.00     | 0.5     | 19.66       |
| -24.88 | 0.25   | 16.44             | 0.00    | 0.00               | 35.00     | 0.5     | 20.27       |
| -24.63 | 0.25   | 16.70             | 0.00    | 0.00               | 35.00     | 0.5     | 20.89       |
| -24.38 | 0.25   | 16.94             | 0.00    | 0.00               | 35.00     | 0.5     | 21.51       |
| -24.13 | 0.25   | 17.16             | 0.00    | 0.00               | 35.00     | 0.5     | 22.13       |

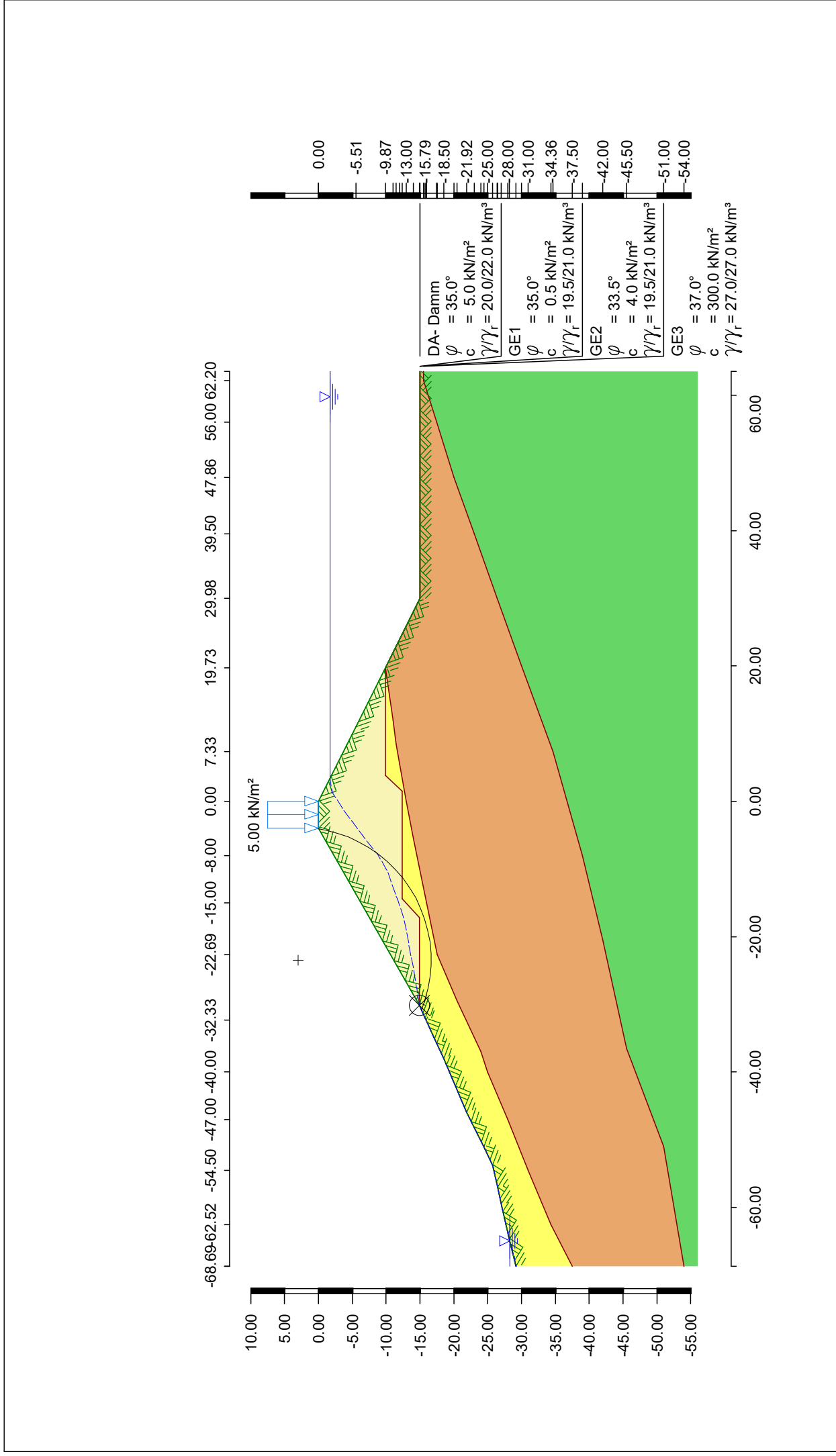
|                                         |             |                   |                     |                     |           |                      |                          |   |
|-----------------------------------------|-------------|-------------------|---------------------|---------------------|-----------|----------------------|--------------------------|---|
|                                         |             |                   |                     |                     |           |                      | Seite                    | 5 |
| Programm DC-Böschung/Win Version 24.2.0 |             |                   |                     |                     |           |                      |                          |   |
| D-L_LFK4                                |             |                   |                     |                     |           |                      | Lastfall                 | G |
|                                         |             |                   |                     |                     |           |                      |                          |   |
| $x_M$                                   | Breite<br>b | Eigen-<br>gewicht | Auflast             | Wasser-<br>auflast  | $\varphi$ | c                    | $\vartheta$              |   |
| [m]                                     | [m]         | [kN/m]            | [kN/m]              | [kN/m]              | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]                   |   |
| -23.88                                  | 0.25        | 17.36             | 0.00                | 0.00                | 35.00     | 5.0                  | 22.75                    |   |
| -23.63                                  | 0.25        | 17.55             | 0.00                | 0.00                | 35.00     | 5.0                  | 23.37                    |   |
| -23.38                                  | 0.25        | 17.71             | 0.00                | 0.00                | 35.00     | 5.0                  | 24.00                    |   |
| -23.13                                  | 0.25        | 17.86             | 0.00                | 0.00                | 35.00     | 5.0                  | 24.63                    |   |
| -22.88                                  | 0.25        | 17.99             | 0.00                | 0.00                | 35.00     | 5.0                  | 25.27                    |   |
| -22.63                                  | 0.25        | 18.11             | 0.00                | 0.00                | 35.00     | 5.0                  | 25.91                    |   |
| -22.38                                  | 0.25        | 18.21             | 0.00                | 0.00                | 35.00     | 5.0                  | 26.55                    |   |
| -22.13                                  | 0.25        | 18.29             | 0.00                | 0.00                | 35.00     | 5.0                  | 27.19                    |   |
| -21.88                                  | 0.25        | 18.35             | 0.00                | 0.00                | 35.00     | 5.0                  | 27.84                    |   |
| -21.63                                  | 0.25        | 18.40             | 0.00                | 0.00                | 35.00     | 5.0                  | 28.49                    |   |
| -21.38                                  | 0.25        | 18.42             | 0.00                | 0.00                | 35.00     | 5.0                  | 29.15                    |   |
| -21.13                                  | 0.25        | 18.43             | 0.00                | 0.00                | 35.00     | 5.0                  | 29.81                    |   |
| -20.88                                  | 0.25        | 18.42             | 0.00                | 0.00                | 35.00     | 5.0                  | 30.48                    |   |
| -20.63                                  | 0.25        | 18.39             | 0.00                | 0.00                | 35.00     | 5.0                  | 31.15                    |   |
| -20.37                                  | 0.25        | 18.34             | 0.00                | 0.00                | 35.00     | 5.0                  | 31.82                    |   |
| -20.12                                  | 0.25        | 18.26             | 0.00                | 0.00                | 35.00     | 5.0                  | 32.50                    |   |
| -19.87                                  | 0.25        | 18.17             | 0.00                | 0.00                | 35.00     | 5.0                  | 33.19                    |   |
| -19.62                                  | 0.25        | 18.06             | 0.00                | 0.00                | 35.00     | 5.0                  | 33.88                    |   |
| -19.37                                  | 0.25        | 17.92             | 0.00                | 0.00                | 35.00     | 5.0                  | 34.57                    |   |
| -19.12                                  | 0.25        | 17.76             | 0.00                | 0.00                | 35.00     | 5.0                  | 35.28                    |   |
| -18.87                                  | 0.25        | 17.58             | 0.00                | 0.00                | 35.00     | 5.0                  | 35.98                    |   |
| -18.62                                  | 0.25        | 17.38             | 0.00                | 0.00                | 35.00     | 5.0                  | 36.70                    |   |
| -18.37                                  | 0.25        | 17.15             | 0.00                | 0.00                | 35.00     | 5.0                  | 37.42                    |   |
| -18.12                                  | 0.25        | 16.89             | 0.00                | 0.00                | 35.00     | 5.0                  | 38.15                    |   |
| -17.87                                  | 0.25        | 16.61             | 0.00                | 0.00                | 35.00     | 5.0                  | 38.88                    |   |
| -17.62                                  | 0.25        | 16.30             | 0.00                | 0.00                | 35.00     | 5.0                  | 39.63                    |   |
| -17.37                                  | 0.25        | 15.97             | 0.00                | 0.00                | 35.00     | 5.0                  | 40.38                    |   |
| -17.12                                  | 0.25        | 15.61             | 0.00                | 0.00                | 35.00     | 5.0                  | 41.14                    |   |
| -16.87                                  | 0.25        | 15.21             | 0.00                | 0.00                | 35.00     | 5.0                  | 41.91                    |   |
| -16.62                                  | 0.25        | 14.79             | 0.00                | 0.00                | 35.00     | 5.0                  | 42.68                    |   |
| -16.37                                  | 0.25        | 14.34             | 0.00                | 0.00                | 35.00     | 5.0                  | 43.47                    |   |
| -16.12                                  | 0.25        | 13.85             | 0.00                | 0.00                | 35.00     | 5.0                  | 44.27                    |   |
| -15.88                                  | 0.25        | 13.33             | 0.00                | 0.00                | 35.00     | 5.0                  | 45.08                    |   |
| -15.63                                  | 0.25        | 12.77             | 0.00                | 0.00                | 35.00     | 5.0                  | 45.90                    |   |
| -15.38                                  | 0.25        | 12.18             | 0.00                | 0.00                | 35.00     | 5.0                  | 46.73                    |   |
| -15.13                                  | 0.25        | 11.54             | 0.00                | 0.00                | 35.00     | 5.0                  | 47.58                    |   |
| -14.88                                  | 0.25        | 10.87             | 0.00                | 0.00                | 35.00     | 5.0                  | 48.44                    |   |
| -14.63                                  | 0.25        | 10.15             | 0.00                | 0.00                | 35.00     | 5.0                  | 49.31                    |   |
| -14.38                                  | 0.25        | 9.39              | 0.00                | 0.00                | 35.00     | 5.0                  | 50.20                    |   |
| -14.13                                  | 0.25        | 8.58              | 0.00                | 0.00                | 35.00     | 5.0                  | 51.11                    |   |
| -13.88                                  | 0.25        | 7.71              | 0.00                | 0.00                | 35.00     | 5.0                  | 52.04                    |   |
| -13.63                                  | 0.25        | 6.80              | 0.00                | 0.00                | 35.00     | 5.0                  | 52.98                    |   |
| -13.38                                  | 0.25        | 5.83              | 0.00                | 0.00                | 35.00     | 5.0                  | 53.95                    |   |
| -13.13                                  | 0.25        | 4.79              | 0.00                | 0.00                | 35.00     | 5.0                  | 54.94                    |   |
| -12.88                                  | 0.25        | 3.69              | 0.00                | 0.00                | 35.00     | 5.0                  | 55.95                    |   |
| -12.63                                  | 0.25        | 2.52              | 0.00                | 0.00                | 35.00     | 5.0                  | 57.00                    |   |
| -12.38                                  | 0.25        | 1.27              | 0.00                | 0.00                | 35.00     | 5.0                  | 58.07                    |   |
| -12.19                                  | 0.11        | 0.14              | 0.00                | 0.00                | 35.00     | 5.0                  | 58.87                    |   |
| $x_M$                                   |             |                   | Erdbeben-<br>last V | Erdbeben-<br>last H | $R^*T_i$  |                      | $R^*G^* \sin(\vartheta)$ |   |
| [m]                                     |             |                   | [kN/m]              | [kN/m]              | [kNm/m]   |                      | [kNm/m]                  |   |
| -34.08                                  |             |                   | 0.00                | 0.00                | 3.39      |                      | -0.01                    |   |
| -33.88                                  |             |                   | 0.01                | 0.01                | 12.28     |                      | 0.06                     |   |
| -33.63                                  |             |                   | 0.01                | 0.02                | 20.52     |                      | 0.42                     |   |
| -33.38                                  |             |                   | 0.02                | 0.03                | 28.48     |                      | 1.05                     |   |
| -33.13                                  |             |                   | 0.02                | 0.04                | 36.17     |                      | 1.96                     |   |
| -32.88                                  |             |                   | 0.03                | 0.05                | 43.60     |                      | 3.12                     |   |

|                                         |                     |                     |               | Seite                            | 6 |
|-----------------------------------------|---------------------|---------------------|---------------|----------------------------------|---|
| Programm DC-Böschung/Win Version 24.2.0 |                     |                     |               |                                  |   |
| D-L_LFK4                                |                     |                     |               | Lastfall                         | G |
| $x_M$                                   | Erdbeben-<br>last V | Erdbeben-<br>last H | $R \cdot T_i$ | $R \cdot G^*$<br>$\sin(\varphi)$ |   |
| [m]                                     | [kN/m]              | [kN/m]              | [kNm/m]       | [kNm/m]                          |   |
| -32.63                                  | 0.03                | 0.06                | 50.78         | 4.53                             |   |
| -32.38                                  | 0.04                | 0.07                | 57.71         | 6.18                             |   |
| -32.13                                  | 0.04                | 0.08                | 64.40         | 8.06                             |   |
| -31.88                                  | 0.05                | 0.09                | 70.86         | 10.16                            |   |
| -31.63                                  | 0.05                | 0.10                | 77.08         | 12.47                            |   |
| -31.38                                  | 0.05                | 0.11                | 83.07         | 14.98                            |   |
| -31.13                                  | 0.06                | 0.12                | 88.85         | 17.69                            |   |
| -30.88                                  | 0.06                | 0.13                | 94.40         | 20.58                            |   |
| -30.63                                  | 0.07                | 0.13                | 99.75         | 23.64                            |   |
| -30.38                                  | 0.07                | 0.14                | 104.88        | 26.87                            |   |
| -30.13                                  | 0.07                | 0.15                | 110.09        | 30.33                            |   |
| -29.88                                  | 0.08                | 0.16                | 116.74        | 34.44                            |   |
| -29.63                                  | 0.08                | 0.17                | 123.46        | 38.85                            |   |
| -29.38                                  | 0.09                | 0.18                | 129.96        | 43.46                            |   |
| -29.13                                  | 0.09                | 0.19                | 136.25        | 48.26                            |   |
| -28.88                                  | 0.10                | 0.20                | 142.34        | 53.26                            |   |
| -28.63                                  | 0.10                | 0.21                | 148.22        | 58.43                            |   |
| -28.38                                  | 0.11                | 0.22                | 153.90        | 63.76                            |   |
| -28.13                                  | 0.11                | 0.22                | 159.39        | 69.26                            |   |
| -27.88                                  | 0.12                | 0.23                | 164.68        | 74.89                            |   |
| -27.63                                  | 0.12                | 0.24                | 169.78        | 80.67                            |   |
| -27.38                                  | 0.12                | 0.25                | 174.69        | 86.56                            |   |
| -27.13                                  | 0.13                | 0.26                | 179.41        | 92.57                            |   |
| -26.88                                  | 0.13                | 0.26                | 183.94        | 98.69                            |   |
| -26.63                                  | 0.14                | 0.27                | 188.29        | 104.89                           |   |
| -26.38                                  | 0.14                | 0.28                | 192.45        | 111.17                           |   |
| -26.13                                  | 0.14                | 0.28                | 196.43        | 117.53                           |   |
| -25.88                                  | 0.15                | 0.29                | 200.23        | 123.94                           |   |
| -25.63                                  | 0.15                | 0.30                | 203.85        | 130.40                           |   |
| -25.38                                  | 0.15                | 0.30                | 207.29        | 136.89                           |   |
| -25.13                                  | 0.15                | 0.31                | 210.55        | 143.40                           |   |
| -24.88                                  | 0.16                | 0.31                | 213.63        | 149.92                           |   |
| -24.63                                  | 0.16                | 0.32                | 216.53        | 156.43                           |   |
| -24.38                                  | 0.16                | 0.32                | 219.26        | 162.94                           |   |
| -24.13                                  | 0.16                | 0.33                | 221.78        | 169.39                           |   |
| -23.88                                  | 0.16                | 0.33                | 244.33        | 175.71                           |   |
| -23.63                                  | 0.17                | 0.33                | 246.32        | 181.94                           |   |
| -23.38                                  | 0.17                | 0.34                | 248.12        | 188.09                           |   |
| -23.13                                  | 0.17                | 0.34                | 249.73        | 194.14                           |   |
| -22.88                                  | 0.17                | 0.34                | 251.16        | 200.08                           |   |
| -22.63                                  | 0.17                | 0.34                | 252.40        | 205.89                           |   |
| -22.38                                  | 0.17                | 0.35                | 253.45        | 211.56                           |   |
| -22.13                                  | 0.17                | 0.35                | 254.31        | 217.07                           |   |
| -21.88                                  | 0.17                | 0.35                | 254.97        | 222.40                           |   |
| -21.63                                  | 0.17                | 0.35                | 255.43        | 227.54                           |   |
| -21.38                                  | 0.18                | 0.35                | 255.69        | 232.47                           |   |
| -21.13                                  | 0.18                | 0.35                | 255.74        | 237.16                           |   |
| -20.88                                  | 0.17                | 0.35                | 255.59        | 241.61                           |   |
| -20.63                                  | 0.17                | 0.35                | 255.22        | 245.79                           |   |
| -20.37                                  | 0.17                | 0.35                | 254.63        | 249.68                           |   |
| -20.12                                  | 0.17                | 0.35                | 253.82        | 253.26                           |   |
| -19.87                                  | 0.17                | 0.35                | 252.78        | 256.51                           |   |
| -19.62                                  | 0.17                | 0.34                | 251.51        | 259.41                           |   |
| -19.37                                  | 0.17                | 0.34                | 249.99        | 261.92                           |   |
| -19.12                                  | 0.17                | 0.34                | 248.22        | 264.03                           |   |
| -18.87                                  | 0.17                | 0.33                | 246.20        | 265.72                           |   |
| -18.62                                  | 0.17                | 0.33                | 243.91        | 266.95                           |   |
| -18.37                                  | 0.16                | 0.33                | 241.34        | 267.69                           |   |



|                                         |         |                          |           |               |                 |
|-----------------------------------------|---------|--------------------------|-----------|---------------|-----------------|
|                                         |         |                          |           | Seite         | 7               |
| Programm DC-Böschung/Win Version 24.2.0 |         |                          |           |               |                 |
| D-L_LFK4                                |         |                          |           | Lastfall      | G               |
|                                         |         |                          |           |               |                 |
| $x_M$                                   |         | Erdbeben-                | Erdbeben- | $R \cdot T_i$ | $R \cdot G^*$   |
|                                         |         | last V                   | last H    |               | $\sin(\varphi)$ |
| [m]                                     |         | [kN/m]                   | [kN/m]    | [kNm/m]       | [kNm/m]         |
| -18.12                                  |         | 0.16                     | 0.32      | 238.49        | 267.92          |
| -17.87                                  |         | 0.16                     | 0.32      | 235.34        | 267.61          |
| -17.62                                  |         | 0.15                     | 0.31      | 231.88        | 266.72          |
| -17.37                                  |         | 0.15                     | 0.30      | 228.10        | 265.23          |
| -17.12                                  |         | 0.15                     | 0.30      | 223.98        | 263.09          |
| -16.87                                  |         | 0.14                     | 0.29      | 219.50        | 260.25          |
| -16.62                                  |         | 0.14                     | 0.28      | 214.66        | 256.70          |
| -16.37                                  |         | 0.14                     | 0.27      | 209.42        | 252.38          |
| -16.12                                  |         | 0.13                     | 0.26      | 203.76        | 247.24          |
| -15.88                                  |         | 0.13                     | 0.25      | 197.67        | 241.24          |
| -15.63                                  |         | 0.12                     | 0.24      | 191.12        | 234.33          |
| -15.38                                  |         | 0.12                     | 0.23      | 184.07        | 226.45          |
| -15.13                                  |         | 0.11                     | 0.22      | 176.49        | 217.53          |
| -14.88                                  |         | 0.10                     | 0.21      | 168.35        | 207.52          |
| -14.63                                  |         | 0.10                     | 0.19      | 159.61        | 196.34          |
| -14.38                                  |         | 0.09                     | 0.18      | 150.23        | 183.92          |
| -14.13                                  |         | 0.08                     | 0.16      | 140.12        | 170.15          |
| -13.88                                  |         | 0.07                     | 0.15      | 129.26        | 154.97          |
| -13.63                                  |         | 0.06                     | 0.13      | 117.57        | 138.26          |
| -13.38                                  |         | 0.06                     | 0.11      | 104.97        | 119.92          |
| -13.13                                  |         | 0.05                     | 0.09      | 91.37         | 99.80           |
| -12.88                                  |         | 0.04                     | 0.07      | 76.67         | 77.78           |
| -12.63                                  |         | 0.02                     | 0.05      | 60.73         | 53.68           |
| -12.38                                  |         | 0.01                     | 0.02      | 43.42         | 27.32           |
| -12.19                                  |         | 0.00                     | 0.00      | 13.59         | 3.05            |
|                                         |         |                          |           |               |                 |
| Summen:                                 |         |                          |           | 15084.61      | 12558.05        |
|                                         |         |                          |           |               |                 |
| Einwirkungen                            | $E_d =$ | 12558.05 kN              |           |               |                 |
| Widerstände                             | $R_d =$ | 15084.61 kN              |           |               |                 |
|                                         |         |                          |           |               |                 |
| $E_d/R_d = 0.83 < 1.0$                  |         | *** Nachweis erfüllt *** |           |               |                 |





Eingabedatei: M:\Projekte\2023\  
 23020\_P-BL-S-SK-K\_Speicher-Bodensee\_Kronplatz\Berechnungen\D-L\_LFK5.dbb

**Berechnung nach: NTC 2018 (Eurocode 7)**

Berechnung mit Nachweisverfahren 1  
 Kombination mit Teilsicherheitsbeiwerten der Gruppen A2 + M2 + R2

| Schichtdaten                  |         |          | DA- Damm | GE1    | GE2    |        |        |
|-------------------------------|---------|----------|----------|--------|--------|--------|--------|
|                               |         |          | GE3      |        |        |        |        |
| Innere Reibung cal $\varphi'$ | [Grad]  |          | 35.00    | 35.00  | 33.50  |        |        |
|                               |         |          | 37.00    |        |        |        |        |
| Kohäsion cal c'               | [kN/m²] |          | 5.0      | 0.5    | 4.0    |        |        |
|                               |         |          | 300.0    |        |        |        |        |
| Wichte Boden                  | [kN/m³] |          | 20.0     | 19.5   | 19.5   |        |        |
|                               |         |          | 27.0     |        |        |        |        |
| Wichte wassergesättigt        | [kN/m³] |          | 22.0     | 21.0   | 21.0   |        |        |
|                               |         |          | 27.0     |        |        |        |        |
| Wichte unter Auftrieb         | [kN/m³] |          | 12.0     | 11.0   | 11.0   |        |        |
|                               |         |          | 17.0     |        |        |        |        |
| Geländeverlauf und Schichten  |         |          |          |        |        |        |        |
| x [m]                         |         | -68.69   | -64.72   | -62.53 | -59.50 | -57.00 |        |
|                               |         | -54.50   | -53.74   | -51.11 | -51.00 | -47.00 |        |
|                               |         | -45.97   | -40.00   | -38.00 | -37.00 | -36.50 |        |
|                               |         | -35.79   | -32.33   | -32.02 | -30.12 | -29.50 |        |
|                               |         | -22.69   | -20.50   | -17.16 | -15.00 | -14.37 |        |
|                               |         | -8.00    | -5.50    | -4.00  | 0.00   | 1.52   |        |
|                               |         | 3.86     | 5.50     | 7.33   | 8.50   | 11.03  |        |
|                               |         | 12.00    | 19.73    | 20.00  | 29.98  | 30.00  |        |
|                               |         | 39.50    | 47.86    | 56.00  | 62.20  | 63.50  |        |
| z Gelände                     |         | -29.17   | -28.19   | -27.69 | -27.00 | -26.50 |        |
|                               |         | -25.93   | -25.75   | -24.45 | -24.40 | -22.43 |        |
|                               |         | -21.92   | -19.36   | -18.50 | -18.05 | -17.82 |        |
|                               |         | -17.50   | -15.93   | -15.79 | -14.93 | -14.57 |        |
|                               |         | -10.68   | -9.43    | -7.52  | -6.29  | -5.93  |        |
|                               |         | -2.29    | -0.86    | 0.00   | 0.00   | -0.76  |        |
|                               |         | -1.93    | -2.75    | -3.67  | -4.25  | -5.51  |        |
|                               |         | -6.00    | -9.87    | -10.00 | -14.99 | -15.00 |        |
|                               |         | -15.00   | -15.00   | -15.00 | -15.00 | -15.00 |        |
| z Schicht                     |         | DA- Damm | -29.17   | -28.19 | -27.69 | -27.00 | -26.50 |
|                               |         |          | -25.93   | -25.75 | -24.45 | -24.40 | -22.43 |
|                               |         |          | -21.92   | -19.36 | -18.50 | -18.05 | -17.82 |
|                               |         |          | -17.50   | -15.93 | -15.79 | -14.93 | -14.93 |
|                               |         |          | -14.93   | -14.93 | -14.93 | -12.94 | -12.37 |
|                               |         |          | -12.37   | -12.37 | -12.37 | -12.37 | -12.37 |
|                               |         |          | -9.87    | -9.87  | -9.87  | -9.87  | -9.87  |
|                               |         |          | -9.87    | -9.87  | -10.00 | -14.99 | -15.00 |
|                               |         |          | -15.00   | -15.00 | -15.00 | -15.00 | -15.00 |

|                                         |     |          |          |          |          |          |          |   |
|-----------------------------------------|-----|----------|----------|----------|----------|----------|----------|---|
|                                         |     |          |          |          |          |          | Seite    | 3 |
| Programm DC-Böschung/Win Version 24.2.0 |     |          |          |          |          |          |          |   |
| D-L_LFK5                                |     |          |          |          |          |          | Lastfall | G |
|                                         |     |          |          |          |          |          |          |   |
| z Schicht                               | GE1 | -37.50   | -35.48   | -34.36   | -33.09   | -32.05   |          |   |
|                                         |     | -31.00   | -30.70   | -29.64   | -29.60   | -28.00   |          |   |
|                                         |     | -27.56   | -25.00   | -24.33   | -24.00   | -23.77   |          |   |
|                                         |     | -23.43   | -21.82   | -21.67   | -20.79   | -20.50   |          |   |
|                                         |     | -17.56   | -17.12   | -16.44   | -16.00   | -15.87   |          |   |
|                                         |     | -14.53   | -14.00   | -13.73   | -13.00   | -12.72   |          |   |
|                                         |     | -12.30   | -12.00   | -11.69   | -11.50   | -11.14   |          |   |
|                                         |     | -11.00   | -9.87    | -10.00   | -14.99   | -15.00   |          |   |
|                                         |     | -15.00   | -15.00   | -15.00   | -15.00   | -15.00   |          |   |
| z Schicht                               | GE2 | -54.00   | -53.33   | -52.95   | -52.44   | -52.02   |          |   |
|                                         |     | -51.59   | -51.46   | -51.02   | -51.00   | -49.48   |          |   |
|                                         |     | -49.09   | -46.83   | -46.07   | -45.69   | -45.50   |          |   |
|                                         |     | -45.34   | -44.59   | -44.52   | -44.11   | -43.97   |          |   |
|                                         |     | -42.48   | -42.00   | -41.20   | -40.68   | -40.53   |          |   |
|                                         |     | -39.00   | -38.29   | -37.86   | -36.72   | -36.29   |          |   |
|                                         |     | -35.62   | -35.15   | -34.63   | -34.20   | -33.28   |          |   |
|                                         |     | -32.92   | -30.10   | -30.00   | -26.39   | -26.38   |          |   |
|                                         |     | -23.00   | -20.00   | -17.50   | -15.49   | -15.49   |          |   |
| z Schicht                               | GE3 | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |          |   |
|                                         |     | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |          |   |
|                                         |     | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |          |   |
|                                         |     | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |          |   |
|                                         |     | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |          |   |
|                                         |     | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |          |   |
|                                         |     | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |          |   |
|                                         |     | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |          |   |
|                                         |     | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |          |   |
| Verlauf des Grundwasserspiegels         |     |          |          |          |          |          |          |   |
| x [m]                                   |     | z [m]    |          |          |          |          |          |   |
| -68.69                                  |     | -29.17   |          |          |          |          |          |   |
| -64.72                                  |     | -28.19   |          |          |          |          |          |   |
| -59.50                                  |     | -27.00   |          |          |          |          |          |   |
| -57.00                                  |     | -26.50   |          |          |          |          |          |   |
| -53.74                                  |     | -25.75   |          |          |          |          |          |   |
| -51.11                                  |     | -24.45   |          |          |          |          |          |   |
| -45.97                                  |     | -21.92   |          |          |          |          |          |   |
| -38.00                                  |     | -18.50   |          |          |          |          |          |   |
| -35.79                                  |     | -17.50   |          |          |          |          |          |   |
| -32.33                                  |     | -15.93   |          |          |          |          |          |   |
| -32.02                                  |     | -15.79   |          |          |          |          |          |   |
| -30.13                                  |     | -14.93   |          |          |          |          |          |   |
| -27.50                                  |     | -14.50   |          |          |          |          |          |   |
| -24.50                                  |     | -14.00   |          |          |          |          |          |   |
| -22.00                                  |     | -13.50   |          |          |          |          |          |   |
| -19.00                                  |     | -13.00   |          |          |          |          |          |   |
| -17.00                                  |     | -12.50   |          |          |          |          |          |   |
| -14.00                                  |     | -11.50   |          |          |          |          |          |   |
| -10.00                                  |     | -10.00   |          |          |          |          |          |   |
| -7.50                                   |     | -8.50    |          |          |          |          |          |   |
| -5.00                                   |     | -6.50    |          |          |          |          |          |   |
| -3.00                                   |     | -5.00    |          |          |          |          |          |   |
| -1.00                                   |     | -3.50    |          |          |          |          |          |   |
| 1.50                                    |     | -2.00    |          |          |          |          |          |   |
| 3.40                                    |     | -1.70    |          |          |          |          |          |   |
| 63.50                                   |     | -1.75    |          |          |          |          |          |   |

Streckenlasten

Alle Lasten beziehen sich auf 1 m Länge

| LF-Komb. |   | q   | x <sub>A</sub> | x <sub>E</sub> | z <sub>Q</sub> | γ    | ψ    |
|----------|---|-----|----------------|----------------|----------------|------|------|
| G        | Q | 5.0 | -4.0           | 0.0            | 0.00           | 1.30 | 1.00 |

Lamellenbreiten

| Von x [m] | bis x [m] | Breite [m] |
|-----------|-----------|------------|
| -10000.00 | 10000.00  | 0.25       |

Teilsicherheitsbeiwerte (GEO) für NW-Verf. 1

| γ- | G    | Q    | W    | E    | φ    | c    | c <sub>u</sub> | R <sub>a</sub> | R <sub>b</sub> | R    |
|----|------|------|------|------|------|------|----------------|----------------|----------------|------|
|    | 1.00 | 1.30 | 1.00 | 1.30 | 1.25 | 1.25 | 1.40           | 1.10           | 1.10           | 1.10 |

|                |                                   |
|----------------|-----------------------------------|
| γ-             | Teilsicherheitsbeiwert für...     |
| G              | Ständige Lasten                   |
| Q              | Veränderliche Lasten              |
| W              | Wasserdruck                       |
| E              | Erdbeben                          |
| φ              | Reibungsbeiwert tan(φ)            |
| c              | Kohäsion c                        |
| c <sub>u</sub> | Kohäsion undränirt c <sub>u</sub> |
| R <sub>a</sub> | Anker                             |
| R <sub>b</sub> | Bauteile                          |
| R              | Widerstände                       |

Bestimmung der Sicherheit nach Krey-Bishop

Gleitkreis mit Iteration des Mittelpunktes:

Startpunkt: x<sub>M</sub> = -23.50 m, z<sub>M</sub> = 3.00 m,

Δ x = 1.00 m, Δ z = 1.00 m,

Festpunkt: x<sub>F</sub> = -30.12 m, z<sub>F</sub> = -14.93 m

Lastfallkomb. G

Gleitkörper von x = -30.13 bis -2.59 m

Gleitkreis: x<sub>M</sub> = -28.87 m, z<sub>M</sub> = 15.63 m, R = 30.58 m

Bestimmung der Lamellen-Anteile

| x <sub>M</sub> | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | φ      | c       | ψ      |
|----------------|-------------|-------------------|---------|--------------------|--------|---------|--------|
| [m]            | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad] | [kN/m²] | [Grad] |
| -30.06         | 0.13        | 0.10              | 0.00    | 0.00               | 35.00  | 0.5     | -2.23  |
| -29.88         | 0.25        | 0.78              | 0.00    | 0.00               | 35.00  | 0.5     | -1.87  |
| -29.63         | 0.25        | 1.56              | 0.00    | 0.00               | 35.00  | 0.5     | -1.41  |
| -29.38         | 0.25        | 2.32              | 0.00    | 0.00               | 35.00  | 0.5     | -0.94  |
| -29.13         | 0.25        | 3.07              | 0.00    | 0.00               | 35.00  | 0.5     | -0.47  |
| -28.88         | 0.25        | 3.81              | 0.00    | 0.00               | 35.00  | 0.5     | 0.00   |
| -28.63         | 0.25        | 4.54              | 0.00    | 0.00               | 35.00  | 0.5     | 0.47   |
| -28.38         | 0.25        | 5.26              | 0.00    | 0.00               | 35.00  | 0.5     | 0.94   |
| -28.13         | 0.25        | 5.96              | 0.00    | 0.00               | 35.00  | 0.5     | 1.41   |
| -27.88         | 0.25        | 6.66              | 0.00    | 0.00               | 35.00  | 0.5     | 1.87   |
| -27.63         | 0.25        | 7.35              | 0.00    | 0.00               | 35.00  | 0.5     | 2.34   |
| -27.38         | 0.25        | 8.02              | 0.00    | 0.00               | 35.00  | 5.0     | 2.81   |
| -27.13         | 0.25        | 8.68              | 0.00    | 0.00               | 35.00  | 5.0     | 3.28   |
| -26.88         | 0.25        | 9.33              | 0.00    | 0.00               | 35.00  | 5.0     | 3.75   |
| -26.63         | 0.25        | 9.97              | 0.00    | 0.00               | 35.00  | 5.0     | 4.22   |
| -26.38         | 0.25        | 10.60             | 0.00    | 0.00               | 35.00  | 5.0     | 4.69   |
| -26.13         | 0.25        | 11.21             | 0.00    | 0.00               | 35.00  | 5.0     | 5.16   |
| -25.88         | 0.25        | 11.82             | 0.00    | 0.00               | 35.00  | 5.0     | 5.63   |
| -25.63         | 0.25        | 12.41             | 0.00    | 0.00               | 35.00  | 5.0     | 6.10   |
| -25.38         | 0.25        | 13.00             | 0.00    | 0.00               | 35.00  | 5.0     | 6.57   |
| -25.13         | 0.25        | 13.57             | 0.00    | 0.00               | 35.00  | 5.0     | 7.04   |

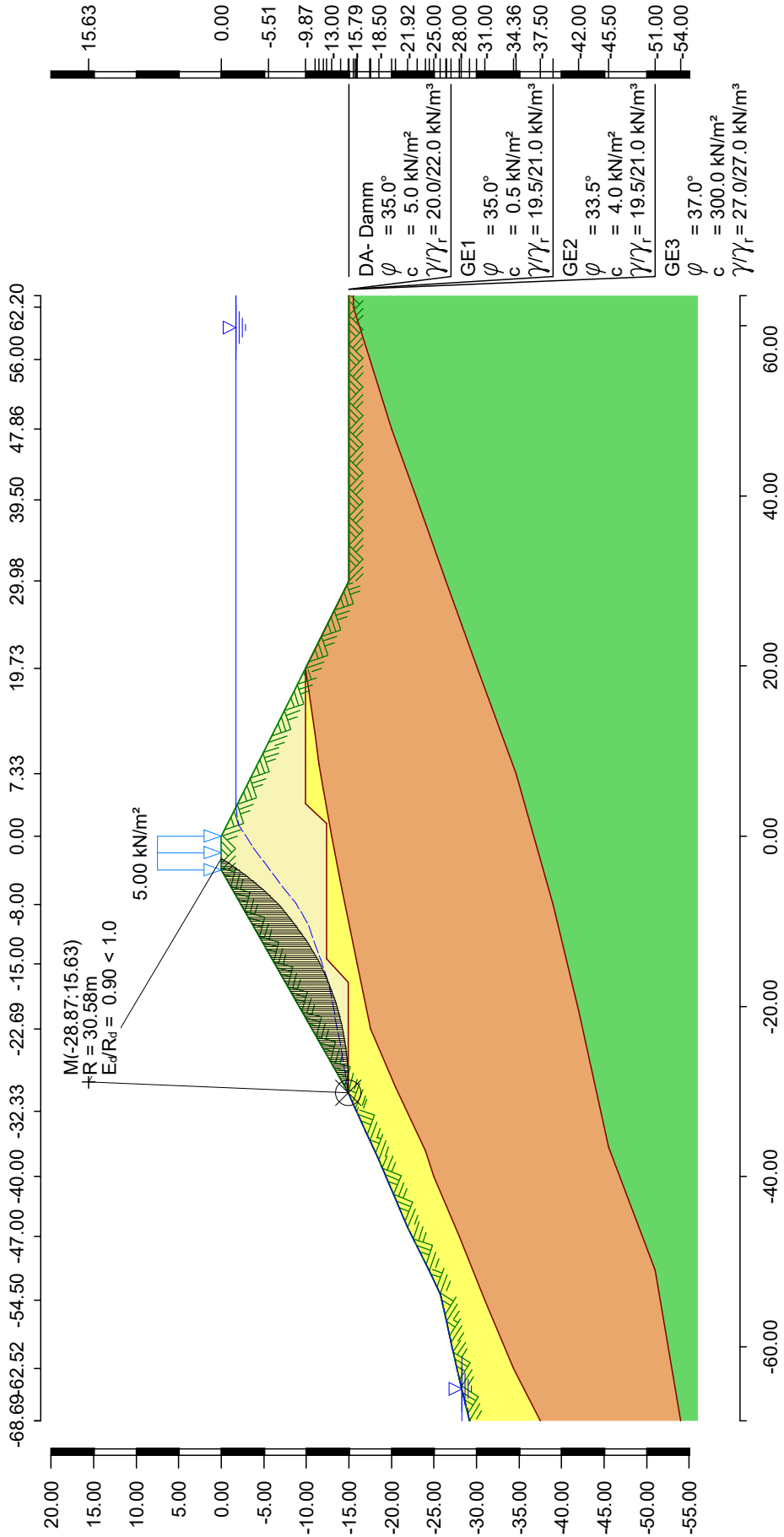
|                                         |             |                   |         |                    |           |                      |             |   |
|-----------------------------------------|-------------|-------------------|---------|--------------------|-----------|----------------------|-------------|---|
|                                         |             |                   |         |                    |           |                      | Seite       | 5 |
| Programm DC-Böschung/Win Version 24.2.0 |             |                   |         |                    |           |                      |             |   |
| D-L_LFK5                                |             |                   |         |                    |           |                      | Lastfall    | G |
|                                         |             |                   |         |                    |           |                      |             |   |
| $x_M$                                   | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c                    | $\vartheta$ |   |
| [m]                                     | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]      |   |
| -24.88                                  | 0.25        | 14.13             | 0.00    | 0.00               | 35.00     | 5.0                  | 7.52        |   |
| -24.63                                  | 0.25        | 14.68             | 0.00    | 0.00               | 35.00     | 5.0                  | 7.99        |   |
| -24.38                                  | 0.25        | 15.21             | 0.00    | 0.00               | 35.00     | 5.0                  | 8.46        |   |
| -24.13                                  | 0.25        | 15.74             | 0.00    | 0.00               | 35.00     | 5.0                  | 8.94        |   |
| -23.88                                  | 0.25        | 16.26             | 0.00    | 0.00               | 35.00     | 5.0                  | 9.41        |   |
| -23.63                                  | 0.25        | 16.77             | 0.00    | 0.00               | 35.00     | 5.0                  | 9.89        |   |
| -23.38                                  | 0.25        | 17.26             | 0.00    | 0.00               | 35.00     | 5.0                  | 10.36       |   |
| -23.13                                  | 0.25        | 17.74             | 0.00    | 0.00               | 35.00     | 5.0                  | 10.84       |   |
| -22.88                                  | 0.25        | 18.21             | 0.00    | 0.00               | 35.00     | 5.0                  | 11.32       |   |
| -22.63                                  | 0.25        | 18.67             | 0.00    | 0.00               | 35.00     | 5.0                  | 11.79       |   |
| -22.38                                  | 0.25        | 19.12             | 0.00    | 0.00               | 35.00     | 5.0                  | 12.27       |   |
| -22.13                                  | 0.25        | 19.55             | 0.00    | 0.00               | 35.00     | 5.0                  | 12.75       |   |
| -21.88                                  | 0.25        | 19.97             | 0.00    | 0.00               | 35.00     | 5.0                  | 13.23       |   |
| -21.63                                  | 0.25        | 20.38             | 0.00    | 0.00               | 35.00     | 5.0                  | 13.71       |   |
| -21.38                                  | 0.25        | 20.77             | 0.00    | 0.00               | 35.00     | 5.0                  | 14.20       |   |
| -21.13                                  | 0.25        | 21.15             | 0.00    | 0.00               | 35.00     | 5.0                  | 14.68       |   |
| -20.88                                  | 0.25        | 21.52             | 0.00    | 0.00               | 35.00     | 5.0                  | 15.17       |   |
| -20.63                                  | 0.25        | 21.87             | 0.00    | 0.00               | 35.00     | 5.0                  | 15.65       |   |
| -20.37                                  | 0.25        | 22.21             | 0.00    | 0.00               | 35.00     | 5.0                  | 16.14       |   |
| -20.12                                  | 0.25        | 22.54             | 0.00    | 0.00               | 35.00     | 5.0                  | 16.63       |   |
| -19.87                                  | 0.25        | 22.86             | 0.00    | 0.00               | 35.00     | 5.0                  | 17.12       |   |
| -19.62                                  | 0.25        | 23.17             | 0.00    | 0.00               | 35.00     | 5.0                  | 17.61       |   |
| -19.37                                  | 0.25        | 23.46             | 0.00    | 0.00               | 35.00     | 5.0                  | 18.10       |   |
| -19.12                                  | 0.25        | 23.74             | 0.00    | 0.00               | 35.00     | 5.0                  | 18.59       |   |
| -18.87                                  | 0.25        | 24.02             | 0.00    | 0.00               | 35.00     | 5.0                  | 19.09       |   |
| -18.62                                  | 0.25        | 24.28             | 0.00    | 0.00               | 35.00     | 5.0                  | 19.58       |   |
| -18.37                                  | 0.25        | 24.53             | 0.00    | 0.00               | 35.00     | 5.0                  | 20.08       |   |
| -18.12                                  | 0.25        | 24.77             | 0.00    | 0.00               | 35.00     | 5.0                  | 20.58       |   |
| -17.87                                  | 0.25        | 24.99             | 0.00    | 0.00               | 35.00     | 5.0                  | 21.08       |   |
| -17.62                                  | 0.25        | 25.20             | 0.00    | 0.00               | 35.00     | 5.0                  | 21.59       |   |
| -17.37                                  | 0.25        | 25.39             | 0.00    | 0.00               | 35.00     | 5.0                  | 22.09       |   |
| -17.12                                  | 0.25        | 25.57             | 0.00    | 0.00               | 35.00     | 5.0                  | 22.60       |   |
| -16.87                                  | 0.25        | 25.74             | 0.00    | 0.00               | 35.00     | 5.0                  | 23.11       |   |
| -16.62                                  | 0.25        | 25.90             | 0.00    | 0.00               | 35.00     | 5.0                  | 23.62       |   |
| -16.37                                  | 0.25        | 26.06             | 0.00    | 0.00               | 35.00     | 5.0                  | 24.13       |   |
| -16.12                                  | 0.25        | 26.20             | 0.00    | 0.00               | 35.00     | 5.0                  | 24.64       |   |
| -15.88                                  | 0.25        | 26.34             | 0.00    | 0.00               | 35.00     | 5.0                  | 25.16       |   |
| -15.63                                  | 0.25        | 26.46             | 0.00    | 0.00               | 35.00     | 5.0                  | 25.68       |   |
| -15.38                                  | 0.25        | 26.56             | 0.00    | 0.00               | 35.00     | 5.0                  | 26.20       |   |
| -15.13                                  | 0.25        | 26.66             | 0.00    | 0.00               | 35.00     | 5.0                  | 26.72       |   |
| -14.88                                  | 0.25        | 26.73             | 0.00    | 0.00               | 35.00     | 5.0                  | 27.25       |   |
| -14.63                                  | 0.25        | 26.80             | 0.00    | 0.00               | 35.00     | 5.0                  | 27.77       |   |
| -14.38                                  | 0.25        | 26.85             | 0.00    | 0.00               | 35.00     | 5.0                  | 28.31       |   |
| -14.13                                  | 0.25        | 26.88             | 0.00    | 0.00               | 35.00     | 5.0                  | 28.84       |   |
| -13.88                                  | 0.25        | 26.90             | 0.00    | 0.00               | 35.00     | 5.0                  | 29.38       |   |
| -13.63                                  | 0.25        | 26.90             | 0.00    | 0.00               | 35.00     | 5.0                  | 29.91       |   |
| -13.38                                  | 0.25        | 26.89             | 0.00    | 0.00               | 35.00     | 5.0                  | 30.46       |   |
| -13.13                                  | 0.25        | 26.86             | 0.00    | 0.00               | 35.00     | 5.0                  | 31.00       |   |
| -12.88                                  | 0.25        | 26.81             | 0.00    | 0.00               | 35.00     | 5.0                  | 31.55       |   |
| -12.63                                  | 0.25        | 26.75             | 0.00    | 0.00               | 35.00     | 5.0                  | 32.10       |   |
| -12.38                                  | 0.25        | 26.67             | 0.00    | 0.00               | 35.00     | 5.0                  | 32.65       |   |
| -12.13                                  | 0.25        | 26.58             | 0.00    | 0.00               | 35.00     | 5.0                  | 33.21       |   |
| -11.88                                  | 0.25        | 26.47             | 0.00    | 0.00               | 35.00     | 5.0                  | 33.77       |   |
| -11.63                                  | 0.25        | 26.34             | 0.00    | 0.00               | 35.00     | 5.0                  | 34.34       |   |
| -11.38                                  | 0.25        | 26.19             | 0.00    | 0.00               | 35.00     | 5.0                  | 34.91       |   |
| -11.13                                  | 0.25        | 26.02             | 0.00    | 0.00               | 35.00     | 5.0                  | 35.48       |   |
| -10.88                                  | 0.25        | 25.83             | 0.00    | 0.00               | 35.00     | 5.0                  | 36.06       |   |
| -10.63                                  | 0.25        | 25.63             | 0.00    | 0.00               | 35.00     | 5.0                  | 36.64       |   |

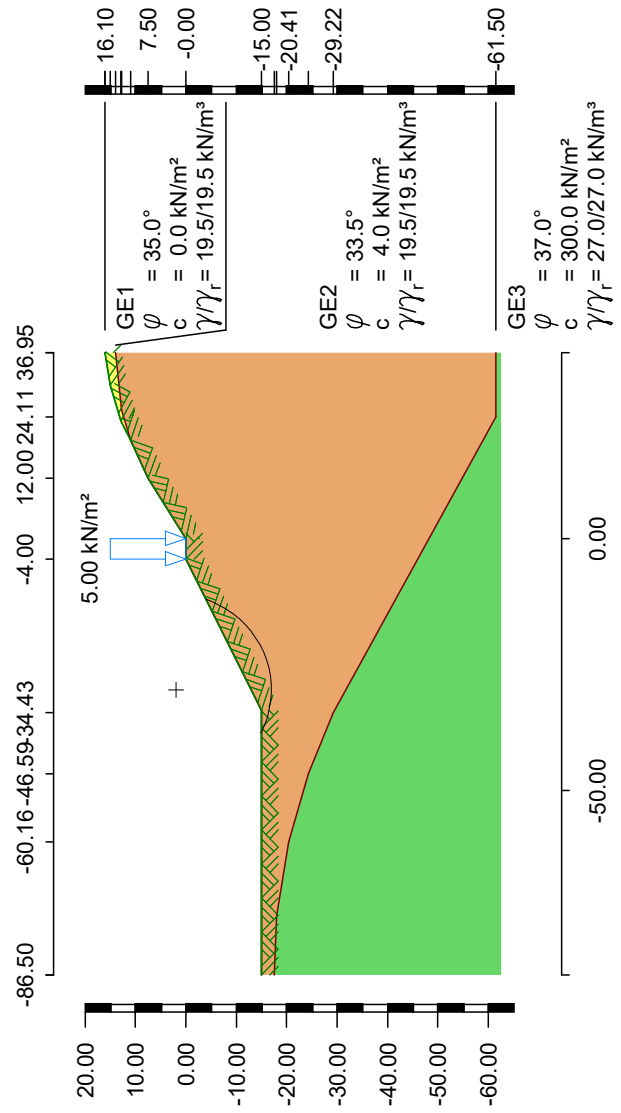
|                                         |                         |                                      |         |                    |           |                      |                          |   |
|-----------------------------------------|-------------------------|--------------------------------------|---------|--------------------|-----------|----------------------|--------------------------|---|
|                                         |                         |                                      |         |                    |           |                      | Seite                    | 6 |
| Programm DC-Böschung/Win Version 24.2.0 |                         |                                      |         |                    |           |                      |                          |   |
| D-L_LFK5                                |                         |                                      |         |                    |           |                      | Lastfall                 | G |
|                                         |                         |                                      |         |                    |           |                      |                          |   |
| $x_M$                                   | Breite<br>b             | Eigen-<br>gewicht                    | Auflast | Wasser-<br>auflast | $\varphi$ | c                    | $\vartheta$              |   |
| [m]                                     | [m]                     | [kN/m]                               | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]                   |   |
| -10.38                                  | 0.25                    | 25.40                                | 0.00    | 0.00               | 35.00     | 5.0                  | 37.23                    |   |
| -10.13                                  | 0.25                    | 25.16                                | 0.00    | 0.00               | 35.00     | 5.0                  | 37.82                    |   |
| -9.88                                   | 0.25                    | 24.89                                | 0.00    | 0.00               | 35.00     | 5.0                  | 38.41                    |   |
| -9.63                                   | 0.25                    | 24.60                                | 0.00    | 0.00               | 35.00     | 5.0                  | 39.01                    |   |
| -9.38                                   | 0.25                    | 24.29                                | 0.00    | 0.00               | 35.00     | 5.0                  | 39.62                    |   |
| -9.13                                   | 0.25                    | 23.96                                | 0.00    | 0.00               | 35.00     | 5.0                  | 40.23                    |   |
| -8.88                                   | 0.25                    | 23.61                                | 0.00    | 0.00               | 35.00     | 5.0                  | 40.85                    |   |
| -8.63                                   | 0.25                    | 23.23                                | 0.00    | 0.00               | 35.00     | 5.0                  | 41.47                    |   |
| -8.38                                   | 0.25                    | 22.83                                | 0.00    | 0.00               | 35.00     | 5.0                  | 42.10                    |   |
| -8.13                                   | 0.25                    | 22.40                                | 0.00    | 0.00               | 35.00     | 5.0                  | 42.73                    |   |
| -7.88                                   | 0.25                    | 21.94                                | 0.00    | 0.00               | 35.00     | 5.0                  | 43.37                    |   |
| -7.63                                   | 0.25                    | 21.46                                | 0.00    | 0.00               | 35.00     | 5.0                  | 44.02                    |   |
| -7.38                                   | 0.25                    | 20.96                                | 0.00    | 0.00               | 35.00     | 5.0                  | 44.67                    |   |
| -7.13                                   | 0.25                    | 20.42                                | 0.00    | 0.00               | 35.00     | 5.0                  | 45.34                    |   |
| -6.88                                   | 0.25                    | 19.86                                | 0.00    | 0.00               | 35.00     | 5.0                  | 46.01                    |   |
| -6.63                                   | 0.25                    | 19.26                                | 0.00    | 0.00               | 35.00     | 5.0                  | 46.69                    |   |
| -6.38                                   | 0.25                    | 18.63                                | 0.00    | 0.00               | 35.00     | 5.0                  | 47.37                    |   |
| -6.13                                   | 0.25                    | 17.97                                | 0.00    | 0.00               | 35.00     | 5.0                  | 48.07                    |   |
| -5.88                                   | 0.25                    | 17.28                                | 0.00    | 0.00               | 35.00     | 5.0                  | 48.78                    |   |
| -5.63                                   | 0.25                    | 16.55                                | 0.00    | 0.00               | 35.00     | 5.0                  | 49.49                    |   |
| -5.38                                   | 0.25                    | 15.78                                | 0.00    | 0.00               | 35.00     | 5.0                  | 50.22                    |   |
| -5.13                                   | 0.25                    | 14.97                                | 0.00    | 0.00               | 35.00     | 5.0                  | 50.96                    |   |
| -4.88                                   | 0.25                    | 14.12                                | 0.00    | 0.00               | 35.00     | 5.0                  | 51.71                    |   |
| -4.63                                   | 0.25                    | 13.23                                | 0.00    | 0.00               | 35.00     | 5.0                  | 52.47                    |   |
| -4.38                                   | 0.25                    | 12.30                                | 0.00    | 0.00               | 35.00     | 5.0                  | 53.24                    |   |
| -4.13                                   | 0.25                    | 11.31                                | 0.00    | 0.00               | 35.00     | 5.0                  | 54.03                    |   |
| -3.88                                   | 0.25                    | 9.92                                 | 1.62    | 0.00               | 35.00     | 5.0                  | 54.84                    |   |
| -3.63                                   | 0.25                    | 8.12                                 | 1.62    | 0.00               | 35.00     | 5.0                  | 55.66                    |   |
| -3.38                                   | 0.25                    | 6.26                                 | 1.62    | 0.00               | 35.00     | 5.0                  | 56.50                    |   |
| -3.13                                   | 0.25                    | 4.34                                 | 1.62    | 0.00               | 35.00     | 5.0                  | 57.36                    |   |
| -2.88                                   | 0.25                    | 2.35                                 | 1.62    | 0.00               | 35.00     | 5.0                  | 58.24                    |   |
| -2.67                                   | 0.16                    | 0.43                                 | 1.05    | 0.00               | 35.00     | 5.0                  | 58.98                    |   |
| $x_M$                                   | Porenwasser-<br>druck u | Porenwasser-<br>überdruck $\Delta u$ |         |                    |           | $R^*T_i$             | $R^*G^* \sin(\vartheta)$ |   |
| [m]                                     | [kN/m <sup>2</sup> ]    | [kN/m <sup>2</sup> ]                 |         |                    |           | [kNm/m]              | [kNm/m]                  |   |
| -30.06                                  | 0.00                    | 0.00                                 |         |                    |           | 2.98                 | -0.12                    |   |
| -29.88                                  | 0.00                    | 0.00                                 |         |                    |           | 15.23                | -0.78                    |   |
| -29.63                                  | 0.00                    | 0.00                                 |         |                    |           | 27.34                | -1.17                    |   |
| -29.38                                  | 0.00                    | 0.00                                 |         |                    |           | 39.19                | -1.16                    |   |
| -29.13                                  | 0.00                    | 0.00                                 |         |                    |           | 50.77                | -0.77                    |   |
| -28.88                                  | 0.00                    | 0.00                                 |         |                    |           | 62.08                | 0.00                     |   |
| -28.63                                  | 0.00                    | 0.00                                 |         |                    |           | 73.15                | 1.13                     |   |
| -28.38                                  | 0.00                    | 0.00                                 |         |                    |           | 83.96                | 2.63                     |   |
| -28.13                                  | 0.00                    | 0.00                                 |         |                    |           | 94.52                | 4.47                     |   |
| -27.88                                  | 0.00                    | 0.00                                 |         |                    |           | 104.85               | 6.66                     |   |
| -27.63                                  | 0.00                    | 0.00                                 |         |                    |           | 114.91               | 9.18                     |   |
| -27.38                                  | 4.38                    | 0.00                                 |         |                    |           | 132.49               | 12.03                    |   |
| -27.13                                  | 4.66                    | 0.00                                 |         |                    |           | 140.99               | 15.19                    |   |
| -26.88                                  | 4.92                    | 0.00                                 |         |                    |           | 149.35               | 18.66                    |   |
| -26.63                                  | 5.15                    | 0.00                                 |         |                    |           | 157.57               | 22.43                    |   |
| -26.38                                  | 5.37                    | 0.00                                 |         |                    |           | 165.64               | 26.50                    |   |
| -26.13                                  | 5.56                    | 0.00                                 |         |                    |           | 173.59               | 30.84                    |   |
| -25.88                                  | 5.74                    | 0.00                                 |         |                    |           | 181.40               | 35.46                    |   |
| -25.63                                  | 5.89                    | 0.00                                 |         |                    |           | 189.07               | 40.34                    |   |
| -25.38                                  | 6.02                    | 0.00                                 |         |                    |           | 196.62               | 45.48                    |   |
| -25.13                                  | 6.13                    | 0.00                                 |         |                    |           | 204.05               | 50.87                    |   |
| -24.88                                  | 6.25                    | 0.00                                 |         |                    |           | 211.27               | 56.51                    |   |



|                                         |                         |                                      |               | Seite                            | 7 |
|-----------------------------------------|-------------------------|--------------------------------------|---------------|----------------------------------|---|
| Programm DC-Böschung/Win Version 24.2.0 |                         |                                      |               | Lastfall                         | G |
| D-L_LFK5                                |                         |                                      |               |                                  |   |
| $x_M$                                   | Porenwasser-<br>druck u | Porenwasser-<br>überdruck $\Delta u$ | $R \cdot T_i$ | $R \cdot G^*$<br>$\sin(\varphi)$ |   |
| [m]                                     | [kN/m <sup>2</sup> ]    | [kN/m <sup>2</sup> ]                 | [kNm/m]       | [kNm/m]                          |   |
| -24.63                                  | 6.36                    | 0.00                                 | 218.35        | 62.37                            |   |
| -24.38                                  | 6.47                    | 0.00                                 | 225.23        | 68.47                            |   |
| -24.13                                  | 6.59                    | 0.00                                 | 231.90        | 74.78                            |   |
| -23.88                                  | 6.69                    | 0.00                                 | 238.46        | 81.31                            |   |
| -23.63                                  | 6.77                    | 0.00                                 | 244.90        | 88.03                            |   |
| -23.38                                  | 6.83                    | 0.00                                 | 251.24        | 94.94                            |   |
| -23.13                                  | 6.86                    | 0.00                                 | 257.47        | 102.03                           |   |
| -22.88                                  | 6.88                    | 0.00                                 | 263.60        | 109.28                           |   |
| -22.63                                  | 6.87                    | 0.00                                 | 269.62        | 116.70                           |   |
| -22.38                                  | 6.84                    | 0.00                                 | 275.53        | 124.27                           |   |
| -22.13                                  | 6.77                    | 0.00                                 | 281.42        | 131.97                           |   |
| -21.88                                  | 6.63                    | 0.00                                 | 287.33        | 139.79                           |   |
| -21.63                                  | 6.43                    | 0.00                                 | 293.24        | 147.72                           |   |
| -21.38                                  | 6.21                    | 0.00                                 | 299.05        | 155.76                           |   |
| -21.13                                  | 5.97                    | 0.00                                 | 304.76        | 163.90                           |   |
| -20.88                                  | 5.70                    | 0.00                                 | 310.37        | 172.13                           |   |
| -20.63                                  | 5.41                    | 0.00                                 | 315.89        | 180.44                           |   |
| -20.37                                  | 5.10                    | 0.00                                 | 321.32        | 188.82                           |   |
| -20.12                                  | 4.77                    | 0.00                                 | 326.65        | 197.27                           |   |
| -19.87                                  | 4.41                    | 0.00                                 | 331.89        | 205.76                           |   |
| -19.62                                  | 4.03                    | 0.00                                 | 337.05        | 214.30                           |   |
| -19.37                                  | 3.70                    | 0.00                                 | 341.89        | 222.89                           |   |
| -19.12                                  | 3.35                    | 0.00                                 | 346.66        | 231.50                           |   |
| -18.87                                  | 3.05                    | 0.00                                 | 351.12        | 240.17                           |   |
| -18.62                                  | 2.79                    | 0.00                                 | 355.29        | 248.87                           |   |
| -18.37                                  | 2.52                    | 0.00                                 | 359.37        | 257.56                           |   |
| -18.12                                  | 2.21                    | 0.00                                 | 363.36        | 266.23                           |   |
| -17.87                                  | 1.89                    | 0.00                                 | 367.27        | 274.86                           |   |
| -17.62                                  | 1.54                    | 0.00                                 | 371.10        | 283.46                           |   |
| -17.37                                  | 1.16                    | 0.00                                 | 374.84        | 291.99                           |   |
| -17.12                                  | 0.76                    | 0.00                                 | 378.49        | 300.46                           |   |
| -16.87                                  | 0.41                    | 0.00                                 | 381.83        | 308.90                           |   |
| -16.62                                  | 0.13                    | 0.00                                 | 384.85        | 317.29                           |   |
| -16.37                                  | 0.00                    | 0.00                                 | 387.26        | 325.70                           |   |
| -16.12                                  | 0.00                    | 0.00                                 | 389.16        | 334.10                           |   |
| -15.88                                  | 0.00                    | 0.00                                 | 390.91        | 342.39                           |   |
| -15.63                                  | 0.00                    | 0.00                                 | 392.49        | 350.57                           |   |
| -15.38                                  | 0.00                    | 0.00                                 | 393.91        | 358.62                           |   |
| -15.13                                  | 0.00                    | 0.00                                 | 395.17        | 366.53                           |   |
| -14.88                                  | 0.00                    | 0.00                                 | 396.26        | 374.28                           |   |
| -14.63                                  | 0.00                    | 0.00                                 | 397.18        | 381.87                           |   |
| -14.38                                  | 0.00                    | 0.00                                 | 397.93        | 389.28                           |   |
| -14.13                                  | 0.00                    | 0.00                                 | 398.51        | 396.48                           |   |
| -13.88                                  | 0.00                    | 0.00                                 | 398.91        | 403.47                           |   |
| -13.63                                  | 0.00                    | 0.00                                 | 399.13        | 410.24                           |   |
| -13.38                                  | 0.00                    | 0.00                                 | 399.18        | 416.77                           |   |
| -13.13                                  | 0.00                    | 0.00                                 | 399.03        | 423.04                           |   |
| -12.88                                  | 0.00                    | 0.00                                 | 398.70        | 429.04                           |   |
| -12.63                                  | 0.00                    | 0.00                                 | 398.18        | 434.74                           |   |
| -12.38                                  | 0.00                    | 0.00                                 | 397.46        | 440.14                           |   |
| -12.13                                  | 0.00                    | 0.00                                 | 396.54        | 445.21                           |   |
| -11.88                                  | 0.00                    | 0.00                                 | 395.41        | 449.93                           |   |
| -11.63                                  | 0.00                    | 0.00                                 | 394.07        | 454.30                           |   |
| -11.38                                  | 0.00                    | 0.00                                 | 392.52        | 458.28                           |   |
| -11.13                                  | 0.00                    | 0.00                                 | 390.74        | 461.85                           |   |
| -10.88                                  | 0.00                    | 0.00                                 | 388.74        | 465.00                           |   |
| -10.63                                  | 0.00                    | 0.00                                 | 386.50        | 467.71                           |   |
| -10.38                                  | 0.00                    | 0.00                                 | 384.02        | 469.95                           |   |







Eingabedatei: M:\Projekte\2023\  
23020\_P-BL-S-SK-K\_Speicher-Bodensee\_Kronplatz\Berechnungen\BB\_LFK1.dbb

Berechnung nach: NTC 2018 (Eurocode 7)

Berechnung mit Nachweisverfahren 1  
Kombination mit Teilsicherheitsbeiwerten der Gruppen A2 + M2 + R2

| Schichtdaten                  |                      | GE1   | GE2   | GE3   |
|-------------------------------|----------------------|-------|-------|-------|
| Innere Reibung cal $\varphi'$ | [Grad]               | 35.00 | 33.50 | 37.00 |
| Kohäsion cal $c'$             | [kN/m <sup>2</sup> ] | 0.0   | 4.0   | 300.0 |
| Wichte Boden                  | [kN/m <sup>3</sup> ] | 19.5  | 19.5  | 27.0  |
| Wichte wassergesättigt        | [kN/m <sup>3</sup> ] | 19.5  | 19.5  | 27.0  |
| Wichte unter Auftrieb         | [kN/m <sup>3</sup> ] | 9.5   | 9.5   | 17.0  |

| Geländeverlauf und Schichten |     |          |          |          |          |          |
|------------------------------|-----|----------|----------|----------|----------|----------|
| x [m]                        |     | -86.50   | -86.38   | -74.90   | -60.16   | -46.59   |
|                              |     | -34.43   | -34.00   | -4.00    | 0.00     | 12.00    |
|                              |     | 19.50    | 23.34    | 24.11    | 25.50    | 30.50    |
|                              |     | 36.95    | 36.96    |          |          |          |
| z Gelände                    |     | -15.00   | -15.00   | -15.00   | -15.00   | -15.00   |
|                              |     | -15.00   | -15.00   | 0.00     | 0.00     | 7.50     |
|                              |     | 11.00    | 12.89    | 13.12    | 13.53    | 15.00    |
|                              |     | 16.10    | 16.10    |          |          |          |
| z Schicht                    | GE1 | -15.00   | -15.00   | -15.00   | -15.00   | -15.00   |
|                              |     | -15.00   | -15.00   | 0.00     | 0.00     | 7.50     |
|                              |     | 11.00    | 12.08    | 12.30    | 12.69    | 13.26    |
|                              |     | 14.00    | 14.00    |          |          |          |
| z Schicht                    | GE2 | -17.59   | -17.59   | -18.06   | -20.41   | -24.27   |
|                              |     | -29.22   | -29.45   | -46.00   | -48.20   | -54.82   |
|                              |     | -58.95   | -61.07   | -61.50   | -61.50   | -61.50   |
|                              |     | -61.50   | -61.50   |          |          |          |
| z Schicht                    | GE3 | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |
|                              |     | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |
|                              |     | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |
|                              |     | -1000.00 | -1000.00 |          |          |          |

| Streckenlasten |   | Alle Lasten beziehen sich auf 1 m Länge |       |       |          |        |  |
|----------------|---|-----------------------------------------|-------|-------|----------|--------|--|
| LF-Komb.       | q | $x_A$                                   | $x_E$ | $z_Q$ | $\gamma$ | $\psi$ |  |
| G              | Q | 5.0                                     | -4.0  | 0.0   | 1.30     | 1.00   |  |

| Lamellenbreiten |           |            |  |
|-----------------|-----------|------------|--|
| Von x [m]       | bis x [m] | Breite [m] |  |
| -10000.00       | 10000.00  | 0.25       |  |

| Teilsicherheitsbeiwerte (GEO) für NW-Verf. 1 |      |      |      |      |           |      |       |       |       |      |
|----------------------------------------------|------|------|------|------|-----------|------|-------|-------|-------|------|
| $\gamma$ -                                   | G    | Q    | W    | E    | $\varphi$ | c    | $c_u$ | $R_a$ | $R_b$ | R    |
|                                              | 1.00 | 1.30 | 1.00 | 1.30 | 1.25      | 1.25 | 1.40  | 1.10  | 1.10  | 1.10 |

|            |                                 |
|------------|---------------------------------|
| $\gamma$ - | Teilsicherheitsbeiwert für...   |
| G          | Ständige Lasten                 |
| Q          | Veränderliche Lasten            |
| W          | Wasserdruck                     |
| E          | Erdbeben                        |
| $\varphi$  | Reibungsbeiwert $\tan(\varphi)$ |
| c          | Kohäsion c                      |
| $c_u$      | Kohäsion undränirt $c_u$        |
| $R_a$      | Anker                           |

$R_b$  Bauteile  
 $R$  Widerstände

**Bestimmung der Sicherheit nach Krey-Bishop**  
 Gleitkreis mit Iteration des Mittelpunktes:  
 Startpunkt:  $x_M = -30.00$  m,  $z_M = 2.00$  m,  
 $\Delta x = 1.00$  m,  $\Delta z = 1.00$  m,  
 mit Iteration des Radius:  $\Delta R = 1.00$  m ab  $R = 19.01$  m

**Lastfallkomb. G**  
 Gleitkörper von  $x = -33.09$  bis  $-10.26$  m  
 Gleitkreis:  $x_M = -31.06$  m,  $z_M = 9.94$  m,  $R = 24.57$  m

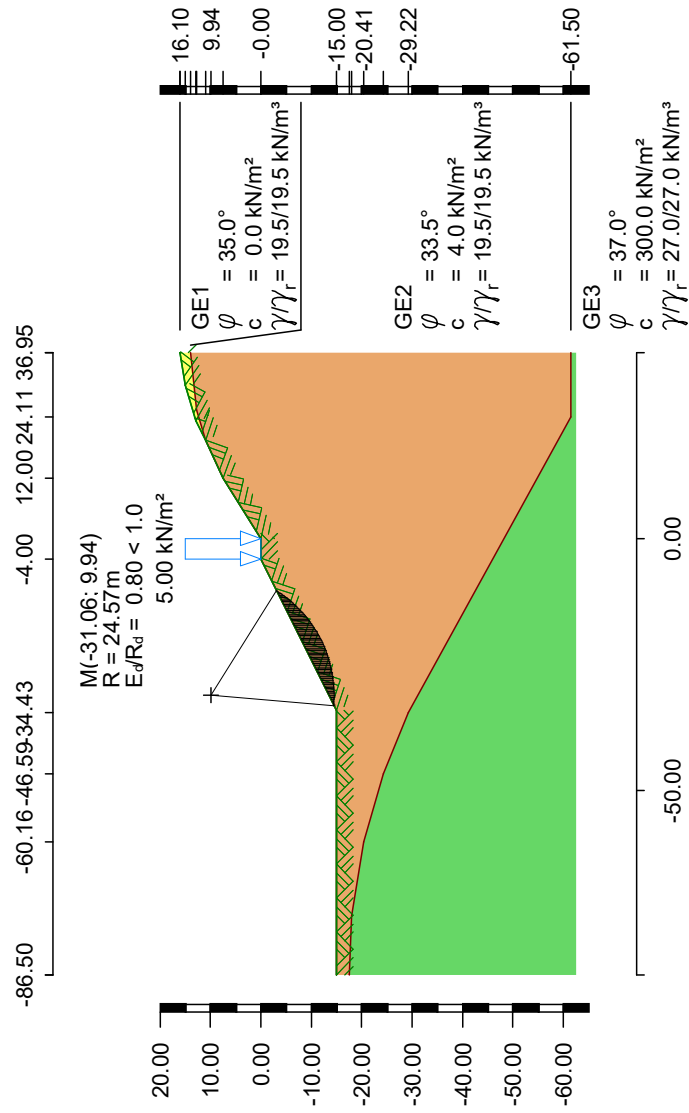
| Bestimmung der Lamellen-Anteile |               |                   |         |                    |           |                      |             |
|---------------------------------|---------------|-------------------|---------|--------------------|-----------|----------------------|-------------|
| $x_M$                           | Breite<br>$b$ | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | $c$                  | $\vartheta$ |
| [m]                             | [m]           | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]      |
| -33.05                          | 0.09          | 0.05              | 0.00    | 0.00               | 33.50     | 4.0                  | -4.63       |
| -32.88                          | 0.25          | 0.61              | 0.00    | 0.00               | 33.50     | 4.0                  | -4.23       |
| -32.63                          | 0.25          | 1.30              | 0.00    | 0.00               | 33.50     | 4.0                  | -3.65       |
| -32.38                          | 0.25          | 1.99              | 0.00    | 0.00               | 33.50     | 4.0                  | -3.06       |
| -32.13                          | 0.25          | 2.65              | 0.00    | 0.00               | 33.50     | 4.0                  | -2.48       |
| -31.88                          | 0.25          | 3.31              | 0.00    | 0.00               | 33.50     | 4.0                  | -1.90       |
| -31.63                          | 0.25          | 3.95              | 0.00    | 0.00               | 33.50     | 4.0                  | -1.31       |
| -31.38                          | 0.25          | 4.58              | 0.00    | 0.00               | 33.50     | 4.0                  | -0.73       |
| -31.13                          | 0.25          | 5.20              | 0.00    | 0.00               | 33.50     | 4.0                  | -0.15       |
| -30.88                          | 0.25          | 5.81              | 0.00    | 0.00               | 33.50     | 4.0                  | 0.44        |
| -30.63                          | 0.25          | 6.40              | 0.00    | 0.00               | 33.50     | 4.0                  | 1.02        |
| -30.38                          | 0.25          | 6.98              | 0.00    | 0.00               | 33.50     | 4.0                  | 1.60        |
| -30.13                          | 0.25          | 7.55              | 0.00    | 0.00               | 33.50     | 4.0                  | 2.19        |
| -29.88                          | 0.25          | 8.11              | 0.00    | 0.00               | 33.50     | 4.0                  | 2.77        |
| -29.63                          | 0.25          | 8.65              | 0.00    | 0.00               | 33.50     | 4.0                  | 3.35        |
| -29.38                          | 0.25          | 9.19              | 0.00    | 0.00               | 33.50     | 4.0                  | 3.94        |
| -29.13                          | 0.25          | 9.71              | 0.00    | 0.00               | 33.50     | 4.0                  | 4.52        |
| -28.88                          | 0.25          | 10.21             | 0.00    | 0.00               | 33.50     | 4.0                  | 5.11        |
| -28.63                          | 0.25          | 10.71             | 0.00    | 0.00               | 33.50     | 4.0                  | 5.69        |
| -28.38                          | 0.25          | 11.19             | 0.00    | 0.00               | 33.50     | 4.0                  | 6.28        |
| -28.13                          | 0.25          | 11.66             | 0.00    | 0.00               | 33.50     | 4.0                  | 6.87        |
| -27.88                          | 0.25          | 12.11             | 0.00    | 0.00               | 33.50     | 4.0                  | 7.45        |
| -27.63                          | 0.25          | 12.56             | 0.00    | 0.00               | 33.50     | 4.0                  | 8.04        |
| -27.38                          | 0.25          | 12.99             | 0.00    | 0.00               | 33.50     | 4.0                  | 8.63        |
| -27.13                          | 0.25          | 13.41             | 0.00    | 0.00               | 33.50     | 4.0                  | 9.22        |
| -26.88                          | 0.25          | 13.81             | 0.00    | 0.00               | 33.50     | 4.0                  | 9.81        |
| -26.63                          | 0.25          | 14.20             | 0.00    | 0.00               | 33.50     | 4.0                  | 10.41       |
| -26.38                          | 0.25          | 14.58             | 0.00    | 0.00               | 33.50     | 4.0                  | 11.00       |
| -26.13                          | 0.25          | 14.95             | 0.00    | 0.00               | 33.50     | 4.0                  | 11.59       |
| -25.88                          | 0.25          | 15.30             | 0.00    | 0.00               | 33.50     | 4.0                  | 12.19       |
| -25.63                          | 0.25          | 15.64             | 0.00    | 0.00               | 33.50     | 4.0                  | 12.79       |
| -25.38                          | 0.25          | 15.97             | 0.00    | 0.00               | 33.50     | 4.0                  | 13.38       |
| -25.13                          | 0.25          | 16.28             | 0.00    | 0.00               | 33.50     | 4.0                  | 13.98       |
| -24.88                          | 0.25          | 16.58             | 0.00    | 0.00               | 33.50     | 4.0                  | 14.59       |
| -24.63                          | 0.25          | 16.86             | 0.00    | 0.00               | 33.50     | 4.0                  | 15.19       |
| -24.38                          | 0.25          | 17.13             | 0.00    | 0.00               | 33.50     | 4.0                  | 15.79       |
| -24.13                          | 0.25          | 17.39             | 0.00    | 0.00               | 33.50     | 4.0                  | 16.40       |
| -23.88                          | 0.25          | 17.64             | 0.00    | 0.00               | 33.50     | 4.0                  | 17.01       |
| -23.63                          | 0.25          | 17.86             | 0.00    | 0.00               | 33.50     | 4.0                  | 17.62       |
| -23.38                          | 0.25          | 18.08             | 0.00    | 0.00               | 33.50     | 4.0                  | 18.23       |
| -23.13                          | 0.25          | 18.28             | 0.00    | 0.00               | 33.50     | 4.0                  | 18.85       |
| -22.88                          | 0.25          | 18.47             | 0.00    | 0.00               | 33.50     | 4.0                  | 19.47       |
| -22.63                          | 0.25          | 18.64             | 0.00    | 0.00               | 33.50     | 4.0                  | 20.08       |

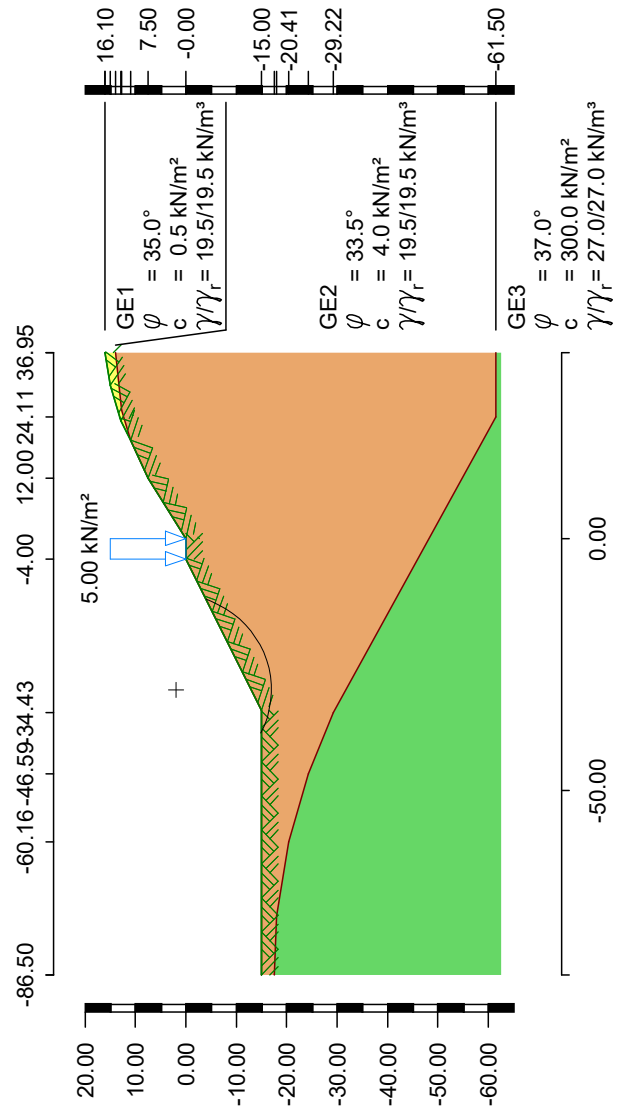
|                                         |             |                   |         |                    |           |                      | Seite                               | 4 |
|-----------------------------------------|-------------|-------------------|---------|--------------------|-----------|----------------------|-------------------------------------|---|
| Programm DC-Böschung/Win Version 24.2.0 |             |                   |         |                    |           |                      | Lastfall                            | G |
| BB_LFK1                                 |             |                   |         |                    |           |                      |                                     |   |
| $x_M$                                   | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c                    | $\vartheta$                         |   |
| [m]                                     | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]                              |   |
| -22.38                                  | 0.25        | 18.79             | 0.00    | 0.00               | 33.50     | 4.0                  | 20.71                               |   |
| -22.13                                  | 0.25        | 18.93             | 0.00    | 0.00               | 33.50     | 4.0                  | 21.33                               |   |
| -21.88                                  | 0.25        | 19.06             | 0.00    | 0.00               | 33.50     | 4.0                  | 21.96                               |   |
| -21.63                                  | 0.25        | 19.17             | 0.00    | 0.00               | 33.50     | 4.0                  | 22.59                               |   |
| -21.38                                  | 0.25        | 19.27             | 0.00    | 0.00               | 33.50     | 4.0                  | 23.22                               |   |
| -21.13                                  | 0.25        | 19.34             | 0.00    | 0.00               | 33.50     | 4.0                  | 23.86                               |   |
| -20.88                                  | 0.25        | 19.41             | 0.00    | 0.00               | 33.50     | 4.0                  | 24.50                               |   |
| -20.63                                  | 0.25        | 19.45             | 0.00    | 0.00               | 33.50     | 4.0                  | 25.14                               |   |
| -20.37                                  | 0.25        | 19.48             | 0.00    | 0.00               | 33.50     | 4.0                  | 25.78                               |   |
| -20.12                                  | 0.25        | 19.49             | 0.00    | 0.00               | 33.50     | 4.0                  | 26.43                               |   |
| -19.87                                  | 0.25        | 19.49             | 0.00    | 0.00               | 33.50     | 4.0                  | 27.09                               |   |
| -19.62                                  | 0.25        | 19.46             | 0.00    | 0.00               | 33.50     | 4.0                  | 27.74                               |   |
| -19.37                                  | 0.25        | 19.42             | 0.00    | 0.00               | 33.50     | 4.0                  | 28.40                               |   |
| -19.12                                  | 0.25        | 19.37             | 0.00    | 0.00               | 33.50     | 4.0                  | 29.07                               |   |
| -18.87                                  | 0.25        | 19.29             | 0.00    | 0.00               | 33.50     | 4.0                  | 29.74                               |   |
| -18.62                                  | 0.25        | 19.19             | 0.00    | 0.00               | 33.50     | 4.0                  | 30.41                               |   |
| -18.37                                  | 0.25        | 19.08             | 0.00    | 0.00               | 33.50     | 4.0                  | 31.09                               |   |
| -18.12                                  | 0.25        | 18.94             | 0.00    | 0.00               | 33.50     | 4.0                  | 31.77                               |   |
| -17.87                                  | 0.25        | 18.78             | 0.00    | 0.00               | 33.50     | 4.0                  | 32.46                               |   |
| -17.62                                  | 0.25        | 18.61             | 0.00    | 0.00               | 33.50     | 4.0                  | 33.16                               |   |
| -17.37                                  | 0.25        | 18.41             | 0.00    | 0.00               | 33.50     | 4.0                  | 33.86                               |   |
| -17.12                                  | 0.25        | 18.19             | 0.00    | 0.00               | 33.50     | 4.0                  | 34.56                               |   |
| -16.87                                  | 0.25        | 17.95             | 0.00    | 0.00               | 33.50     | 4.0                  | 35.27                               |   |
| -16.62                                  | 0.25        | 17.69             | 0.00    | 0.00               | 33.50     | 4.0                  | 35.99                               |   |
| -16.37                                  | 0.25        | 17.40             | 0.00    | 0.00               | 33.50     | 4.0                  | 36.71                               |   |
| -16.12                                  | 0.25        | 17.09             | 0.00    | 0.00               | 33.50     | 4.0                  | 37.44                               |   |
| -15.88                                  | 0.25        | 16.75             | 0.00    | 0.00               | 33.50     | 4.0                  | 38.18                               |   |
| -15.63                                  | 0.25        | 16.39             | 0.00    | 0.00               | 33.50     | 4.0                  | 38.93                               |   |
| -15.38                                  | 0.25        | 16.00             | 0.00    | 0.00               | 33.50     | 4.0                  | 39.68                               |   |
| -15.13                                  | 0.25        | 15.58             | 0.00    | 0.00               | 33.50     | 4.0                  | 40.44                               |   |
| -14.88                                  | 0.25        | 15.14             | 0.00    | 0.00               | 33.50     | 4.0                  | 41.21                               |   |
| -14.63                                  | 0.25        | 14.67             | 0.00    | 0.00               | 33.50     | 4.0                  | 41.99                               |   |
| -14.38                                  | 0.25        | 14.16             | 0.00    | 0.00               | 33.50     | 4.0                  | 42.78                               |   |
| -14.13                                  | 0.25        | 13.63             | 0.00    | 0.00               | 33.50     | 4.0                  | 43.58                               |   |
| -13.88                                  | 0.25        | 13.06             | 0.00    | 0.00               | 33.50     | 4.0                  | 44.39                               |   |
| -13.63                                  | 0.25        | 12.46             | 0.00    | 0.00               | 33.50     | 4.0                  | 45.21                               |   |
| -13.38                                  | 0.25        | 11.83             | 0.00    | 0.00               | 33.50     | 4.0                  | 46.05                               |   |
| -13.13                                  | 0.25        | 11.15             | 0.00    | 0.00               | 33.50     | 4.0                  | 46.89                               |   |
| -12.88                                  | 0.25        | 10.44             | 0.00    | 0.00               | 33.50     | 4.0                  | 47.75                               |   |
| -12.63                                  | 0.25        | 9.69              | 0.00    | 0.00               | 33.50     | 4.0                  | 48.63                               |   |
| -12.38                                  | 0.25        | 8.89              | 0.00    | 0.00               | 33.50     | 4.0                  | 49.52                               |   |
| -12.13                                  | 0.25        | 8.05              | 0.00    | 0.00               | 33.50     | 4.0                  | 50.42                               |   |
| -11.88                                  | 0.25        | 7.16              | 0.00    | 0.00               | 33.50     | 4.0                  | 51.35                               |   |
| -11.63                                  | 0.25        | 6.22              | 0.00    | 0.00               | 33.50     | 4.0                  | 52.29                               |   |
| -11.38                                  | 0.25        | 5.22              | 0.00    | 0.00               | 33.50     | 4.0                  | 53.25                               |   |
| -11.13                                  | 0.25        | 4.17              | 0.00    | 0.00               | 33.50     | 4.0                  | 54.24                               |   |
| -10.88                                  | 0.25        | 3.05              | 0.00    | 0.00               | 33.50     | 4.0                  | 55.25                               |   |
| -10.63                                  | 0.25        | 1.87              | 0.00    | 0.00               | 33.50     | 4.0                  | 56.29                               |   |
| -10.38                                  | 0.24        | 0.62              | 0.00    | 0.00               | 33.50     | 4.0                  | 57.34                               |   |
| $x_M$                                   |             |                   |         |                    |           | $R \cdot T_i$        | $R \cdot G^* \cdot \sin(\vartheta)$ |   |
| [m]                                     |             |                   |         |                    |           | [kNm/m]              | [kNm/m]                             |   |
| -33.05                                  |             |                   |         |                    |           | 7.43                 | -0.10                               |   |
| -32.88                                  |             |                   |         |                    |           | 25.99                | -1.11                               |   |
| -32.63                                  |             |                   |         |                    |           | 34.30                | -2.04                               |   |
| -32.38                                  |             |                   |         |                    |           | 42.38                | -2.61                               |   |
| -32.13                                  |             |                   |         |                    |           | 50.23                | -2.82                               |   |

|                                         |  |               |                             |   |
|-----------------------------------------|--|---------------|-----------------------------|---|
|                                         |  |               | Seite                       | 5 |
| Programm DC-Böschung/Win Version 24.2.0 |  |               |                             |   |
| BB_LFK1                                 |  |               | Lastfall                    | G |
|                                         |  |               |                             |   |
| $x_M$                                   |  | $R \cdot T_i$ | $R \cdot G^* \sin(\varphi)$ |   |
| [m]                                     |  | [kNm/m]       | [kNm/m]                     |   |
| -31.88                                  |  | 57.86         | -2.69                       |   |
| -31.63                                  |  | 65.28         | -2.22                       |   |
| -31.38                                  |  | 72.49         | -1.43                       |   |
| -31.13                                  |  | 79.49         | -0.33                       |   |
| -30.88                                  |  | 86.30         | 1.09                        |   |
| -30.63                                  |  | 92.91         | 2.80                        |   |
| -30.38                                  |  | 99.33         | 4.80                        |   |
| -30.13                                  |  | 105.56        | 7.08                        |   |
| -29.88                                  |  | 111.62        | 9.63                        |   |
| -29.63                                  |  | 117.49        | 12.44                       |   |
| -29.38                                  |  | 123.19        | 15.50                       |   |
| -29.13                                  |  | 128.72        | 18.80                       |   |
| -28.88                                  |  | 134.08        | 22.34                       |   |
| -28.63                                  |  | 139.28        | 26.10                       |   |
| -28.38                                  |  | 144.31        | 30.07                       |   |
| -28.13                                  |  | 149.19        | 34.24                       |   |
| -27.88                                  |  | 153.91        | 38.61                       |   |
| -27.63                                  |  | 158.47        | 43.16                       |   |
| -27.38                                  |  | 162.88        | 47.89                       |   |
| -27.13                                  |  | 167.14        | 52.78                       |   |
| -26.88                                  |  | 171.25        | 57.83                       |   |
| -26.63                                  |  | 175.21        | 63.02                       |   |
| -26.38                                  |  | 179.03        | 68.35                       |   |
| -26.13                                  |  | 182.71        | 73.80                       |   |
| -25.88                                  |  | 186.24        | 79.37                       |   |
| -25.63                                  |  | 189.63        | 85.04                       |   |
| -25.38                                  |  | 192.88        | 90.80                       |   |
| -25.13                                  |  | 195.99        | 96.65                       |   |
| -24.88                                  |  | 198.96        | 102.57                      |   |
| -24.63                                  |  | 201.79        | 108.55                      |   |
| -24.38                                  |  | 204.48        | 114.58                      |   |
| -24.13                                  |  | 207.04        | 120.66                      |   |
| -23.88                                  |  | 209.45        | 126.75                      |   |
| -23.63                                  |  | 211.73        | 132.87                      |   |
| -23.38                                  |  | 213.88        | 138.99                      |   |
| -23.13                                  |  | 215.88        | 145.10                      |   |
| -22.88                                  |  | 217.75        | 151.19                      |   |
| -22.63                                  |  | 219.48        | 157.25                      |   |
| -22.38                                  |  | 221.06        | 163.27                      |   |
| -22.13                                  |  | 222.51        | 169.23                      |   |
| -21.88                                  |  | 223.82        | 175.12                      |   |
| -21.63                                  |  | 224.98        | 180.92                      |   |
| -21.38                                  |  | 226.00        | 186.63                      |   |
| -21.13                                  |  | 226.87        | 192.23                      |   |
| -20.88                                  |  | 227.59        | 197.70                      |   |
| -20.63                                  |  | 228.17        | 203.03                      |   |
| -20.37                                  |  | 228.59        | 208.20                      |   |
| -20.12                                  |  | 228.85        | 213.20                      |   |
| -19.87                                  |  | 228.96        | 218.02                      |   |
| -19.62                                  |  | 228.91        | 222.63                      |   |
| -19.37                                  |  | 228.70        | 227.02                      |   |
| -19.12                                  |  | 228.31        | 231.17                      |   |
| -18.87                                  |  | 227.76        | 235.07                      |   |
| -18.62                                  |  | 227.03        | 238.69                      |   |
| -18.37                                  |  | 226.12        | 242.02                      |   |
| -18.12                                  |  | 225.02        | 245.03                      |   |
| -17.87                                  |  | 223.73        | 247.72                      |   |
| -17.62                                  |  | 222.25        | 250.04                      |   |



|                                         |  |                          |                                   |
|-----------------------------------------|--|--------------------------|-----------------------------------|
| Seite                                   |  |                          | 6                                 |
| Lastfall                                |  |                          | G                                 |
| Programm DC-Böschung/Win Version 24.2.0 |  |                          |                                   |
| BB_LFK1                                 |  |                          |                                   |
| $x_M$                                   |  | $R \cdot T_i$            | $R \cdot G \cdot \sin(\vartheta)$ |
| [m]                                     |  | [kNm/m]                  | [kNm/m]                           |
| -17.37                                  |  | 220.56                   | 251.99                            |
| -17.12                                  |  | 218.66                   | 253.54                            |
| -16.87                                  |  | 216.54                   | 254.66                            |
| -16.62                                  |  | 214.20                   | 255.34                            |
| -16.37                                  |  | 211.62                   | 255.53                            |
| -16.12                                  |  | 208.79                   | 255.23                            |
| -15.88                                  |  | 205.71                   | 254.39                            |
| -15.63                                  |  | 202.36                   | 252.99                            |
| -15.38                                  |  | 198.72                   | 250.99                            |
| -15.13                                  |  | 194.79                   | 248.37                            |
| -14.88                                  |  | 190.56                   | 245.09                            |
| -14.63                                  |  | 185.99                   | 241.10                            |
| -14.38                                  |  | 181.08                   | 236.37                            |
| -14.13                                  |  | 175.80                   | 230.86                            |
| -13.88                                  |  | 170.13                   | 224.52                            |
| -13.63                                  |  | 164.05                   | 217.31                            |
| -13.38                                  |  | 157.52                   | 209.16                            |
| -13.13                                  |  | 150.52                   | 200.04                            |
| -12.88                                  |  | 143.01                   | 189.87                            |
| -12.63                                  |  | 134.96                   | 178.59                            |
| -12.38                                  |  | 126.31                   | 166.13                            |
| -12.13                                  |  | 117.02                   | 152.41                            |
| -11.88                                  |  | 107.03                   | 137.35                            |
| -11.63                                  |  | 96.29                    | 120.86                            |
| -11.38                                  |  | 84.70                    | 102.82                            |
| -11.13                                  |  | 72.19                    | 83.14                             |
| -10.88                                  |  | 58.65                    | 61.67                             |
| -10.63                                  |  | 43.97                    | 38.27                             |
| -10.38                                  |  | 27.51                    | 12.79                             |
| Summen:                                 |  | 15087.61                 | 12093.67                          |
| Einwirkungen $E_d =$                    |  | 12093.67 kN              |                                   |
| Widerstände $R_d =$                     |  | 15087.61 kN              |                                   |
| $E_d/R_d = 0.80 < 1.0$                  |  | *** Nachweis erfüllt *** |                                   |





Eingabedatei: M:\Projekte\2023\

23020\_P-BL-S-SK-K\_Speicher-Bodensee\_Kronplatz\Berechnungen\BB\_LFK4.dbb

## Berechnung nach: NTC 2018 (Eurocode 7)

Berechnung mit Nachweisverfahren 1

Kombination mit Teilsicherheitsbeiwerten der Gruppen A2 + M2 + R2

| Schichtdaten               |                      | GE1   | GE2   | GE3   |
|----------------------------|----------------------|-------|-------|-------|
| Innere Reibung cal $\phi'$ | [Grad]               | 35.00 | 33.50 | 37.00 |
| Kohäsion cal $c'$          | [kN/m <sup>2</sup> ] | 0.5   | 4.0   | 300.0 |
| Wichte Boden               | [kN/m <sup>3</sup> ] | 19.5  | 19.5  | 27.0  |
| Wichte wassergesättigt     | [kN/m <sup>3</sup> ] | 19.5  | 19.5  | 27.0  |
| Wichte unter Auftrieb      | [kN/m <sup>3</sup> ] | 9.5   | 9.5   | 17.0  |
| Erdbebenfaktor             | [-]                  | 1.0   | 1.0   | 1.0   |

### Geländeverlauf und Schichten

|           |     |          |          |          |          |          |
|-----------|-----|----------|----------|----------|----------|----------|
| x [m]     |     | -86.50   | -86.38   | -74.90   | -60.16   | -46.59   |
|           |     | -34.43   | -34.00   | -4.00    | 0.00     | 12.00    |
|           |     | 19.50    | 23.34    | 24.11    | 25.50    | 30.50    |
|           |     | 36.95    | 36.96    |          |          |          |
| z Gelände |     | -15.00   | -15.00   | -15.00   | -15.00   | -15.00   |
|           |     | -15.00   | -15.00   | 0.00     | 0.00     | 7.50     |
|           |     | 11.00    | 12.89    | 13.12    | 13.53    | 15.00    |
|           |     | 16.10    | 16.10    |          |          |          |
| z Schicht | GE1 | -15.00   | -15.00   | -15.00   | -15.00   | -15.00   |
|           |     | -15.00   | -15.00   | 0.00     | 0.00     | 7.50     |
|           |     | 11.00    | 12.08    | 12.30    | 12.69    | 13.26    |
|           |     | 14.00    | 14.00    |          |          |          |
| z Schicht | GE2 | -17.59   | -17.59   | -18.06   | -20.41   | -24.27   |
|           |     | -29.22   | -29.45   | -46.00   | -48.20   | -54.82   |
|           |     | -58.95   | -61.07   | -61.50   | -61.50   | -61.50   |
|           |     | -61.50   | -61.50   |          |          |          |
| z Schicht | GE3 | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |
|           |     | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |
|           |     | -1000.00 | -1000.00 | -1000.00 | -1000.00 | -1000.00 |
|           |     | -1000.00 | -1000.00 |          |          |          |

### Streckenlasten

Alle Lasten beziehen sich auf 1 m Länge

|          |     |       |       |       |          |        |
|----------|-----|-------|-------|-------|----------|--------|
| LF-Komb. | q   | $x_A$ | $x_E$ | $z_Q$ | $\gamma$ | $\psi$ |
| G Q      | 5.0 | -4.0  | 0.0   | 0.00  | 1.30     | 1.00   |

### Berechnung mit Erdbebenlasten nach Eurocode 8, BS-E

$$k_h/S = a_g/g = 0.038$$

$$k_v/S = a_{vg}/g = 0.019$$

### Lamellenbreiten

|           |           |            |
|-----------|-----------|------------|
| Von x [m] | bis x [m] | Breite [m] |
| -10000.00 | 10000.00  | 0.25       |

### Teilsicherheitsbeiwerte (GEO) für NW-Verf. 1

| $\gamma$ | G    | Q    | W    | E    | $\varphi$ | c    | $c_u$ | $R_a$ | $R_b$ | R    |
|----------|------|------|------|------|-----------|------|-------|-------|-------|------|
| BS-E     | 1.00 | 1.00 | 1.00 | 1.00 | 1.00      | 1.00 | 1.00  | 1.00  | 1.00  | 1.20 |

|           |                                 |
|-----------|---------------------------------|
| $\gamma$  | Teilsicherheitsbeiwert für...   |
| G         | Ständige Lasten                 |
| Q         | Veränderliche Lasten            |
| W         | Wasserdruck                     |
| E         | Erdbeben                        |
| $\varphi$ | Reibungsbeiwert $\tan(\varphi)$ |
| c         | Kohäsion c                      |
| $c_u$     | Kohäsion undränert $c_u$        |
| $R_a$     | Anker                           |
| $R_b$     | Bauteile                        |
| R         | Widerstände                     |

### Bestimmung der Sicherheit nach Krey-Bishop

Gleitkreis mit Iteration des Mittelpunktes:

Startpunkt:  $x_M = -30.00$  m,  $z_M = 2.00$  m,

$\Delta x = 1.00$  m,  $\Delta z = 1.00$  m,

mit Iteration des Radius:  $\Delta R = 1.00$  m ab  $R = 19.01$  m

### Lastfallkomb. G

Gleitkörper von  $x = -33.11$  bis  $-10.49$  m

Gleitkreis:  $x_M = -31.19$  m,  $z_M = 9.88$  m,  $R = 24.51$  m

### Bestimmung der Lamellen-Anteile

| $x_M$  | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c       | $\vartheta$ |
|--------|-------------|-------------------|---------|--------------------|-----------|---------|-------------|
| [m]    | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m²] | [Grad]      |
| -33.05 | 0.11        | 0.07              | 0.00    | 0.00               | 33.50     | 4.0     | -4.37       |
| -32.88 | 0.25        | 0.65              | 0.00    | 0.00               | 33.50     | 4.0     | -3.95       |
| -32.63 | 0.25        | 1.34              | 0.00    | 0.00               | 33.50     | 4.0     | -3.36       |
| -32.38 | 0.25        | 2.02              | 0.00    | 0.00               | 33.50     | 4.0     | -2.78       |
| -32.13 | 0.25        | 2.68              | 0.00    | 0.00               | 33.50     | 4.0     | -2.19       |
| -31.88 | 0.25        | 3.33              | 0.00    | 0.00               | 33.50     | 4.0     | -1.61       |
| -31.63 | 0.25        | 3.97              | 0.00    | 0.00               | 33.50     | 4.0     | -1.02       |
| -31.38 | 0.25        | 4.59              | 0.00    | 0.00               | 33.50     | 4.0     | -0.44       |
| -31.13 | 0.25        | 5.20              | 0.00    | 0.00               | 33.50     | 4.0     | 0.15        |
| -30.88 | 0.25        | 5.80              | 0.00    | 0.00               | 33.50     | 4.0     | 0.73        |
| -30.63 | 0.25        | 6.39              | 0.00    | 0.00               | 33.50     | 4.0     | 1.32        |
| -30.38 | 0.25        | 6.97              | 0.00    | 0.00               | 33.50     | 4.0     | 1.90        |
| -30.13 | 0.25        | 7.53              | 0.00    | 0.00               | 33.50     | 4.0     | 2.48        |
| -29.88 | 0.25        | 8.08              | 0.00    | 0.00               | 33.50     | 4.0     | 3.07        |
| -29.63 | 0.25        | 8.62              | 0.00    | 0.00               | 33.50     | 4.0     | 3.66        |
| -29.38 | 0.25        | 9.14              | 0.00    | 0.00               | 33.50     | 4.0     | 4.24        |
| -29.13 | 0.25        | 9.65              | 0.00    | 0.00               | 33.50     | 4.0     | 4.83        |
| -28.88 | 0.25        | 10.15             | 0.00    | 0.00               | 33.50     | 4.0     | 5.41        |
| -28.63 | 0.25        | 10.64             | 0.00    | 0.00               | 33.50     | 4.0     | 6.00        |
| -28.38 | 0.25        | 11.12             | 0.00    | 0.00               | 33.50     | 4.0     | 6.59        |
| -28.13 | 0.25        | 11.58             | 0.00    | 0.00               | 33.50     | 4.0     | 7.18        |
| -27.88 | 0.25        | 12.03             | 0.00    | 0.00               | 33.50     | 4.0     | 7.77        |
| -27.63 | 0.25        | 12.47             | 0.00    | 0.00               | 33.50     | 4.0     | 8.36        |
| -27.38 | 0.25        | 12.89             | 0.00    | 0.00               | 33.50     | 4.0     | 8.95        |
| -27.13 | 0.25        | 13.30             | 0.00    | 0.00               | 33.50     | 4.0     | 9.54        |
| -26.88 | 0.25        | 13.70             | 0.00    | 0.00               | 33.50     | 4.0     | 10.14       |
| -26.63 | 0.25        | 14.08             | 0.00    | 0.00               | 33.50     | 4.0     | 10.73       |
| -26.38 | 0.25        | 14.46             | 0.00    | 0.00               | 33.50     | 4.0     | 11.32       |
| -26.13 | 0.25        | 14.81             | 0.00    | 0.00               | 33.50     | 4.0     | 11.92       |
| -25.88 | 0.25        | 15.16             | 0.00    | 0.00               | 33.50     | 4.0     | 12.52       |

|                                         |             |                   |         |                    |           |                      | Seite       | 4 |
|-----------------------------------------|-------------|-------------------|---------|--------------------|-----------|----------------------|-------------|---|
| Programm DC-Böschung/Win Version 24.2.0 |             |                   |         |                    |           |                      | Lastfall    | G |
| BB_LFK4                                 |             |                   |         |                    |           |                      |             |   |
| $x_M$                                   | Breite<br>b | Eigen-<br>gewicht | Auflast | Wasser-<br>auflast | $\varphi$ | c                    | $\vartheta$ |   |
| [m]                                     | [m]         | [kN/m]            | [kN/m]  | [kN/m]             | [Grad]    | [kN/m <sup>2</sup> ] | [Grad]      |   |
| -25.63                                  | 0.25        | 15.49             | 0.00    | 0.00               | 33.50     | 4.0                  | 13.12       |   |
| -25.38                                  | 0.25        | 15.81             | 0.00    | 0.00               | 33.50     | 4.0                  | 13.72       |   |
| -25.13                                  | 0.25        | 16.11             | 0.00    | 0.00               | 33.50     | 4.0                  | 14.32       |   |
| -24.88                                  | 0.25        | 16.41             | 0.00    | 0.00               | 33.50     | 4.0                  | 14.93       |   |
| -24.63                                  | 0.25        | 16.68             | 0.00    | 0.00               | 33.50     | 4.0                  | 15.53       |   |
| -24.38                                  | 0.25        | 16.95             | 0.00    | 0.00               | 33.50     | 4.0                  | 16.14       |   |
| -24.13                                  | 0.25        | 17.20             | 0.00    | 0.00               | 33.50     | 4.0                  | 16.75       |   |
| -23.88                                  | 0.25        | 17.43             | 0.00    | 0.00               | 33.50     | 4.0                  | 17.36       |   |
| -23.63                                  | 0.25        | 17.65             | 0.00    | 0.00               | 33.50     | 4.0                  | 17.97       |   |
| -23.38                                  | 0.25        | 17.86             | 0.00    | 0.00               | 33.50     | 4.0                  | 18.59       |   |
| -23.13                                  | 0.25        | 18.05             | 0.00    | 0.00               | 33.50     | 4.0                  | 19.21       |   |
| -22.88                                  | 0.25        | 18.23             | 0.00    | 0.00               | 33.50     | 4.0                  | 19.83       |   |
| -22.63                                  | 0.25        | 18.39             | 0.00    | 0.00               | 33.50     | 4.0                  | 20.45       |   |
| -22.38                                  | 0.25        | 18.54             | 0.00    | 0.00               | 33.50     | 4.0                  | 21.08       |   |
| -22.13                                  | 0.25        | 18.67             | 0.00    | 0.00               | 33.50     | 4.0                  | 21.70       |   |
| -21.88                                  | 0.25        | 18.79             | 0.00    | 0.00               | 33.50     | 4.0                  | 22.33       |   |
| -21.63                                  | 0.25        | 18.89             | 0.00    | 0.00               | 33.50     | 4.0                  | 22.97       |   |
| -21.38                                  | 0.25        | 18.97             | 0.00    | 0.00               | 33.50     | 4.0                  | 23.60       |   |
| -21.13                                  | 0.25        | 19.04             | 0.00    | 0.00               | 33.50     | 4.0                  | 24.24       |   |
| -20.88                                  | 0.25        | 19.09             | 0.00    | 0.00               | 33.50     | 4.0                  | 24.88       |   |
| -20.63                                  | 0.25        | 19.13             | 0.00    | 0.00               | 33.50     | 4.0                  | 25.53       |   |
| -20.37                                  | 0.25        | 19.15             | 0.00    | 0.00               | 33.50     | 4.0                  | 26.18       |   |
| -20.12                                  | 0.25        | 19.15             | 0.00    | 0.00               | 33.50     | 4.0                  | 26.83       |   |
| -19.87                                  | 0.25        | 19.13             | 0.00    | 0.00               | 33.50     | 4.0                  | 27.49       |   |
| -19.62                                  | 0.25        | 19.10             | 0.00    | 0.00               | 33.50     | 4.0                  | 28.15       |   |
| -19.37                                  | 0.25        | 19.05             | 0.00    | 0.00               | 33.50     | 4.0                  | 28.82       |   |
| -19.12                                  | 0.25        | 18.98             | 0.00    | 0.00               | 33.50     | 4.0                  | 29.49       |   |
| -18.87                                  | 0.25        | 18.89             | 0.00    | 0.00               | 33.50     | 4.0                  | 30.16       |   |
| -18.62                                  | 0.25        | 18.78             | 0.00    | 0.00               | 33.50     | 4.0                  | 30.84       |   |
| -18.37                                  | 0.25        | 18.65             | 0.00    | 0.00               | 33.50     | 4.0                  | 31.52       |   |
| -18.12                                  | 0.25        | 18.50             | 0.00    | 0.00               | 33.50     | 4.0                  | 32.21       |   |
| -17.87                                  | 0.25        | 18.34             | 0.00    | 0.00               | 33.50     | 4.0                  | 32.90       |   |
| -17.62                                  | 0.25        | 18.15             | 0.00    | 0.00               | 33.50     | 4.0                  | 33.60       |   |
| -17.37                                  | 0.25        | 17.93             | 0.00    | 0.00               | 33.50     | 4.0                  | 34.31       |   |
| -17.12                                  | 0.25        | 17.70             | 0.00    | 0.00               | 33.50     | 4.0                  | 35.02       |   |
| -16.87                                  | 0.25        | 17.45             | 0.00    | 0.00               | 33.50     | 4.0                  | 35.73       |   |
| -16.62                                  | 0.25        | 17.17             | 0.00    | 0.00               | 33.50     | 4.0                  | 36.46       |   |
| -16.37                                  | 0.25        | 16.86             | 0.00    | 0.00               | 33.50     | 4.0                  | 37.19       |   |
| -16.12                                  | 0.25        | 16.54             | 0.00    | 0.00               | 33.50     | 4.0                  | 37.92       |   |
| -15.88                                  | 0.25        | 16.18             | 0.00    | 0.00               | 33.50     | 4.0                  | 38.67       |   |
| -15.63                                  | 0.25        | 15.80             | 0.00    | 0.00               | 33.50     | 4.0                  | 39.42       |   |
| -15.38                                  | 0.25        | 15.40             | 0.00    | 0.00               | 33.50     | 4.0                  | 40.18       |   |
| -15.13                                  | 0.25        | 14.96             | 0.00    | 0.00               | 33.50     | 4.0                  | 40.95       |   |
| -14.88                                  | 0.25        | 14.50             | 0.00    | 0.00               | 33.50     | 4.0                  | 41.73       |   |
| -14.63                                  | 0.25        | 14.01             | 0.00    | 0.00               | 33.50     | 4.0                  | 42.52       |   |
| -14.38                                  | 0.25        | 13.48             | 0.00    | 0.00               | 33.50     | 4.0                  | 43.32       |   |
| -14.13                                  | 0.25        | 12.93             | 0.00    | 0.00               | 33.50     | 4.0                  | 44.13       |   |
| -13.88                                  | 0.25        | 12.34             | 0.00    | 0.00               | 33.50     | 4.0                  | 44.95       |   |
| -13.63                                  | 0.25        | 11.71             | 0.00    | 0.00               | 33.50     | 4.0                  | 45.78       |   |
| -13.38                                  | 0.25        | 11.05             | 0.00    | 0.00               | 33.50     | 4.0                  | 46.62       |   |
| -13.13                                  | 0.25        | 10.35             | 0.00    | 0.00               | 33.50     | 4.0                  | 47.48       |   |
| -12.88                                  | 0.25        | 9.61              | 0.00    | 0.00               | 33.50     | 4.0                  | 48.35       |   |
| -12.63                                  | 0.25        | 8.83              | 0.00    | 0.00               | 33.50     | 4.0                  | 49.24       |   |
| -12.38                                  | 0.25        | 8.00              | 0.00    | 0.00               | 33.50     | 4.0                  | 50.14       |   |
| -12.13                                  | 0.25        | 7.13              | 0.00    | 0.00               | 33.50     | 4.0                  | 51.06       |   |
| -11.88                                  | 0.25        | 6.20              | 0.00    | 0.00               | 33.50     | 4.0                  | 52.00       |   |
| -11.63                                  | 0.25        | 5.22              | 0.00    | 0.00               | 33.50     | 4.0                  | 52.96       |   |
| -11.38                                  | 0.25        | 4.19              | 0.00    | 0.00               | 33.50     | 4.0                  | 53.94       |   |

|                                         |             |                   |                     |                     |               |                      |                               |   |
|-----------------------------------------|-------------|-------------------|---------------------|---------------------|---------------|----------------------|-------------------------------|---|
|                                         |             |                   |                     |                     |               |                      | Seite                         | 5 |
| Programm DC-Böschung/Win Version 24.2.0 |             |                   |                     |                     |               |                      |                               |   |
| BB_LFK4                                 |             |                   |                     |                     |               |                      | Lastfall                      | G |
|                                         |             |                   |                     |                     |               |                      |                               |   |
| $x_M$                                   | Breite<br>b | Eigen-<br>gewicht | Auflast             | Wasser-<br>auflast  | $\varphi$     | c                    | $\vartheta$                   |   |
| [m]                                     | [m]         | [kN/m]            | [kN/m]              | [kN/m]              | [Grad]        | [kN/m <sup>2</sup> ] | [Grad]                        |   |
| -11.13                                  | 0.25        | 3.09              | 0.00                | 0.00                | 33.50         | 4.0                  | 54.95                         |   |
| -10.88                                  | 0.25        | 1.93              | 0.00                | 0.00                | 33.50         | 4.0                  | 55.98                         |   |
| -10.63                                  | 0.25        | 0.70              | 0.00                | 0.00                | 33.50         | 4.0                  | 57.04                         |   |
| -10.49                                  | 0.01        | 0.00              | 0.00                | 0.00                | 33.50         | 4.0                  | 57.60                         |   |
| $x_M$                                   |             |                   | Erdbeben-<br>last V | Erdbeben-<br>last H | $R \cdot T_i$ |                      | $R \cdot G^* \sin(\vartheta)$ |   |
| [m]                                     |             |                   | [kN/m]              | [kN/m]              | [kNm/m]       |                      | [kNm/m]                       |   |
| -33.05                                  |             |                   | 0.00                | 0.00                | 10.24         |                      | -0.10                         |   |
| -32.88                                  |             |                   | 0.01                | 0.01                | 30.46         |                      | -0.81                         |   |
| -32.63                                  |             |                   | 0.01                | 0.03                | 39.95         |                      | -1.33                         |   |
| -32.38                                  |             |                   | 0.02                | 0.04                | 49.17         |                      | -1.49                         |   |
| -32.13                                  |             |                   | 0.03                | 0.05                | 58.11         |                      | -1.30                         |   |
| -31.88                                  |             |                   | 0.03                | 0.06                | 66.79         |                      | -0.78                         |   |
| -31.63                                  |             |                   | 0.04                | 0.08                | 75.21         |                      | 0.06                          |   |
| -31.38                                  |             |                   | 0.04                | 0.09                | 83.38         |                      | 1.23                          |   |
| -31.13                                  |             |                   | 0.05                | 0.10                | 91.31         |                      | 2.70                          |   |
| -30.88                                  |             |                   | 0.06                | 0.11                | 98.99         |                      | 4.47                          |   |
| -30.63                                  |             |                   | 0.06                | 0.12                | 106.45        |                      | 6.52                          |   |
| -30.38                                  |             |                   | 0.07                | 0.13                | 113.67        |                      | 8.86                          |   |
| -30.13                                  |             |                   | 0.07                | 0.14                | 120.68        |                      | 11.47                         |   |
| -29.88                                  |             |                   | 0.08                | 0.15                | 127.47        |                      | 14.33                         |   |
| -29.63                                  |             |                   | 0.08                | 0.16                | 134.05        |                      | 17.45                         |   |
| -29.38                                  |             |                   | 0.09                | 0.17                | 140.42        |                      | 20.81                         |   |
| -29.13                                  |             |                   | 0.09                | 0.18                | 146.59        |                      | 24.40                         |   |
| -28.88                                  |             |                   | 0.10                | 0.19                | 152.55        |                      | 28.21                         |   |
| -28.63                                  |             |                   | 0.10                | 0.20                | 158.33        |                      | 32.24                         |   |
| -28.38                                  |             |                   | 0.11                | 0.21                | 163.91        |                      | 36.47                         |   |
| -28.13                                  |             |                   | 0.11                | 0.22                | 169.30        |                      | 40.89                         |   |
| -27.88                                  |             |                   | 0.11                | 0.23                | 174.51        |                      | 45.49                         |   |
| -27.63                                  |             |                   | 0.12                | 0.24                | 179.53        |                      | 50.27                         |   |
| -27.38                                  |             |                   | 0.12                | 0.24                | 184.37        |                      | 55.21                         |   |
| -27.13                                  |             |                   | 0.13                | 0.25                | 189.04        |                      | 60.31                         |   |
| -26.88                                  |             |                   | 0.13                | 0.26                | 193.53        |                      | 65.55                         |   |
| -26.63                                  |             |                   | 0.13                | 0.27                | 197.85        |                      | 70.92                         |   |
| -26.38                                  |             |                   | 0.14                | 0.27                | 202.00        |                      | 76.42                         |   |
| -26.13                                  |             |                   | 0.14                | 0.28                | 205.98        |                      | 82.03                         |   |
| -25.88                                  |             |                   | 0.14                | 0.29                | 209.79        |                      | 87.74                         |   |
| -25.63                                  |             |                   | 0.15                | 0.29                | 213.44        |                      | 93.55                         |   |
| -25.38                                  |             |                   | 0.15                | 0.30                | 216.92        |                      | 99.43                         |   |
| -25.13                                  |             |                   | 0.15                | 0.31                | 220.24        |                      | 105.39                        |   |
| -24.88                                  |             |                   | 0.16                | 0.31                | 223.39        |                      | 111.41                        |   |
| -24.63                                  |             |                   | 0.16                | 0.32                | 226.39        |                      | 117.47                        |   |
| -24.38                                  |             |                   | 0.16                | 0.32                | 229.22        |                      | 123.57                        |   |
| -24.13                                  |             |                   | 0.16                | 0.33                | 231.89        |                      | 129.70                        |   |
| -23.88                                  |             |                   | 0.17                | 0.33                | 234.41        |                      | 135.84                        |   |
| -23.63                                  |             |                   | 0.17                | 0.34                | 236.76        |                      | 141.99                        |   |
| -23.38                                  |             |                   | 0.17                | 0.34                | 238.95        |                      | 148.12                        |   |
| -23.13                                  |             |                   | 0.17                | 0.34                | 240.99        |                      | 154.24                        |   |
| -22.88                                  |             |                   | 0.17                | 0.35                | 242.86        |                      | 160.31                        |   |
| -22.63                                  |             |                   | 0.17                | 0.35                | 244.57        |                      | 166.35                        |   |
| -22.38                                  |             |                   | 0.18                | 0.35                | 246.13        |                      | 172.32                        |   |
| -22.13                                  |             |                   | 0.18                | 0.35                | 247.51        |                      | 178.22                        |   |
| -21.88                                  |             |                   | 0.18                | 0.36                | 248.74        |                      | 184.03                        |   |
| -21.63                                  |             |                   | 0.18                | 0.36                | 249.80        |                      | 189.75                        |   |
| -21.38                                  |             |                   | 0.18                | 0.36                | 250.69        |                      | 195.34                        |   |
| -21.13                                  |             |                   | 0.18                | 0.36                | 251.42        |                      | 200.82                        |   |
| -20.88                                  |             |                   | 0.18                | 0.36                | 251.97        |                      | 206.14                        |   |

|                                         |           |           |               |                 |   |
|-----------------------------------------|-----------|-----------|---------------|-----------------|---|
|                                         |           |           |               | Seite           | 6 |
| Programm DC-Böschung/Win Version 24.2.0 |           |           |               |                 |   |
| BB_LFK4                                 |           |           |               | Lastfall        | G |
|                                         |           |           |               |                 |   |
| $x_M$                                   | Erdbeben- | Erdbeben- | $R \cdot T_i$ | $R \cdot G^*$   |   |
| [m]                                     | last V    | last H    |               | $\sin(\varphi)$ |   |
|                                         | [kN/m]    | [kN/m]    | [kNm/m]       | [kNm/m]         |   |
| -20.63                                  | 0.18      | 0.36      | 252.35        | 211.31          |   |
| -20.37                                  | 0.18      | 0.36      | 252.56        | 216.31          |   |
| -20.12                                  | 0.18      | 0.36      | 252.59        | 221.11          |   |
| -19.87                                  | 0.18      | 0.36      | 252.44        | 225.71          |   |
| -19.62                                  | 0.18      | 0.36      | 252.10        | 230.09          |   |
| -19.37                                  | 0.18      | 0.36      | 251.57        | 234.22          |   |
| -19.12                                  | 0.18      | 0.36      | 250.86        | 238.10          |   |
| -18.87                                  | 0.18      | 0.36      | 249.94        | 241.70          |   |
| -18.62                                  | 0.18      | 0.36      | 248.83        | 245.00          |   |
| -18.37                                  | 0.18      | 0.35      | 247.51        | 247.99          |   |
| -18.12                                  | 0.18      | 0.35      | 245.98        | 250.64          |   |
| -17.87                                  | 0.17      | 0.35      | 244.22        | 252.93          |   |
| -17.62                                  | 0.17      | 0.34      | 242.25        | 254.84          |   |
| -17.37                                  | 0.17      | 0.34      | 240.04        | 256.35          |   |
| -17.12                                  | 0.17      | 0.34      | 237.59        | 257.43          |   |
| -16.87                                  | 0.17      | 0.33      | 234.89        | 258.06          |   |
| -16.62                                  | 0.16      | 0.33      | 231.93        | 258.21          |   |
| -16.37                                  | 0.16      | 0.32      | 228.70        | 257.86          |   |
| -16.12                                  | 0.16      | 0.31      | 225.20        | 256.97          |   |
| -15.88                                  | 0.15      | 0.31      | 221.40        | 255.52          |   |
| -15.63                                  | 0.15      | 0.30      | 217.29        | 253.47          |   |
| -15.38                                  | 0.15      | 0.29      | 212.87        | 250.79          |   |
| -15.13                                  | 0.14      | 0.28      | 208.11        | 247.45          |   |
| -14.88                                  | 0.14      | 0.28      | 202.99        | 243.41          |   |
| -14.63                                  | 0.13      | 0.27      | 197.51        | 238.62          |   |
| -14.38                                  | 0.13      | 0.26      | 191.63        | 233.05          |   |
| -14.13                                  | 0.12      | 0.25      | 185.33        | 226.65          |   |
| -13.88                                  | 0.12      | 0.23      | 178.59        | 219.38          |   |
| -13.63                                  | 0.11      | 0.22      | 171.38        | 211.18          |   |
| -13.38                                  | 0.10      | 0.21      | 163.67        | 202.00          |   |
| -13.13                                  | 0.10      | 0.20      | 155.42        | 191.78          |   |
| -12.88                                  | 0.09      | 0.18      | 146.59        | 180.45          |   |
| -12.63                                  | 0.08      | 0.17      | 137.13        | 167.95          |   |
| -12.38                                  | 0.08      | 0.15      | 127.01        | 154.19          |   |
| -12.13                                  | 0.07      | 0.14      | 116.15        | 139.10          |   |
| -11.88                                  | 0.06      | 0.12      | 104.49        | 122.59          |   |
| -11.63                                  | 0.05      | 0.10      | 91.97         | 104.55          |   |
| -11.38                                  | 0.04      | 0.08      | 78.49         | 84.86           |   |
| -11.13                                  | 0.03      | 0.06      | 63.95         | 63.41           |   |
| -10.88                                  | 0.02      | 0.04      | 48.23         | 40.05           |   |
| -10.63                                  | 0.01      | 0.01      | 31.21         | 14.63           |   |
| -10.49                                  | 0.00      | 0.00      | 0.93          | 0.03            |   |
| Summen:                                 |           |           | 16513.78      | 12312.14        |   |
|                                         |           |           |               |                 |   |
| Einwirkungen $E_d = 12312.14$ kN        |           |           |               |                 |   |
| Widerstände $R_d = 16513.78$ kN         |           |           |               |                 |   |
|                                         |           |           |               |                 |   |
| $E_d/R_d = 0.75 < 1.0$                  |           |           |               |                 |   |
| *** Nachweis erfüllt ***                |           |           |               |                 |   |



