# ATTACHMENT 18

## LTWP Preliminary Design Report – Appendix I – Stability Analysis Technical Memo

# Technical Memorandum

**SUBJECT**
Iqaluit LTWP Proposed Reservoir – Structure Stability Analyses

**TO**
City of Iqaluit

**DATE**
29 February 2024

**OUR REF**
301192375

**DEPARTMENT**
Geotechnical

**PROJECT NUMBER**

**COPIES TO**
Appendices – Preliminary Design Report

**NAME**
Ryan Janzen P.Eng., (Geotechnical)
Arun Phakade

# 1.0 Introduction

Arcadis Canda Inc. (Arcadis) was retained by the City of Iqaluit to complete a preliminary design for a raw water supply reservoir within the city limits of Iqaluit, Nunavut. As part of the reservoir system, eight (8) rock-fill water-retaining structures are proposed. This memorandum summarizes the slope stability analyses for seven (7) of the eight (8) proposed structures in the reservoir system. All retention structure design and configurations will be consistent with the design presented herein. Slope stability of all retention structures will be confirmed at a later design stage.

# 2.0 Slope Stability Analyses

Stability analyses for the retention structures were completed through critical cross-sections as shown on Drawings C301 of the Preliminary Design Report. Stability analyses were performed in consideration of various scenarios such as end of construction, static loading, Inflow Design Flood (IDF) loading, and earthquake (pseudo-static) loading conditions. These scenarios are summarized in Table 1 below.

## 2.1 Minimum Factors of Safety and Loading Conditions

The applicable minimum factors of safety (FoS) meeting the Canadian Dam Association (CDA) Dam Safety Guidelines (2013) were adopted for analyzed loading conditions and are summarized in Table 1 below.

*Table 1: Specified Minimum Factors of Safety*

| Loading Conditions | Minimum Factor of Safety | Slopes Considered |
|---|---|---|
| End of construction (prior to filling) | 1.3 | Upstream, downstream |
| Static loading (normal reservoir level) | 1.5 | Upstream, downstream |
| Inflow Design Flood (IDF) | 1.3 | Upstream, downstream |
| Earthquake (pseudo-static) | >1.0 | Upstream |

## 2.2 Design Seismic Loading

The retaining structures have been designed considering a 1/10,000-year earthquake design event. The PGA corresponding to the 10,000-year design earthquake event is 0.143 (estimated by extrapolation of NBCC 2020 values). These values have been considered for the preliminary design; design parameters will be revised as part of the detailed design process to be completed after site-specific testing has been performed.

## 2.3 Reservoir Elevations

The reservoir water levels adopted in the analyses were based on the hydrology review (please see Technical Memorandum) and are summarized in Table 2 below.

*Table 2: Reservoir Elevations*

| Condition | Water Level (masl) |
|---|---|
| End of Construction | 117.0 |
| Steady State | 127.0 |
| Inflow Design Flood | 127.5 |
| Seismic Loading | 127.0 |

The phreatic surface is assumed to be controlled by the presence of an impermeable linear low-density polyethylene (LLDPE) liner. As dam and dyke structures have been designed such that seepage and surficial drainage will be channeled away from the toes of the structures, the phreatic surfaces were assumed to be at or below ground surface on the downstream side.

## 2.4 Material Properties

The material properties used in the stability analyses are listed in Table 3 below. The foundation is assumed to be impervious bedrock. Dam and dyke fill material properties were adopted based on relevant literature and Arcadis' experience with similar project sites and materials. Material properties will be revised during the detailed design process, after site-specific geotechnical investigation has taken place and geotechnical testing performed on representative samples of the various aggregate materials at site.

*Table 3: Material Properties*

| Material | Bulk Unit Weight ($kN/m^3$) | Effective Cohesion (kPa) | Effective Friction Angle (degrees) |
|---|---|---|---|
| Rock Fill | 21 | 0 | 41 |
| Cushion 1 | 20 | 0 | 35 |
| Cushion 2 | 19 | 0 | 32 |
| Riprap | 21 | 0 | 41 |

## 2.5 Analyses and Results

Analyses were carried out using the computer software program Slope/W, a component of the GeoStudio 2022.1 software suite. Limit equilibrium methods with a half-sine function using the Morgenstern-Price method of slices were used to calculate the interslice side forces. Calculated factors of safety (FoS) for most critical and deeply seated slip surfaces are summarized in Table 4 below. The deep-seated critical slip surfaces are selected based on slip surfaces which could result in a loss of containment.

As noted above, the stability of the structure considered the following conditions:

- End of Construction: constructed dam or dyke without additional water loads;
- Steady State (Normal Operation): reservoir filled to normal operating level of 127.0masl;
- Inflow Design Flood (IDF): considered reservoir filled to an elevated condition of 127.5masl;
- Design Earthquake (Pseudo-Static): considered the reservoir filled to normal operating level (127.0masl) with pseudo-static analyses of the design earthquake acceleration.

The stability analyses are illustrated in the Figures attached at the rear of this memorandum.

The results of the slope stability analyses indicate that the proposed design for the water retaining structures (Dam 1 and Dykes 2, 3, 4, 5, 6 and 8) provide adequate factors of safety for all applicable loading conditions.

*Table 4: Slope Stability Results*

| Analysis Condition | Factor of Safety | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dam 1 | | Dyke 2 | | Dyke 3 | | Dyke 4 | | Dyke 5 | | Dyke 6 | | Dyke 8 | |
| | US | DS | US | DS | US | DS | US | DS | US | DS | US | DS | US | DS |
| End of Construction | 2.062 | 2.718 | 2.240 | 2.717 | 2.161 | 2.776 | 2.410 | 2.700 | 2.512 | 2.717 | 2.199 | 2.680 | 2.116 | 2.681 |
| Steady State | 2.124 | 2.685 | 2.093 | 2.707 | 2.086 | 2.707 | 2.090 | 2.710 | 2.125 | 2.714 | 2.091 | 2.677 | 2.126 | 2.688 |
| Inflow Design Flood | 2.164 | 2.685 | 2.157 | 2.700 | 2.146 | 2.695 | 2.160 | 2.710 | 2.178 | 2.700 | 2.147 | 2.695 | 2.166 | 2.869 |
| Seismic Loading | 1.083 | NA | 1.130 | NA | 1.106 | NA | 1.200 | NA | 1.268 | NA | 1.126 | NA | 1.095 | NA |

**Note: US = Upstream Slope and DS = Downstream Slope**

# 3.0 Limitations of Analyses

This memorandum and its contents are intended for the sole use of the City of Iqaluit and their agents. Arcadis Canada Inc. (Arcadis) does not accept any responsibility for the accuracy of any of the data, the analyses, of the recommendations contained or referenced in the memo, when the memo is used or relied upon by any Party other than the City of Iqaluit, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use attached to the Preliminary Design Report or Contractual Terms and Conditions Executed by both parties.

These preliminary analyses have been performed based on assumed site conditions and estimated material properties. These assumptions will be revisited, and more detailed stability analyses be modeled, during the detailed design process to be conducted after site-specific geotechnical investigations have been performed.

# 4.0 Closure

We trust this technical memorandum meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,

Arcadis Canada Inc.

DRAFT

Prepared by:

Mr. Arun Phakade, Geotechnical Specialist

Arun.Phakade@arcadis.com

DRAFT

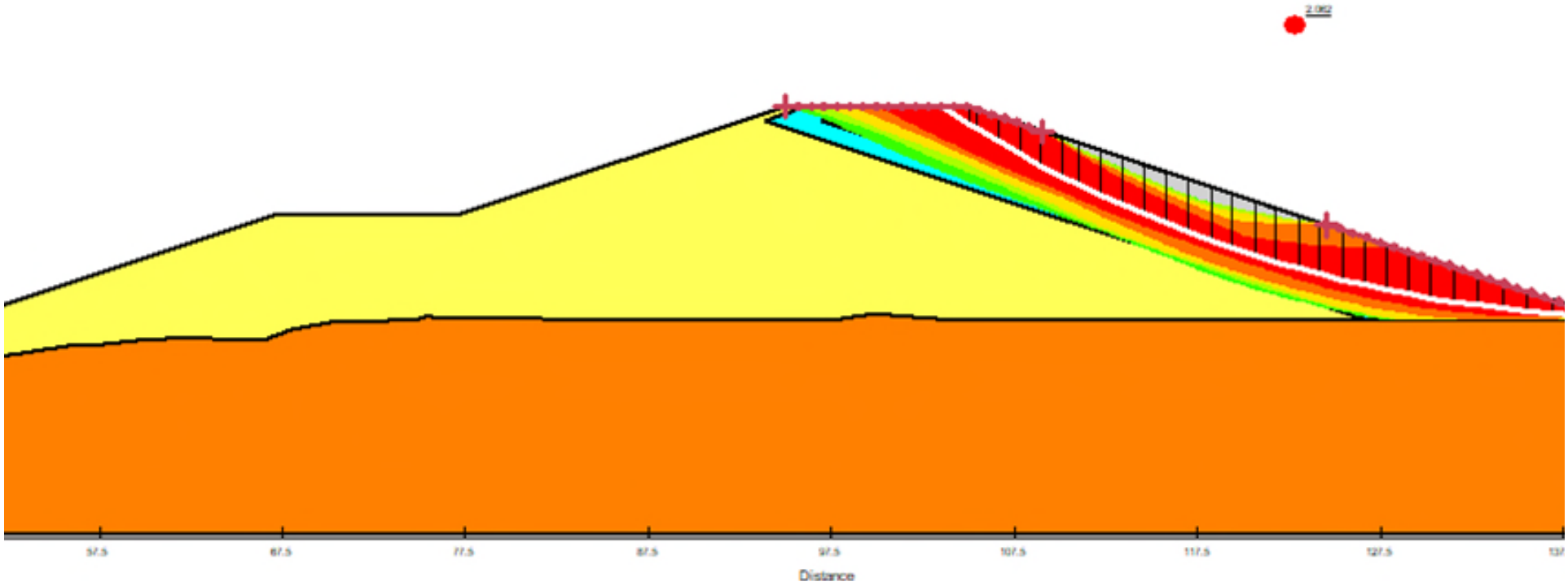
Reviewed by:

Mr. Ryan Janzen, P.Eng., Senior Engineer

Ryan.Janzen@arcadis.com

Enc. Slope Stability Analyses Results (Cross-Sections)

| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bedrock | |
| | Cushion1 | 35 |
| | Cushion2 | 32 |
| | Riprap | 41 |
| | Rockfill | 41 |




SLOPE STABILITY ANALYSIS

DAM 1
END OF CONSTRUCTION: UPSTREAM

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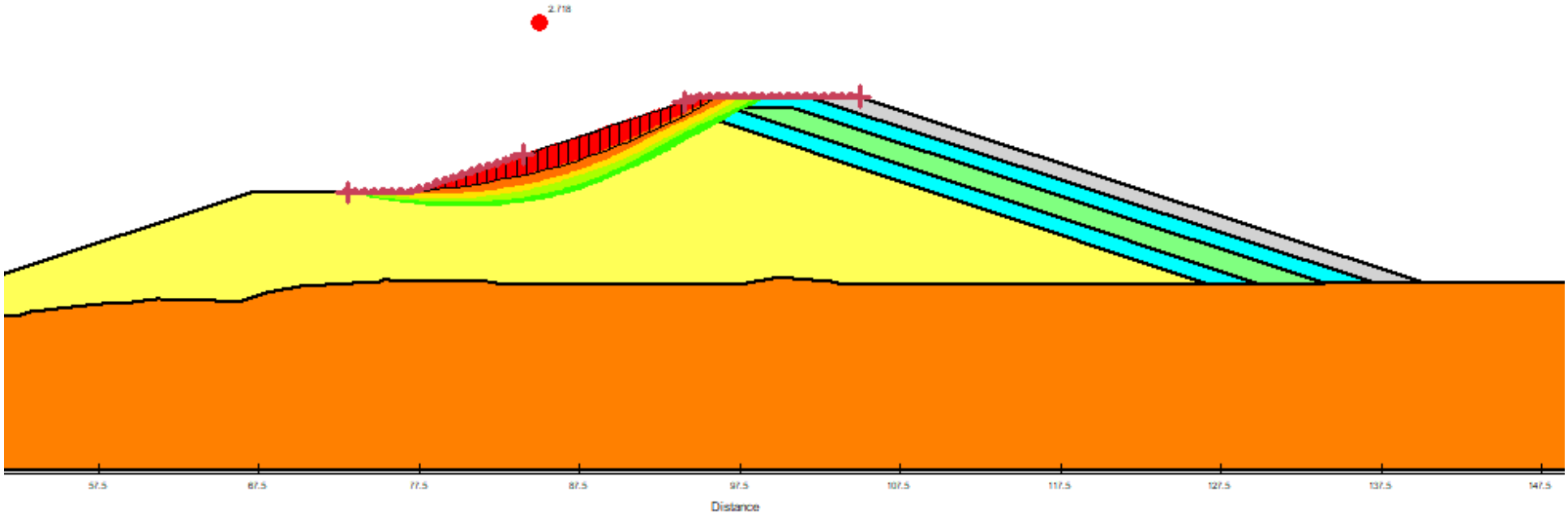
FIGURE
1.1

| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bedrock | |
| | Cushion1 | 35 |
| | Cushion2 | 32 |
| | Riprap | 41 |
| | Rockfill | 41 |

130.66667, 143.33333 m




SLOPE STABILITY ANALYSIS

DAM 1 END OF CONSTRUCTION: DOWNSTREAM

ARCADIS

FIGURE 1.2

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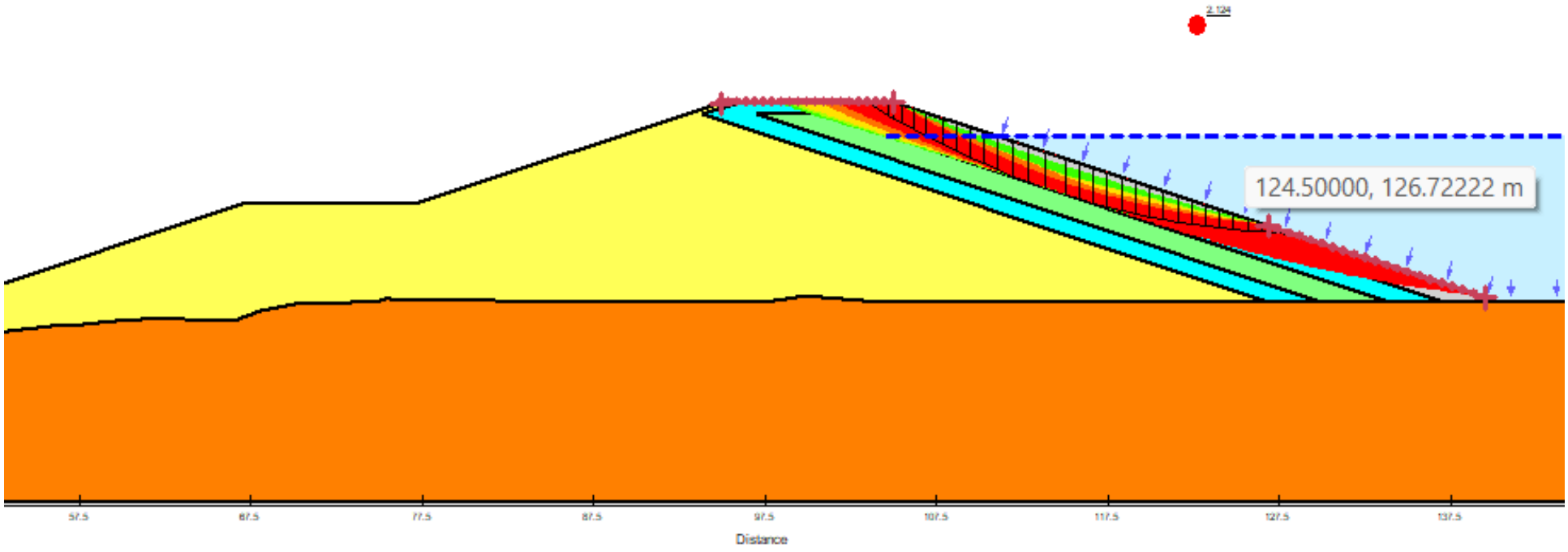
| Color | Name | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|
| | Bedrock | | 1 |
| | Cushion1 | 35 | 1 |
| | Cushion2 | 32 | |
| | Riprap | 41 | 1 |
| | Rockfill | 41 | |




SLOPE STABILITY ANALYSIS

DAM 1
STEADY STATE: UPSTREAM

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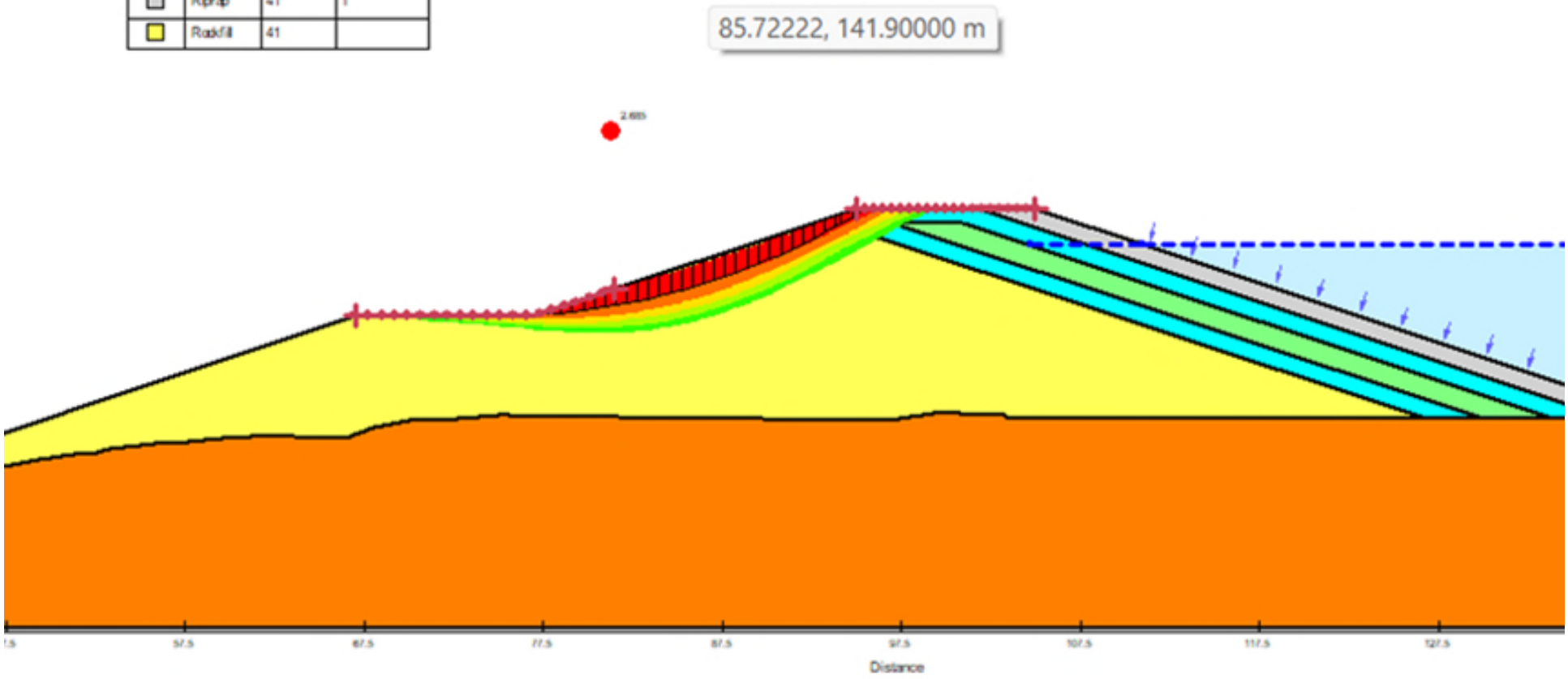
FIGURE
1.3

| Color | Name | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|
| | Bedrock | | 1 |
| | Cushion 1 | 35 | 1 |
| | Cushion 2 | 32 | |
| | Riprap | 41 | 1 |
| | Rockfill | 41 | |




SLOPE STABILITY ANALYSIS

DAM 1
STEADY STATE: DOWNSTREAM

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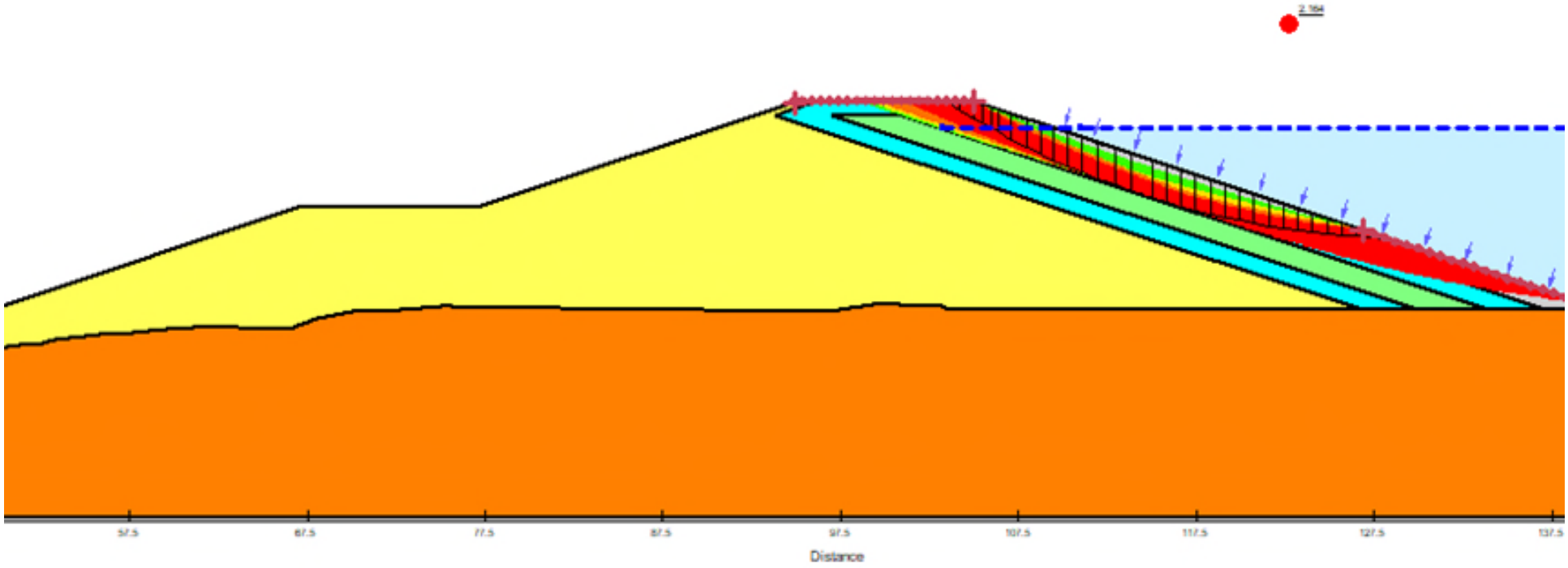
FIGURE
1.4

| Color | Name | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|
| | Bedrock | | 1 |
| | Cushion1 | 35 | 1 |
| | Cushion2 | 32 | |
| | Riprap | 41 | 1 |
| | Rockfill | 41 | |




SLOPE STABILITY ANALYSIS

DAM 1
IDF: UPSTREAM

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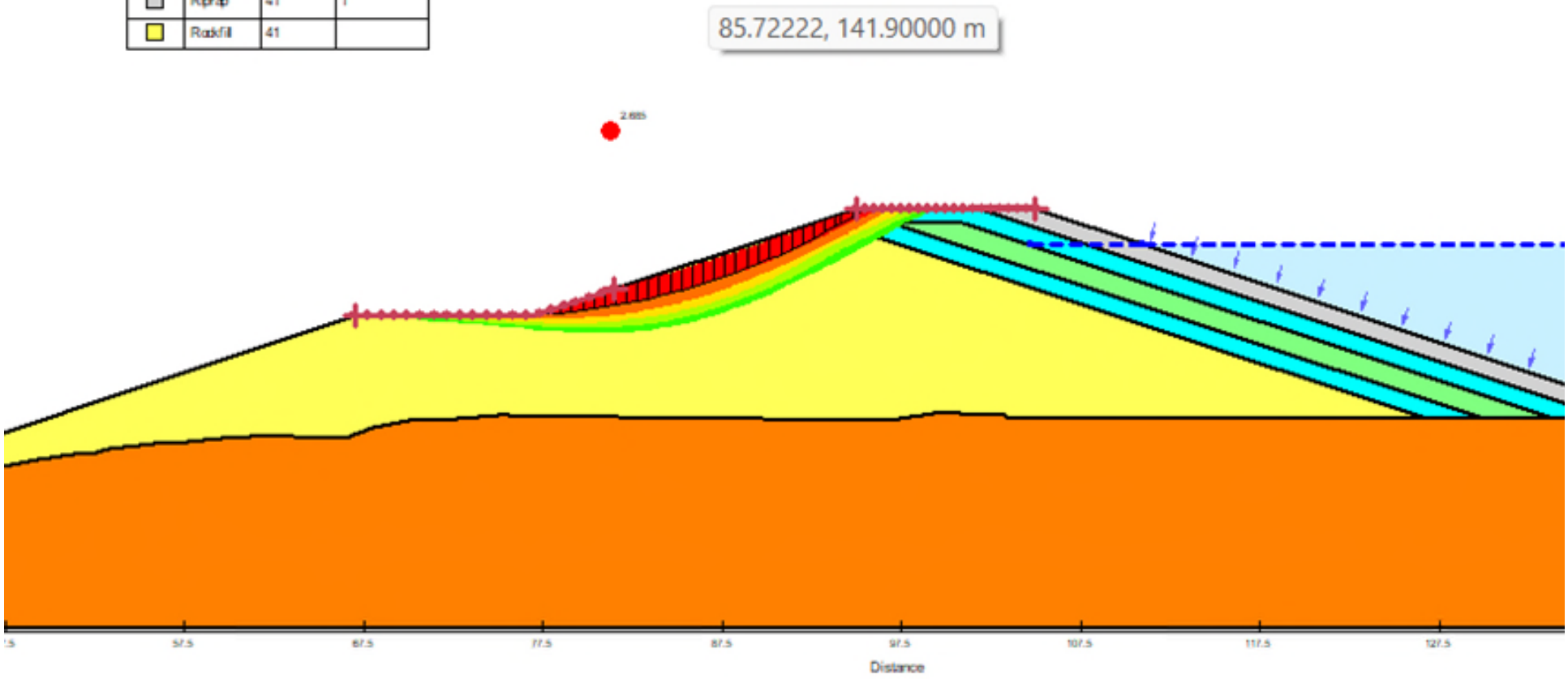
FIGURE
1.5

| Color | Name | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|
| | Bedrock | | 1 |
| | Cushion 1 | 35 | 1 |
| | Cushion 2 | 32 | |
| | Riprap | 41 | 1 |
| | Rockfill | 41 | |




SLOPE STABILITY ANALYSIS

DAM 1
IDF: DOWNSTREAM

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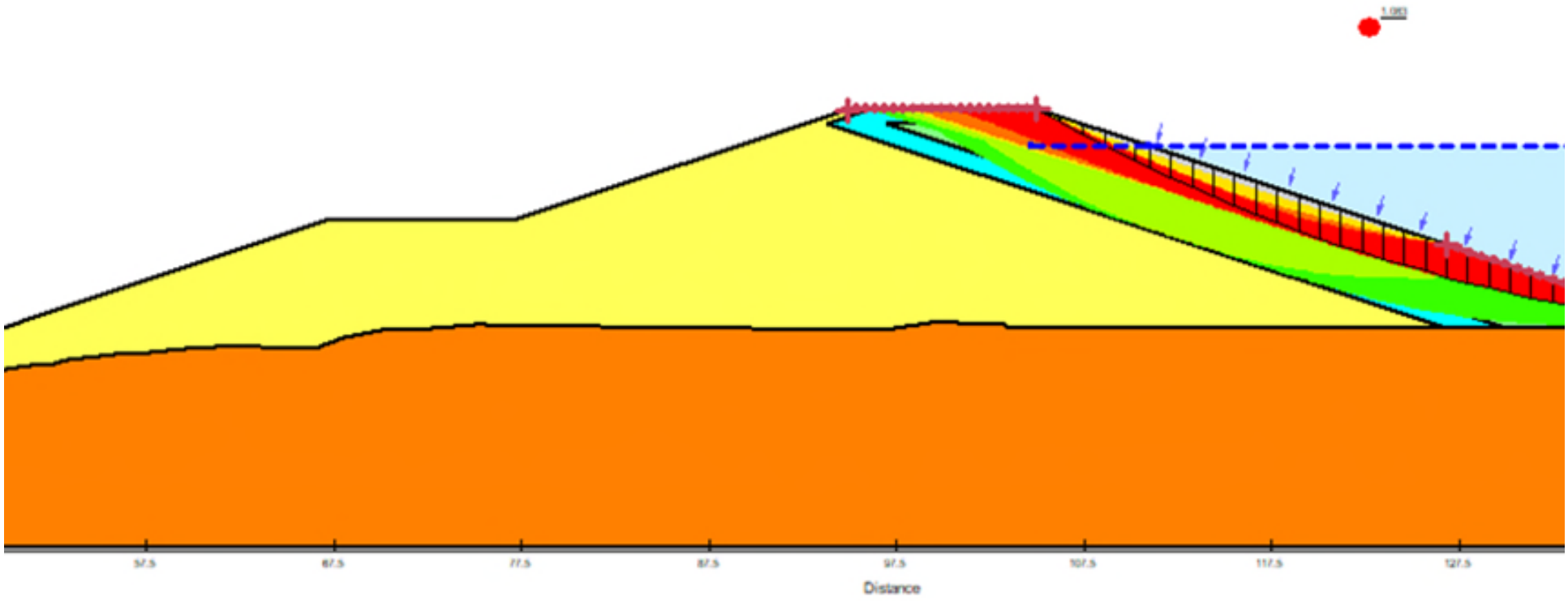
FIGURE
1.6

| Color | Name | Effective Friction Angle (°) | Cohesion R (kPa) | Phi R (°) | Piezometric Surface |
|---|---|---|---|---|---|
| | Bedrock | | | | 1 |
| | Cushion 1 | 35 | 0 | 0 | 1 |
| | Cushion 2 | 32 | 0 | 0 | |
| | Riprap | 41 | 0 | 0 | 1 |
| | Rockfill | 41 | 0 | 0 | |




SLOPE STABILITY ANALYSIS

DAM 1
SEISMIC: UPSTREAM

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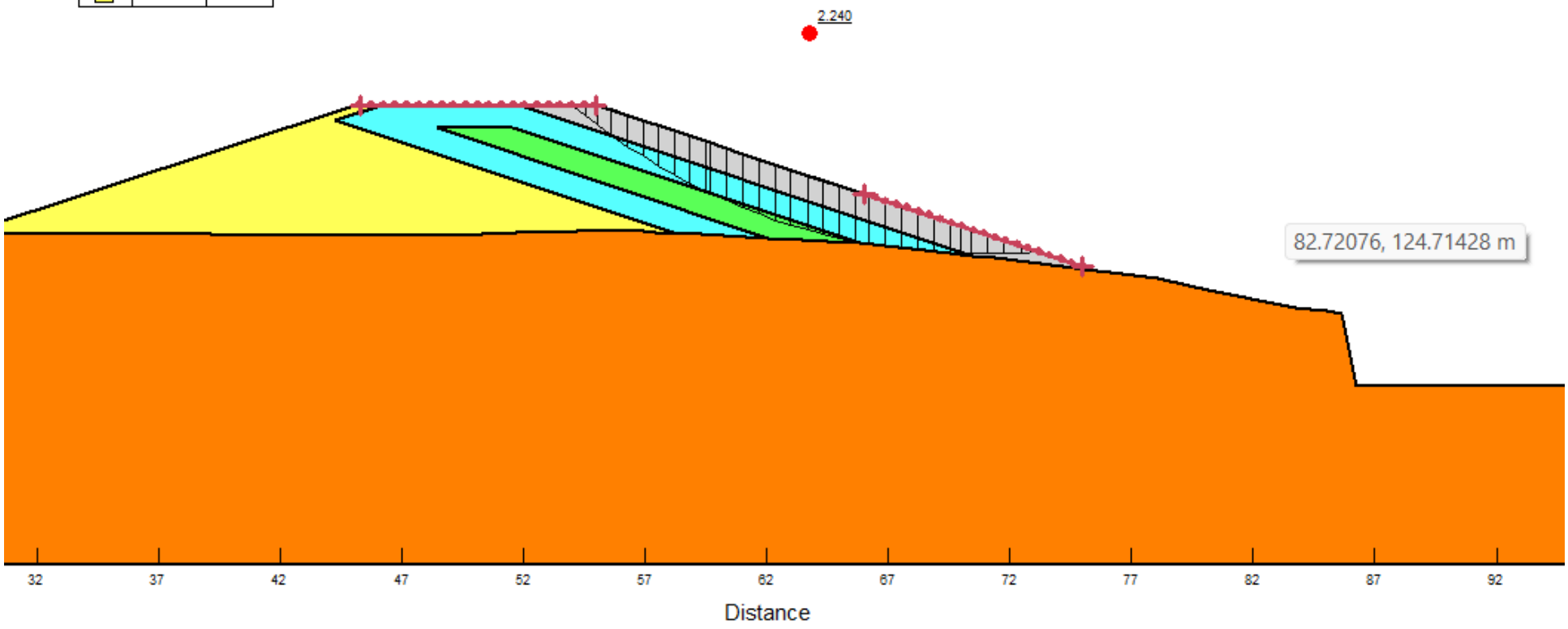
FIGURE
1.7

| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1l | 35 |
| | Cushion2 | 32 |
| | Riprap | 41 |
| | Rockfill | 41 |




SLOPE STABILITY ANALYSIS

DYKE 2
END OF CONSTRUCTION: UPSTREAM

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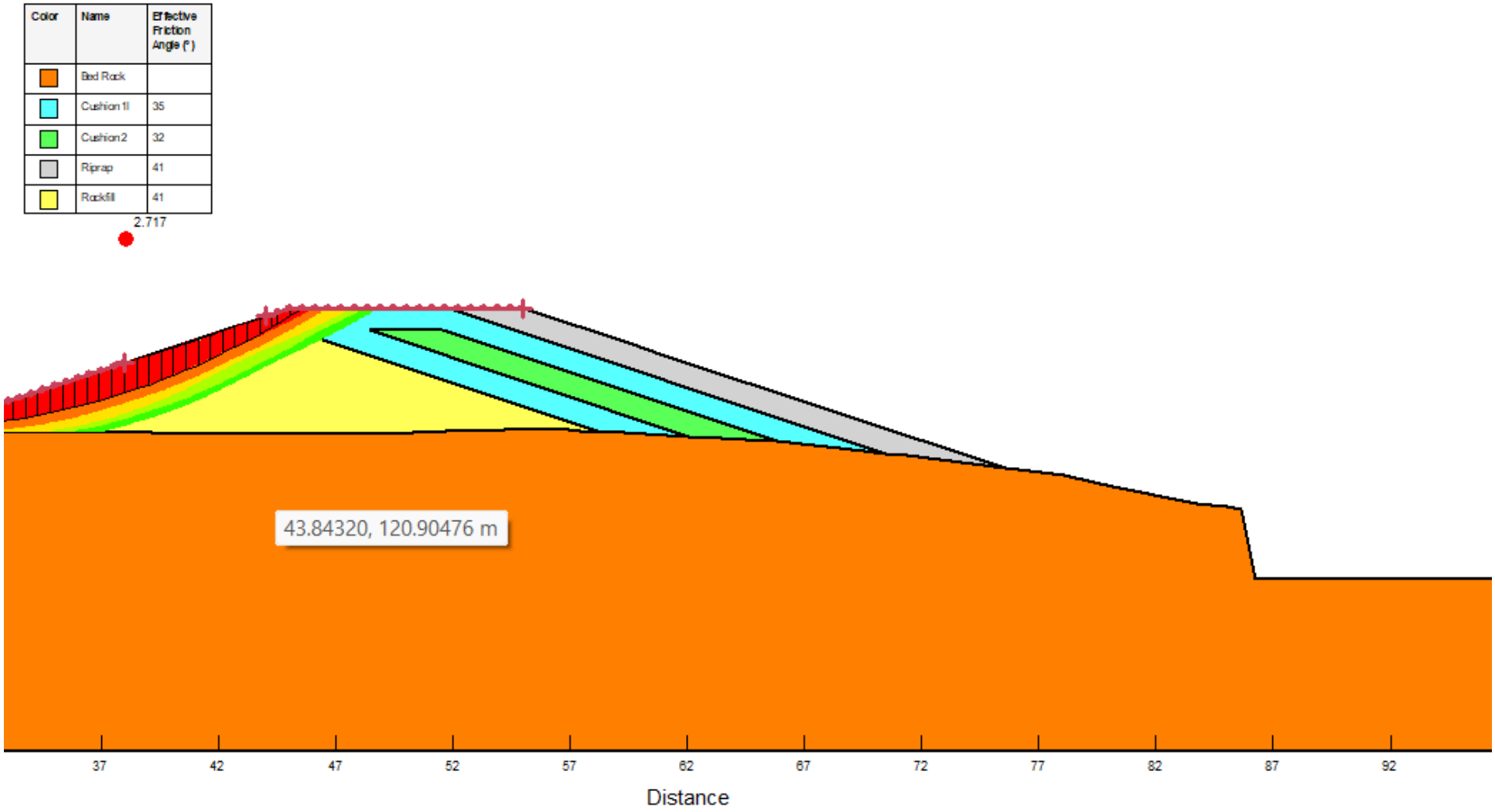
FIGURE
2.1




SLOPE STABILITY ANALYSIS

DYKE 2 END OF CONSTRUCTION: DOWNSTREAM

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FIGURE 2.2

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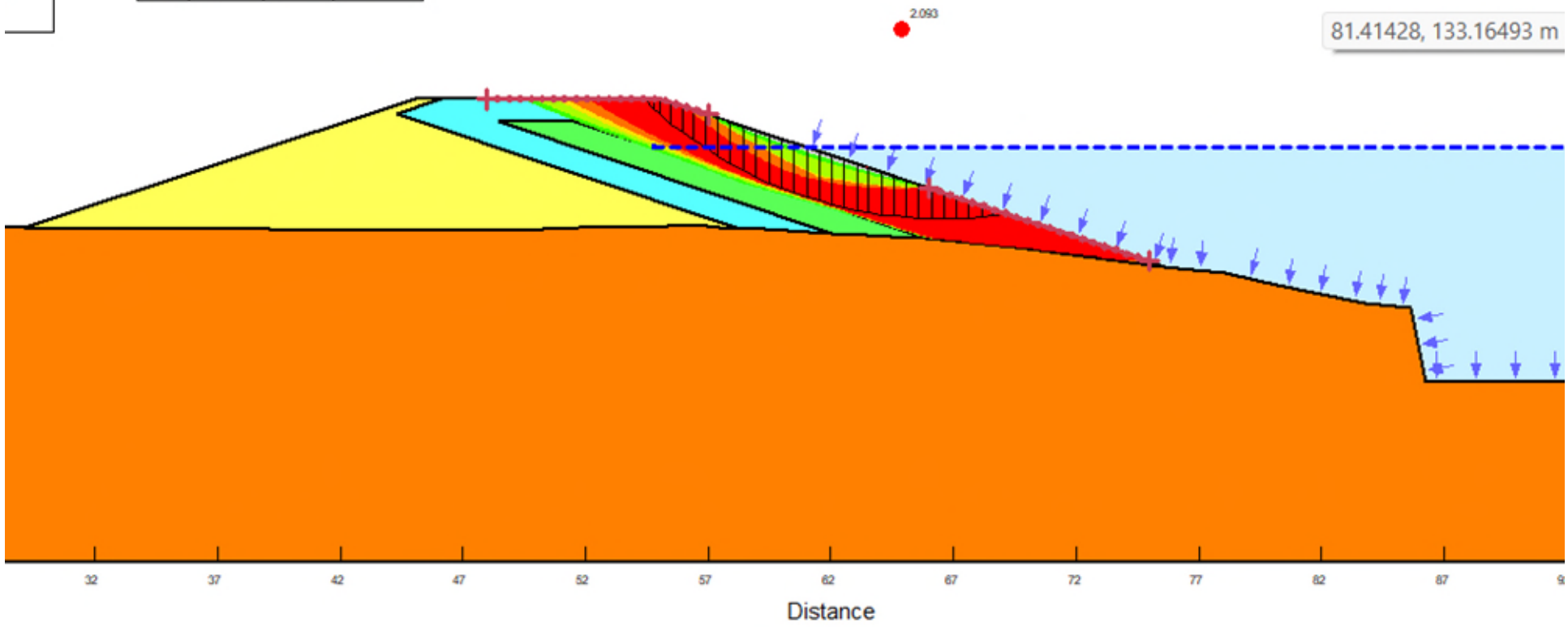
| Color | Name | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|
| | Bed Rock | | 1 |
| | Cushion 1l | 35 | 1 |
| | Cushion2 | 32 | |
| | Riprap | 41 | 1 |
| | Rockfill | 41 | 1 |




SLOPE STABILITY ANALYSIS

DYKE 2
STEADY STATE: UPSTREAM

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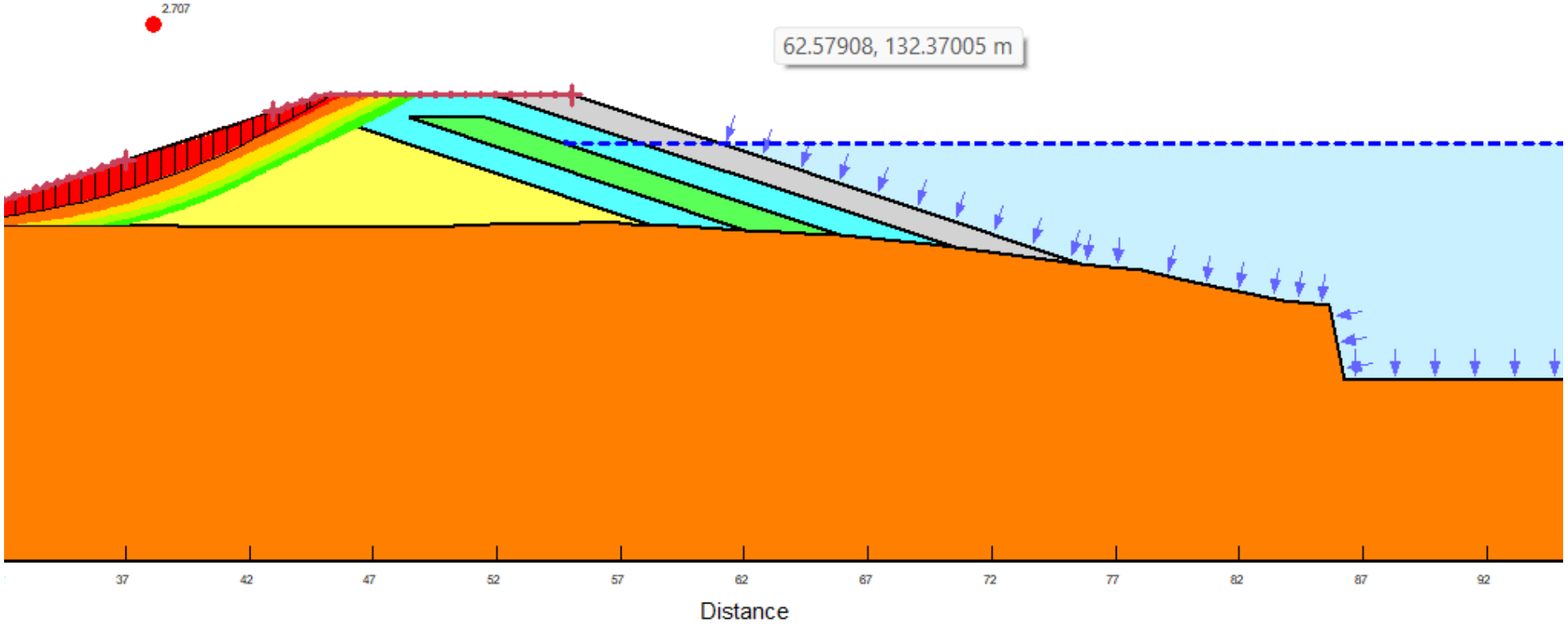
FIGURE
2.3

| Color | Name | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|
| | Bed Rock | | 1 |
| | Cushion 1l | 35 | 1 |
| | Cushion2 | 32 | 1 |
| | Riprap | 41 | 1 |
| | Rockfill | 41 | 1 |




SLOPE STABILITY ANALYSIS

DYKE 2
STEADY STATE: DOWNSTREAM

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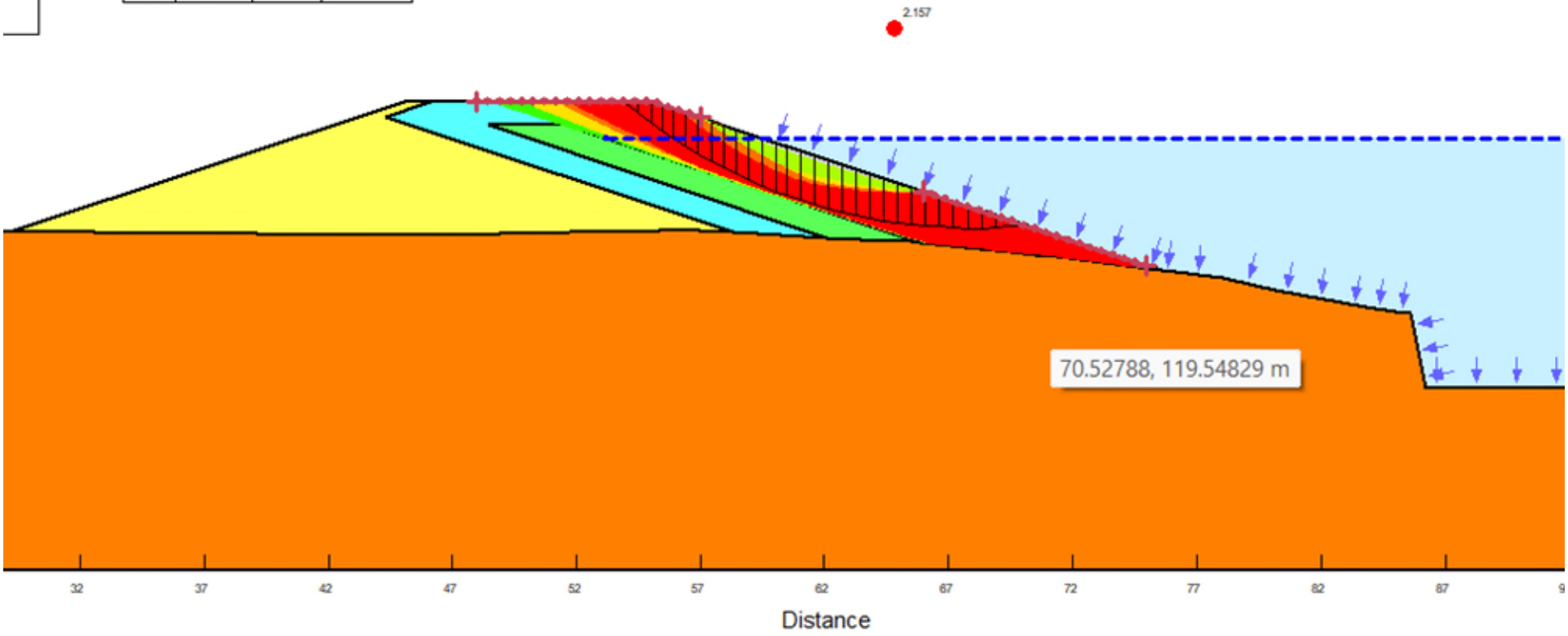
FIGURE
2.4

| Color | Name | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|
| | Bed Rock | | 1 |
| | Cushion 1l | 35 | 1 |
| | Cushion2 | 32 | |
| | Riprap | 41 | 1 |
| | Rockfill | 41 | 1 |




SLOPE STABILITY ANALYSIS

DYKE 2
IDF: UPSTREAM

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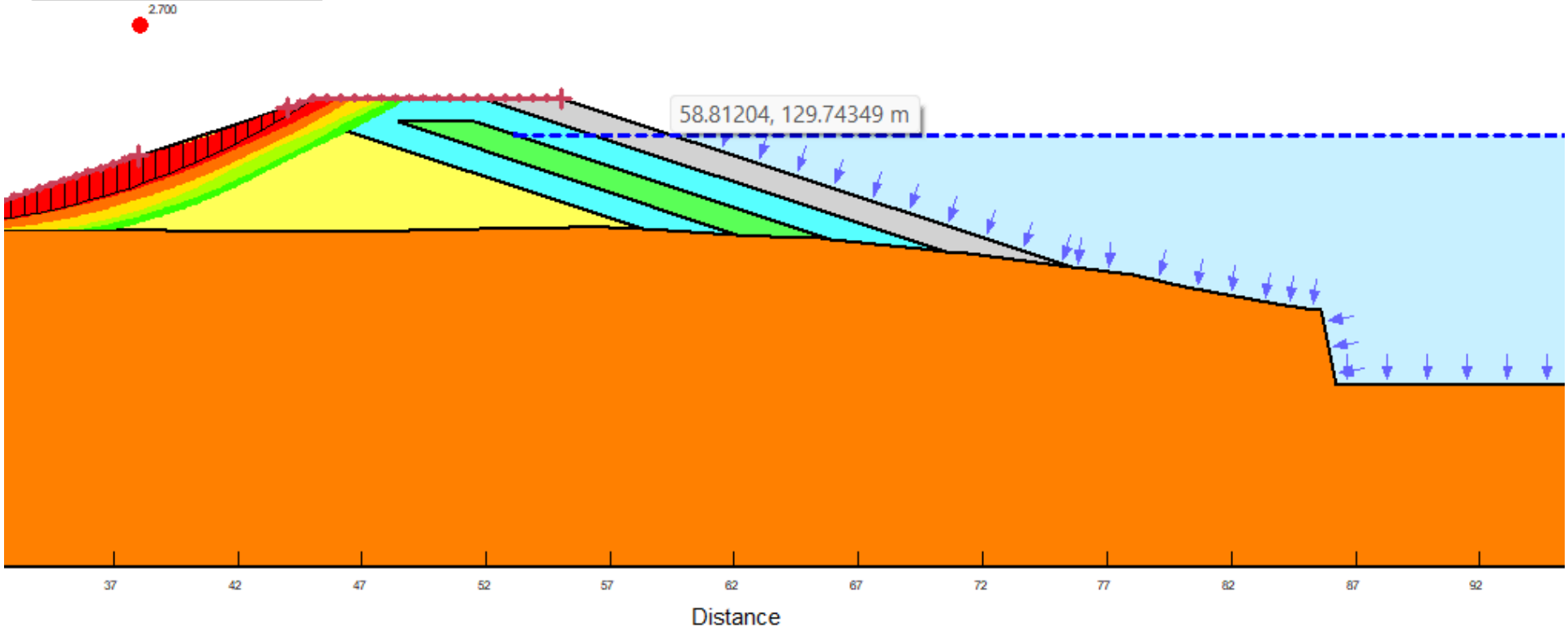
FIGURE
2.5

| Color | Name | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|
| | Bed Rock | | 1 |
| | Cushion 1l | 35 | 1 |
| | Cushion2 | 32 | |
| | Riprap | 41 | 1 |
| | Rockfill | 41 | 1 |




SLOPE STABILITY ANALYSIS

DYKE 2
IDF: DOWNSTREAM

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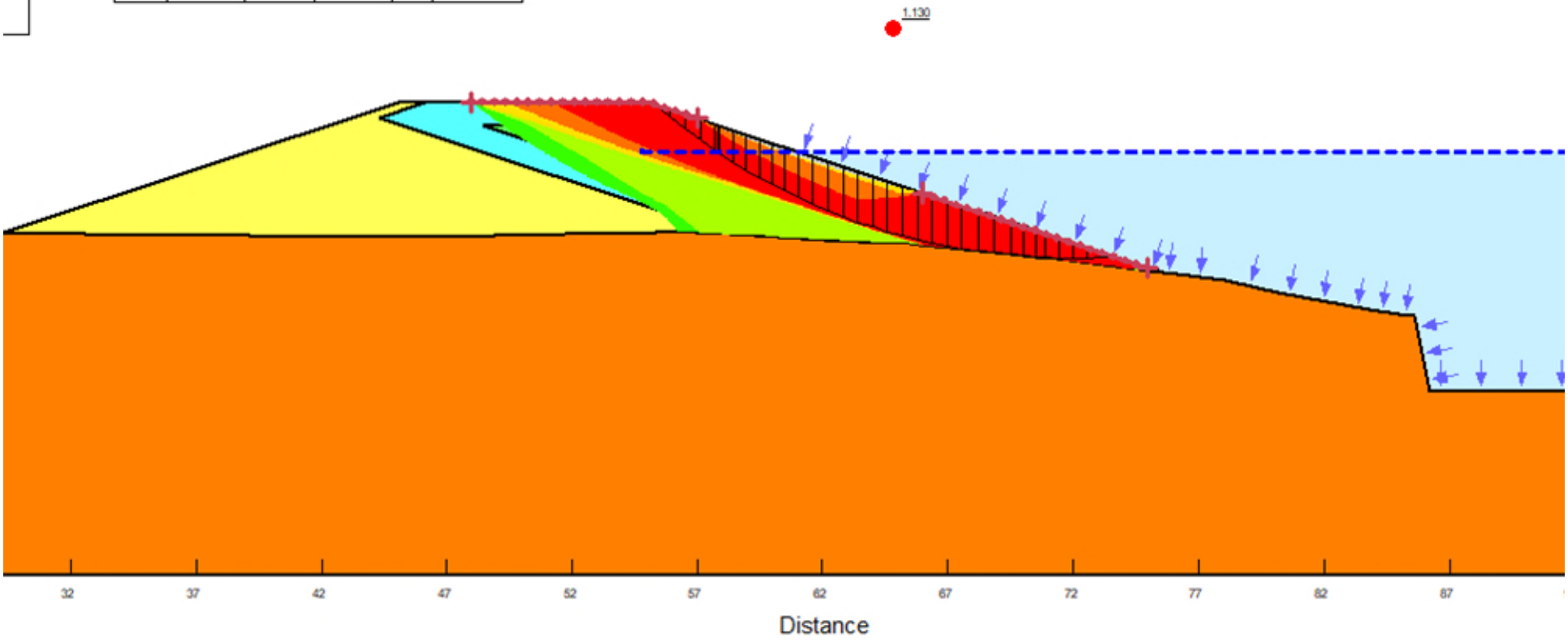
FIGURE
2.6

| Color | Name | Effective Friction Angle (°) | Cohesion R (kPa) | Phi R (°) | Piezometric Surface |
|---|---|---|---|---|---|
| | Bed Rock | | | | 1 |
| | Cushion 1l | 35 | 0 | 0 | 1 |
| | Cushion2 | 32 | 0 | 0 | |
| | Riprap | 41 | 0 | 0 | 1 |
| | Rockfill | 41 | 0 | 0 | 1 |




SLOPE STABILITY ANALYSIS

DYKE 2
SEISMIC: UPSTREAM

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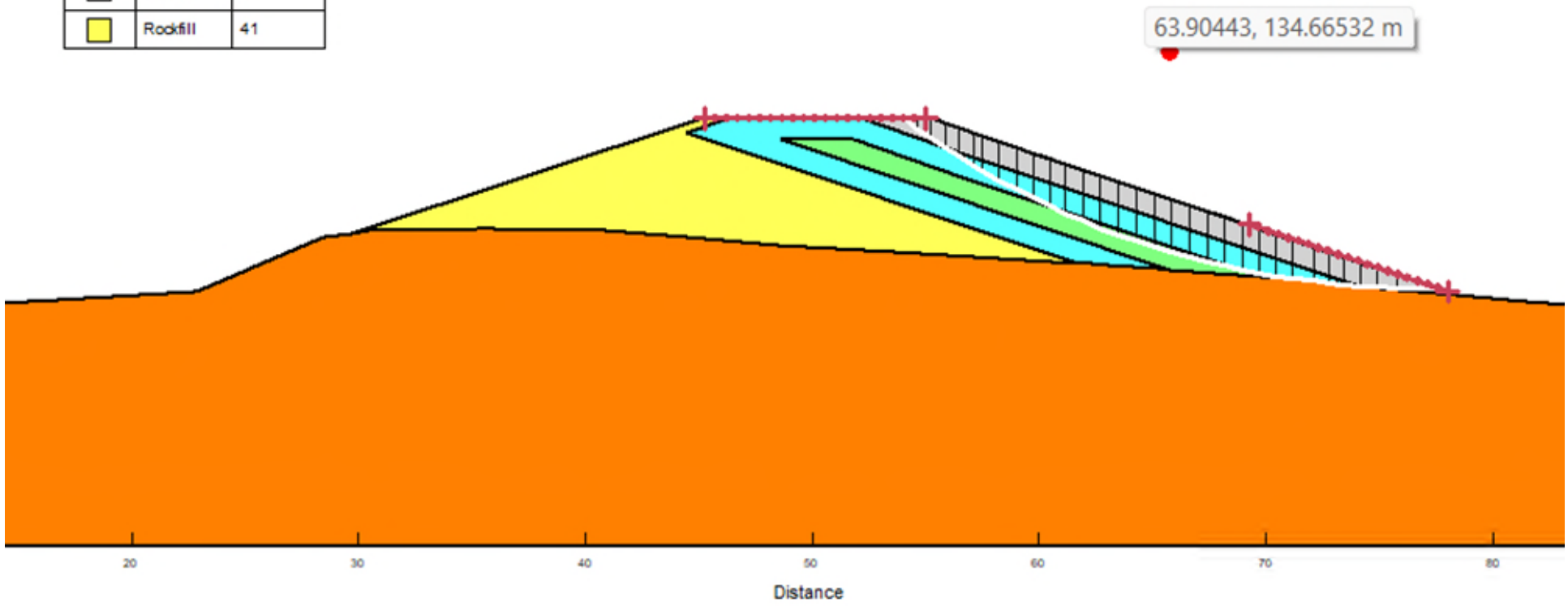
FIGURE
2.7

| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1 | 35 |
| | Cushion 2 | 32 |
| | Riprap | 41 |
| | Rockfill | 41 |




SLOPE STABILITY ANALYSIS

DYKE 3
END OF CONSTRUCTION: UPSTREAM

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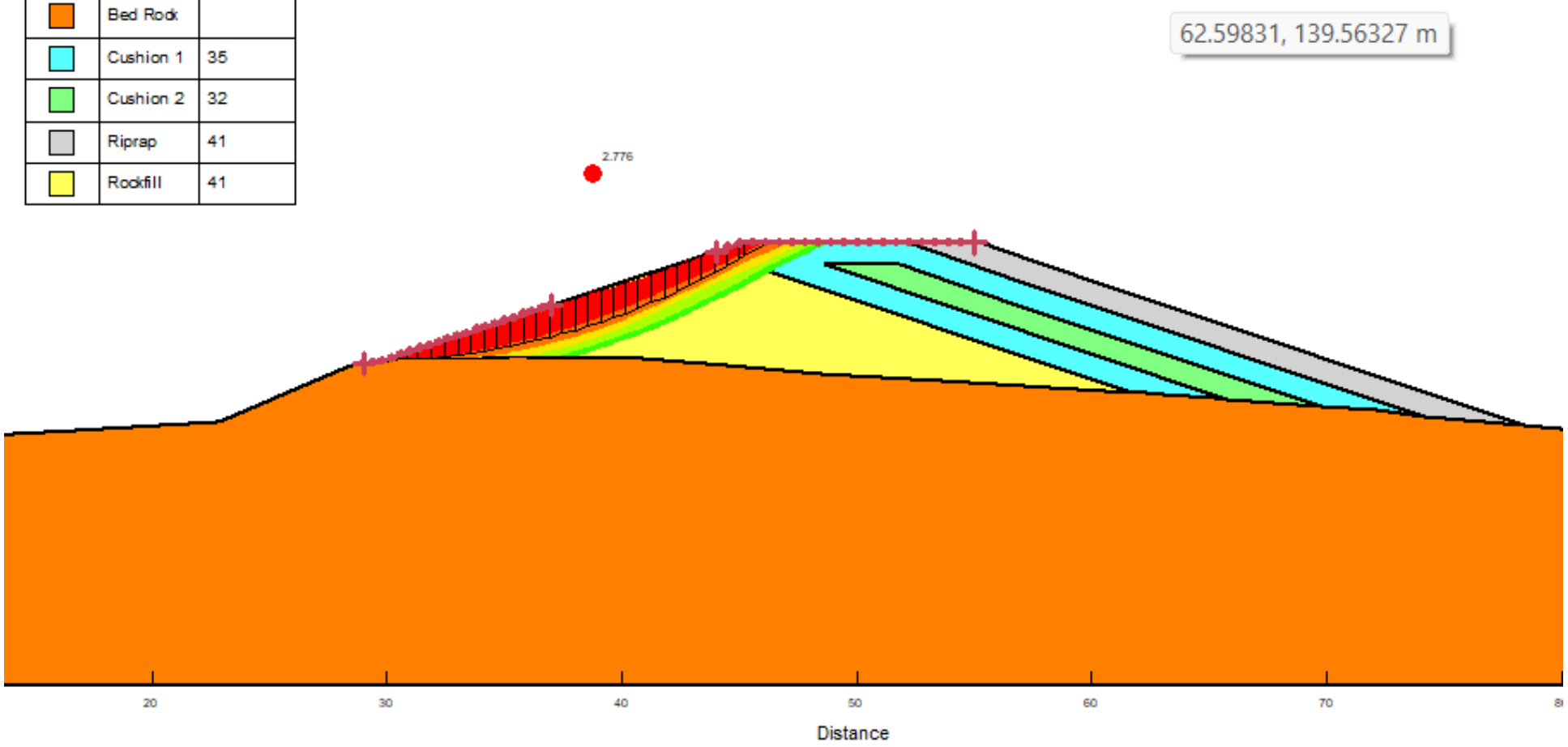
FIGURE
3.1

| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1 | 35 |
| | Cushion 2 | 32 |
| | Riprap | 41 |
| | Rockfill | 41 |




SLOPE STABILITY ANALYSIS

DYKE 3 END OF CONSTRUCTION: DOWNSTREAM

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FIGURE 3.2

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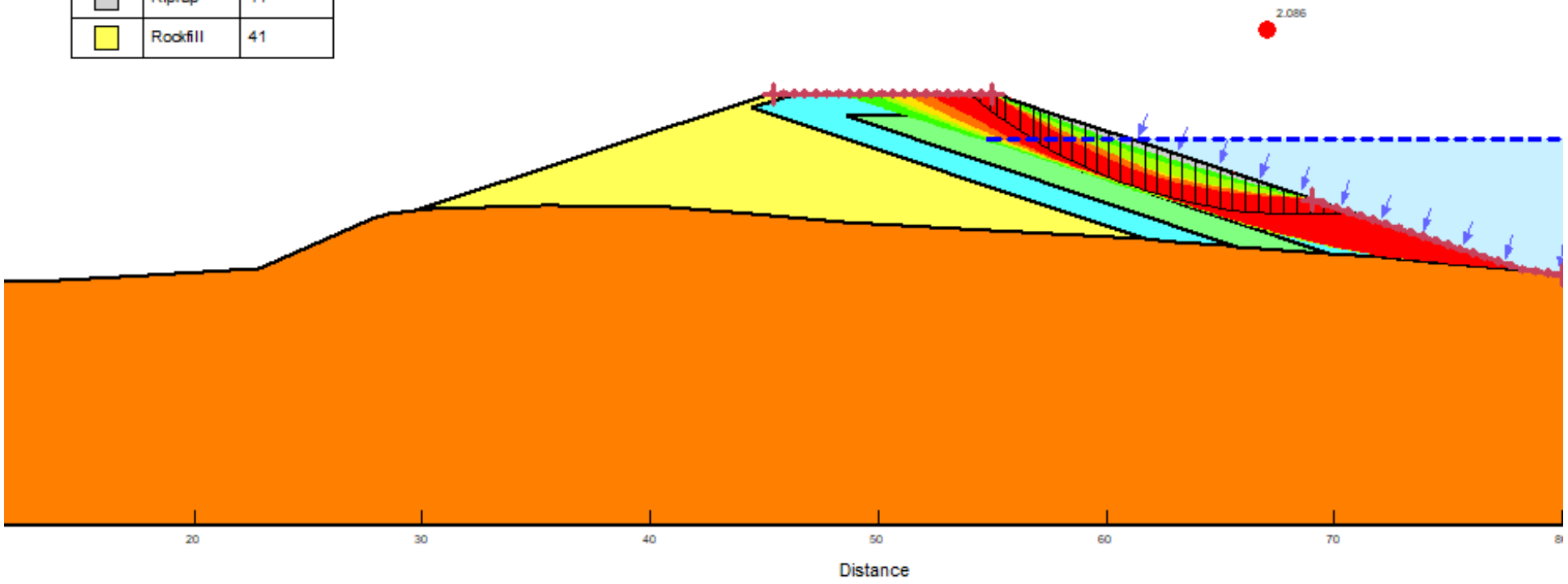
| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1 | 35 |
| | Cushion 2 | 32 |
| | Riprap | 41 |
| | Rockfill | 41 |




SLOPE STABILITY ANALYSIS

DYKE 3
STEADY STATE: UPSTREAM

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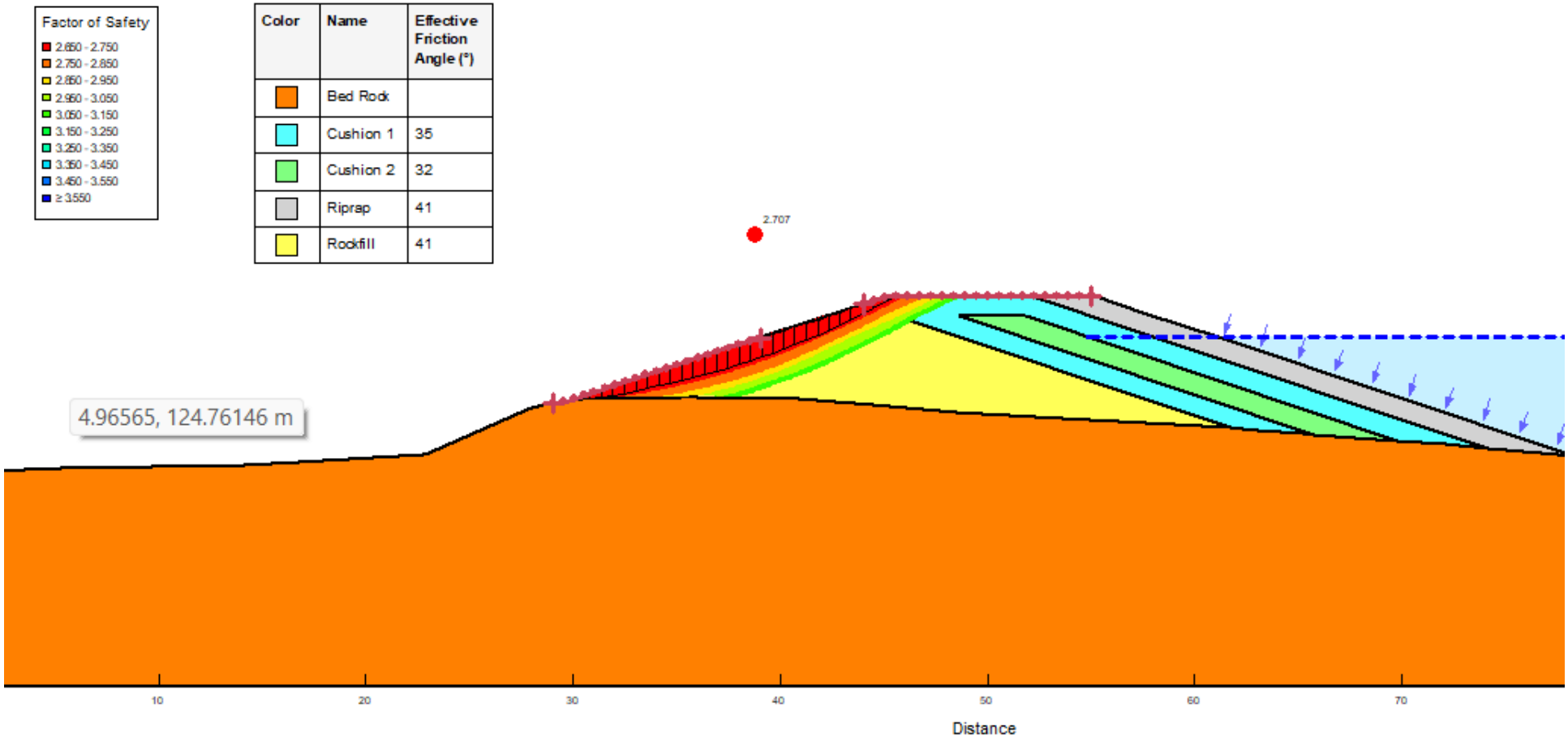
FIGURE
3.3




SLOPE STABILITY ANALYSIS

DYKE 3
STEADY STATE: DOWNSTREAM

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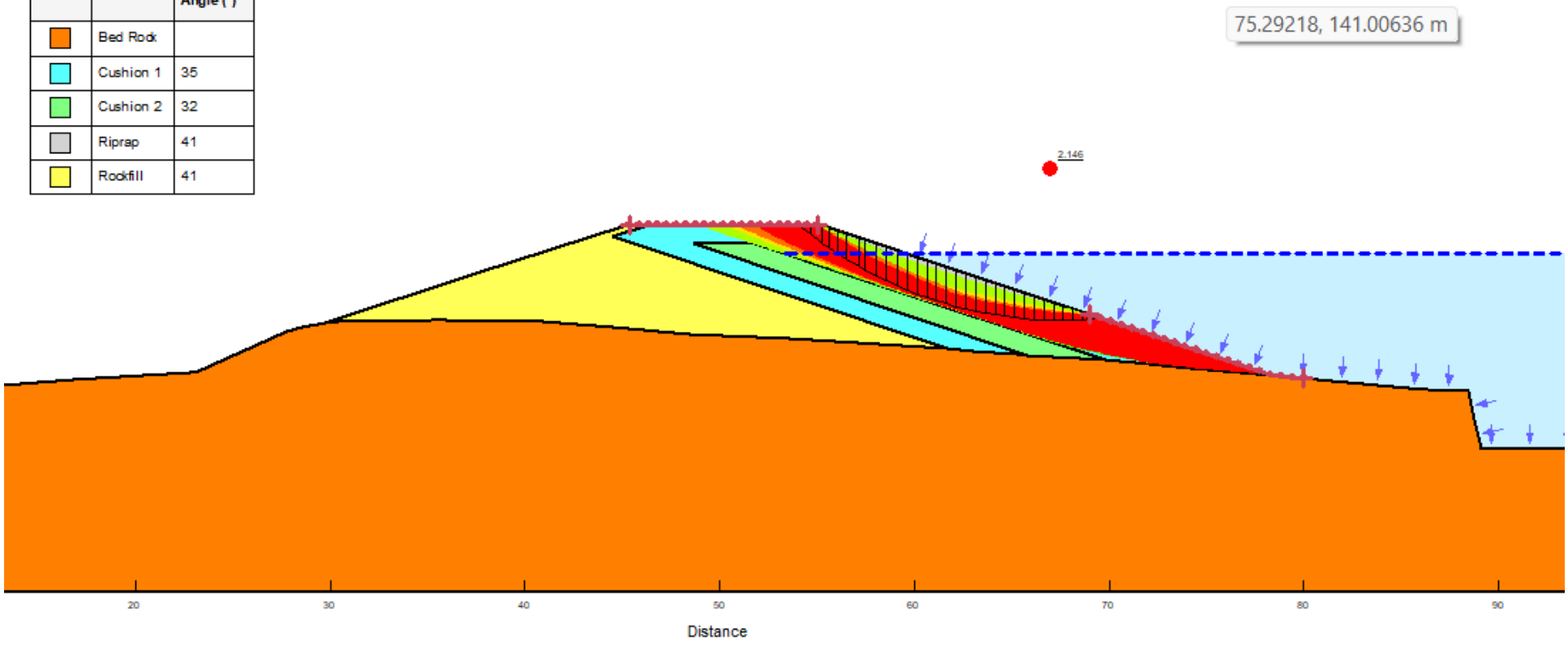
FIGURE
3.4

| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1 | 35 |
| | Cushion 2 | 32 |
| | Riprap | 41 |
| | Rockfill | 41 |




SLOPE STABILITY ANALYSIS

DYKE 3
IDF: UPSTREAM

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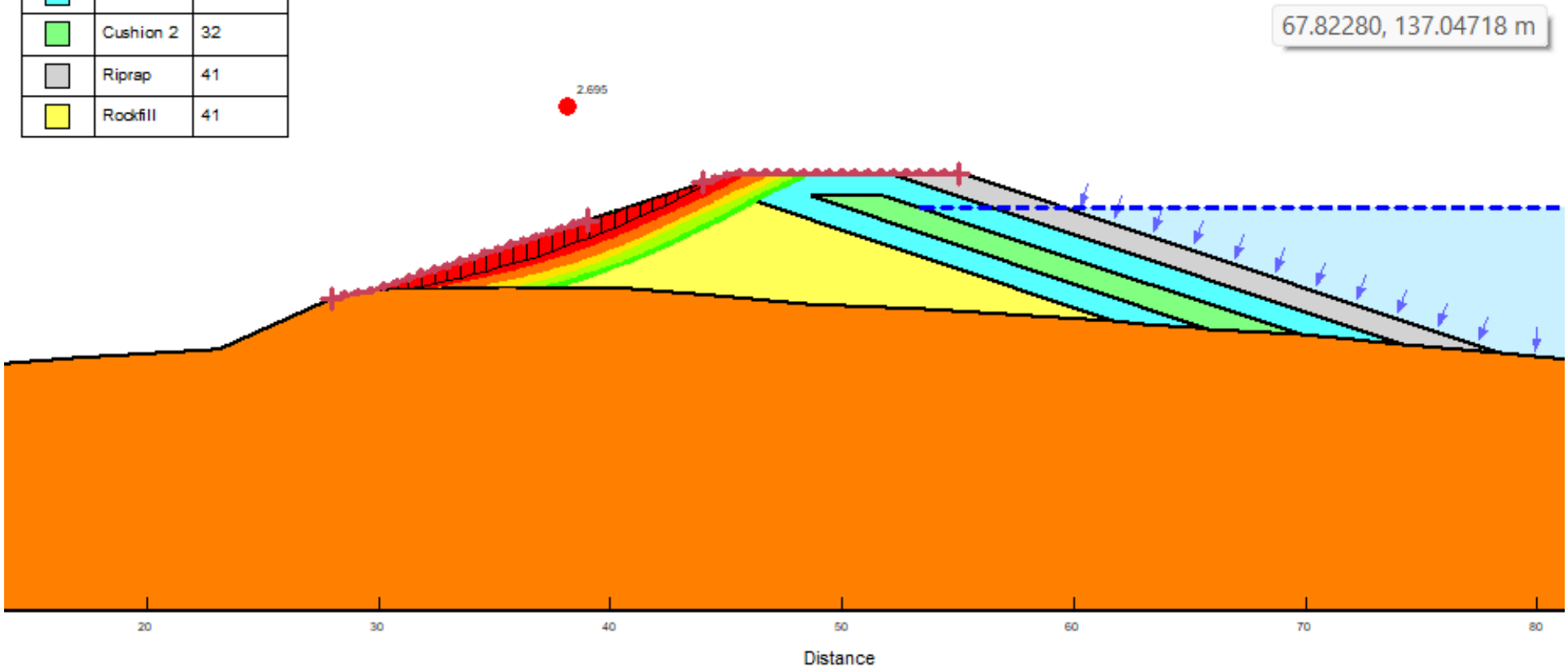
FIGURE
3.5

| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1 | 35 |
| | Cushion 2 | 32 |
| | Riprap | 41 |
| | Rockfill | 41 |




SLOPE STABILITY ANALYSIS

DYKE 3
IDF: DOWNSTREAM

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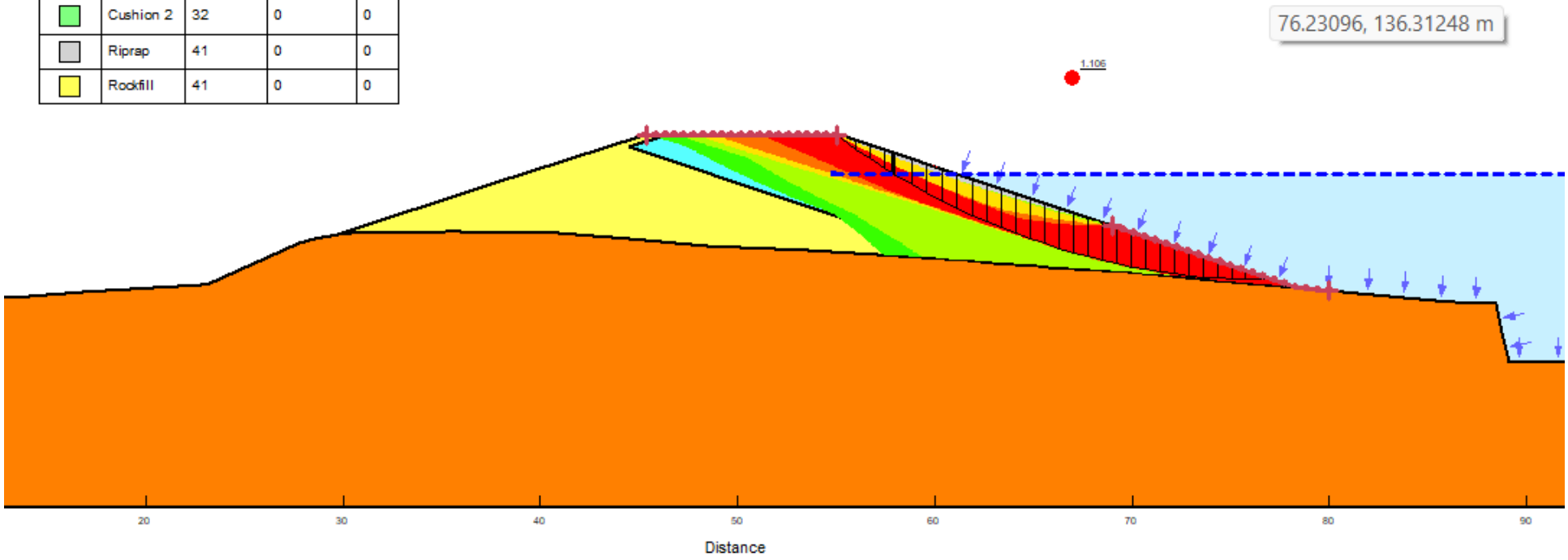
FIGURE
3.6

| Color | Name | Effective Friction Angle (°) | Cohesion R (kPa) | Phi R (°) |
|---|---|---|---|---|
| | Bed Rock | | | |
| | Cushion 1 | 35 | 0 | 0 |
| | Cushion 2 | 32 | 0 | 0 |
| | Riprap | 41 | 0 | 0 |
| | Rockfill | 41 | 0 | 0 |




SLOPE STABILITY ANALYSIS

DYKE 3
SEISMIC: UPSTREAM

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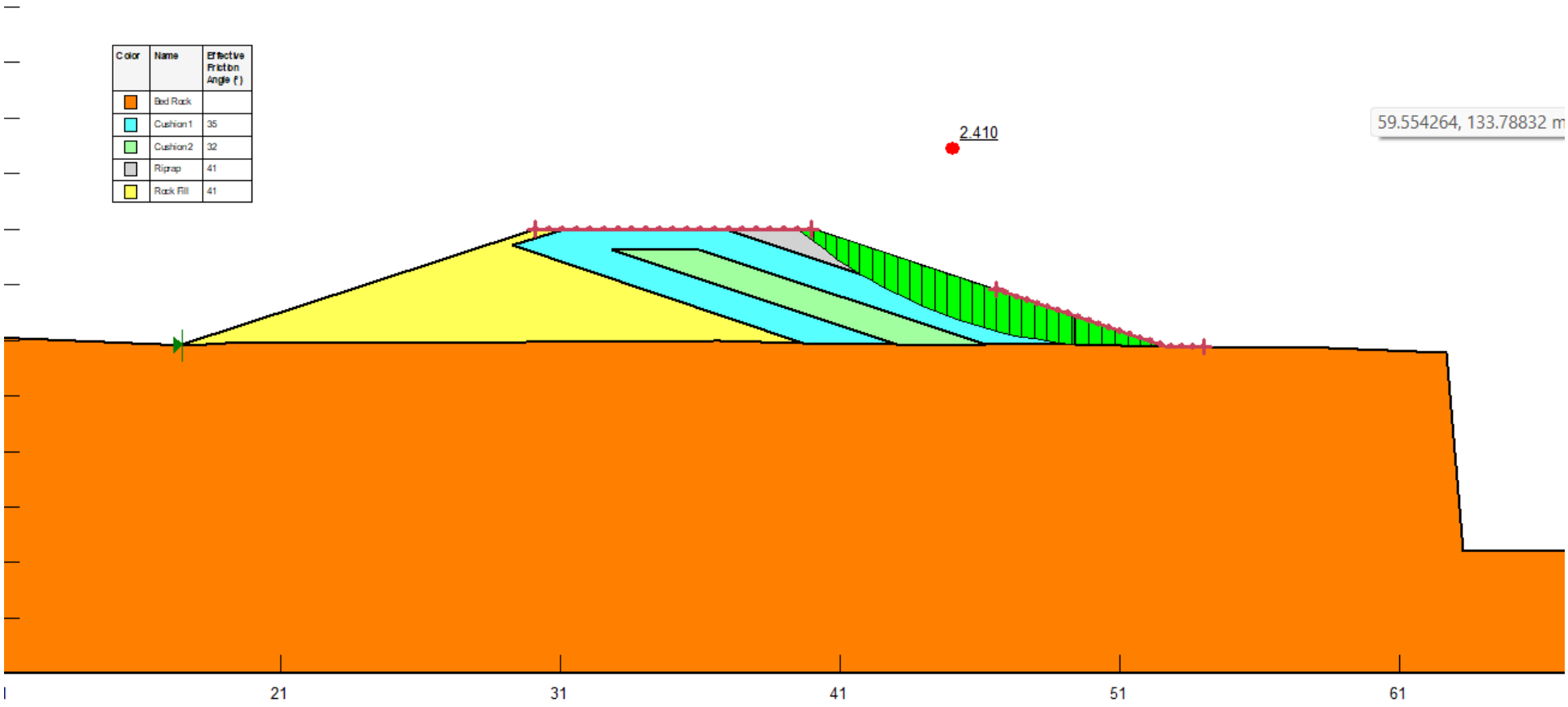
FIGURE
3.7




SLOPE STABILITY ANALYSIS

DYKE 4
END OF CONSTRUCTION: UPSTREAM

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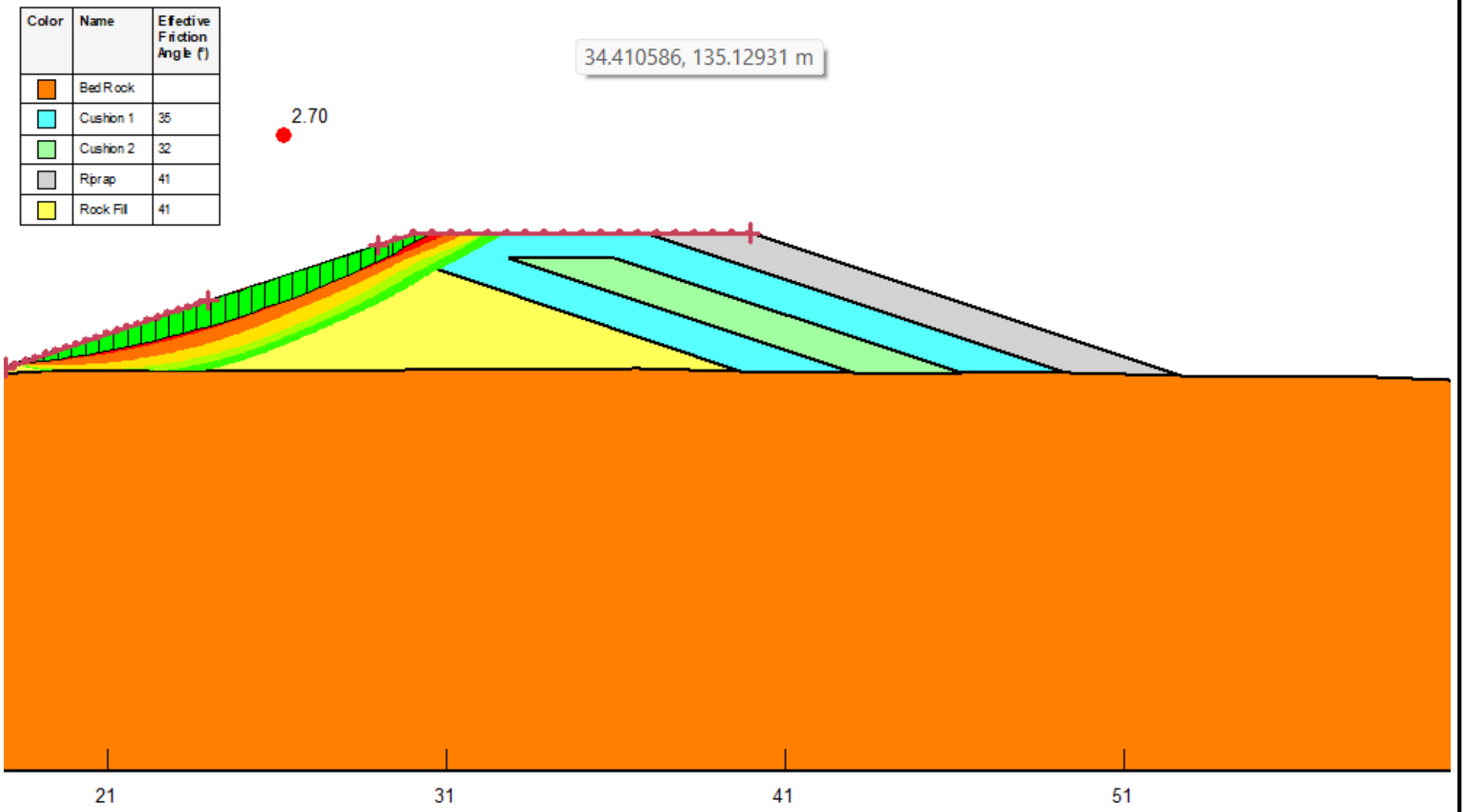
FIGURE
4.1

| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1 | 35 |
| | Cushion 2 | 32 |
| | Riprap | 41 |
| | Rock Fill | 41 |




SLOPE STABILITY ANALYSIS

DYKE 4 END OF CONSTRUCTION: DOWNSTREAM

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FIGURE 4.2

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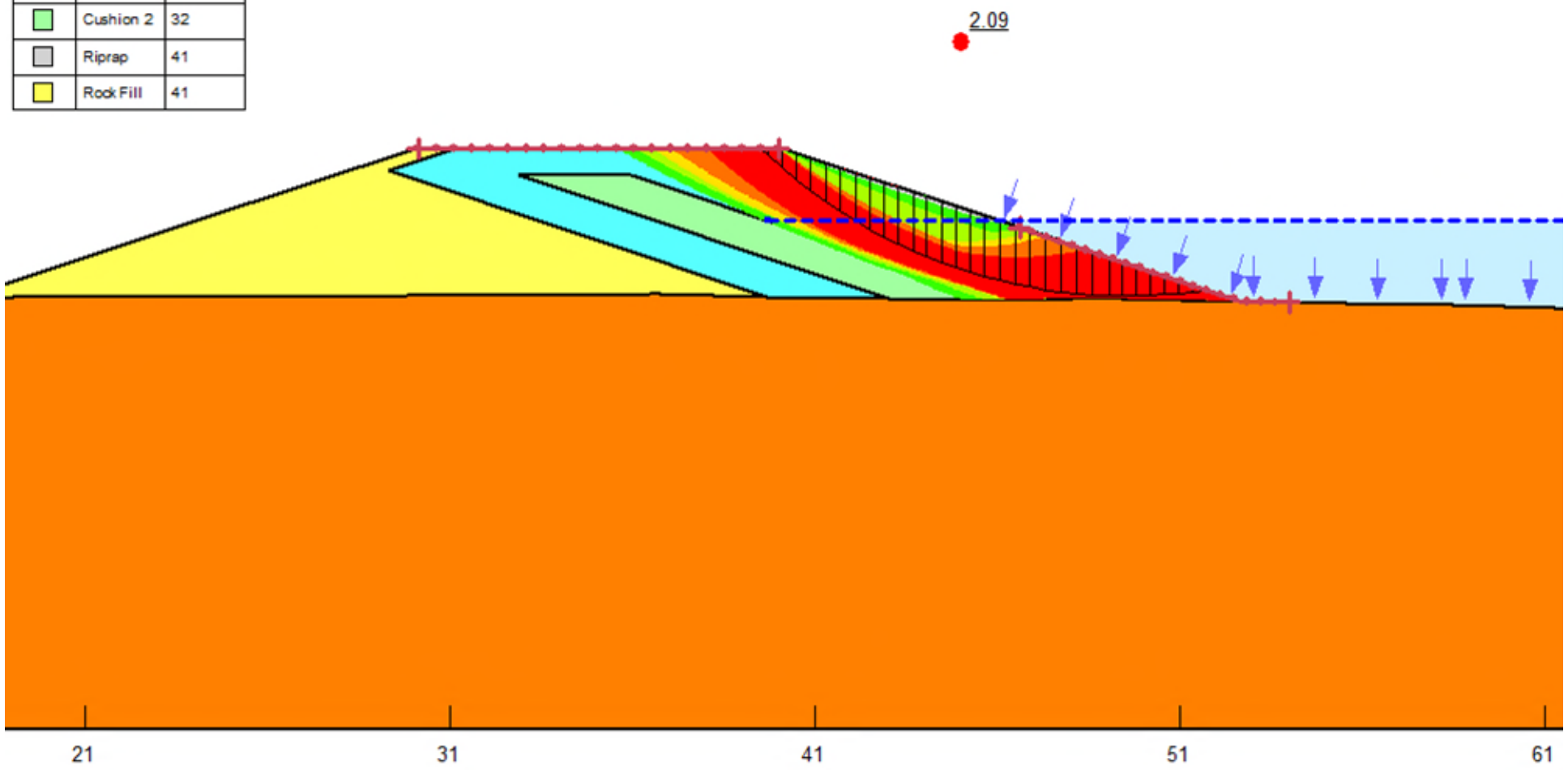
| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1 | 35 |
| | Cushion 2 | 32 |
| | Riprap | 41 |
| | Rock Fill | 41 |




SLOPE STABILITY ANALYSIS

DYKE 4
STEADY STATE: UPSTREAM

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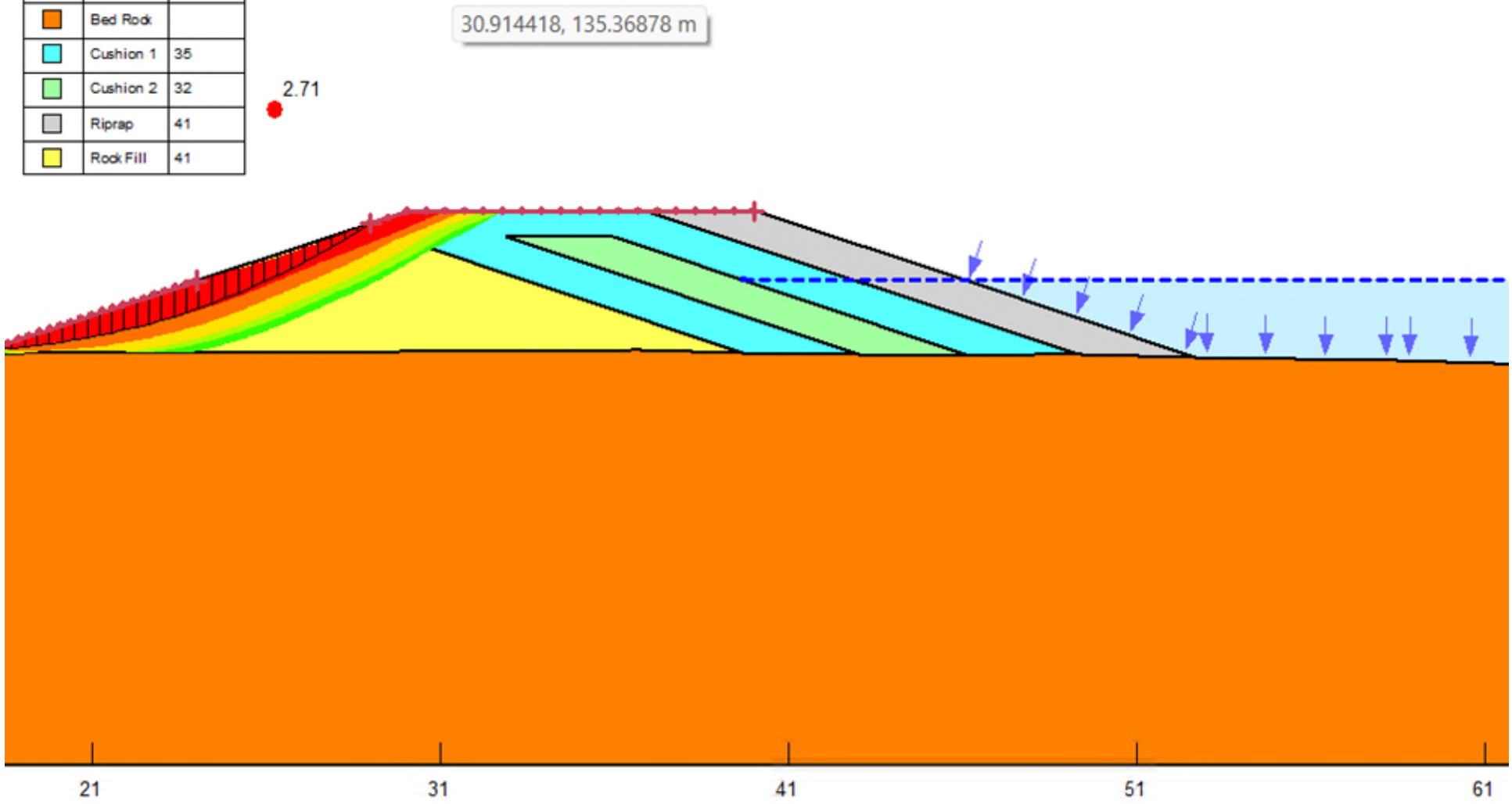
FIGURE
4.3

| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1 | 35 |
| | Cushion 2 | 32 |
| | Riprap | 41 |
| | Rock Fill | 41 |




SLOPE STABILITY ANALYSIS

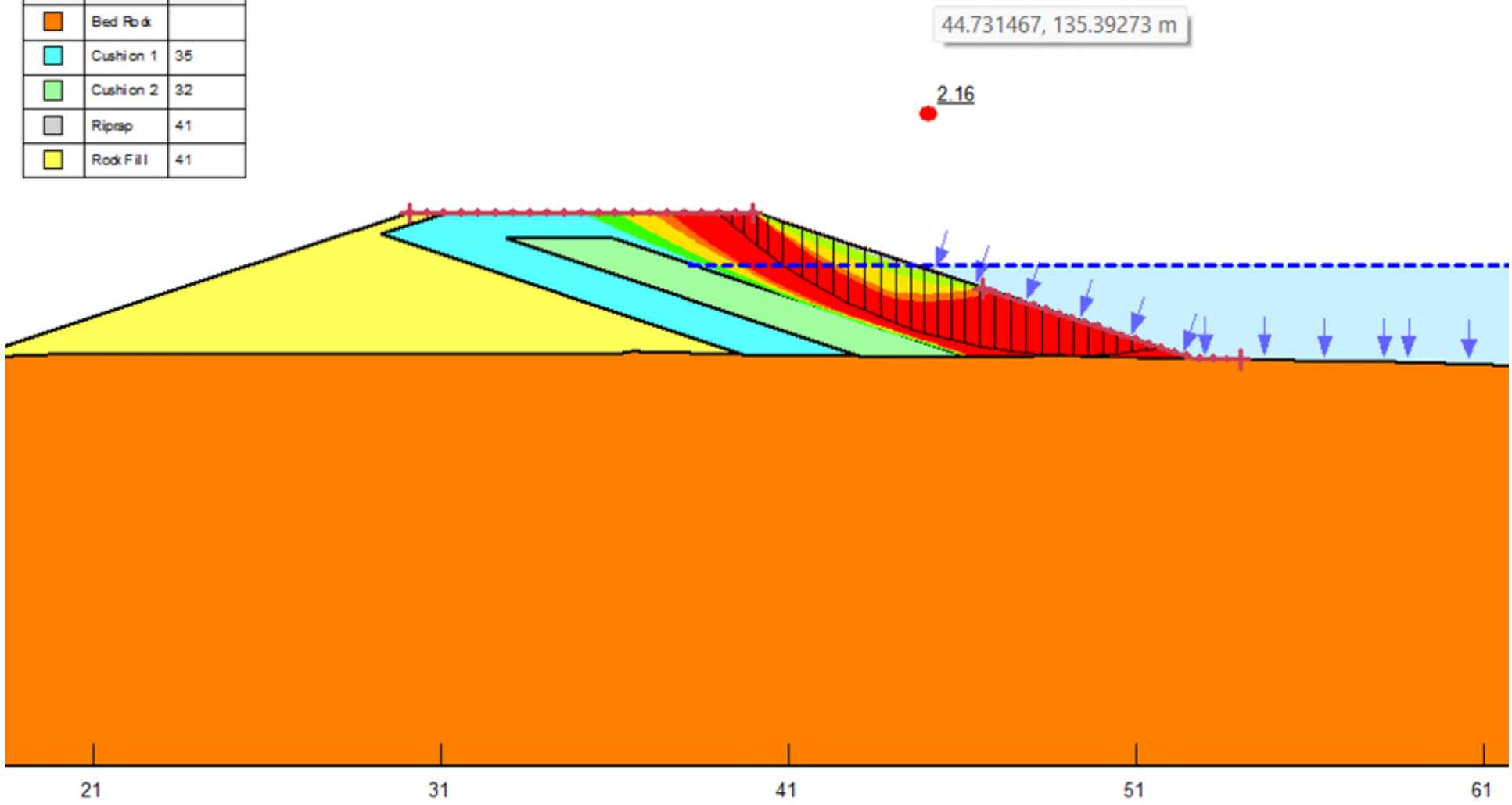
DYKE 4
STEADY STATE: DOWNSTREAM

DRAFT

ARCADIS

FIGURE
4.4

| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1 | 35 |
| | Cushion 2 | 32 |
| | Riprap | 41 |
| | Rock Fill | 41 |




SLOPE STABILITY ANALYSIS

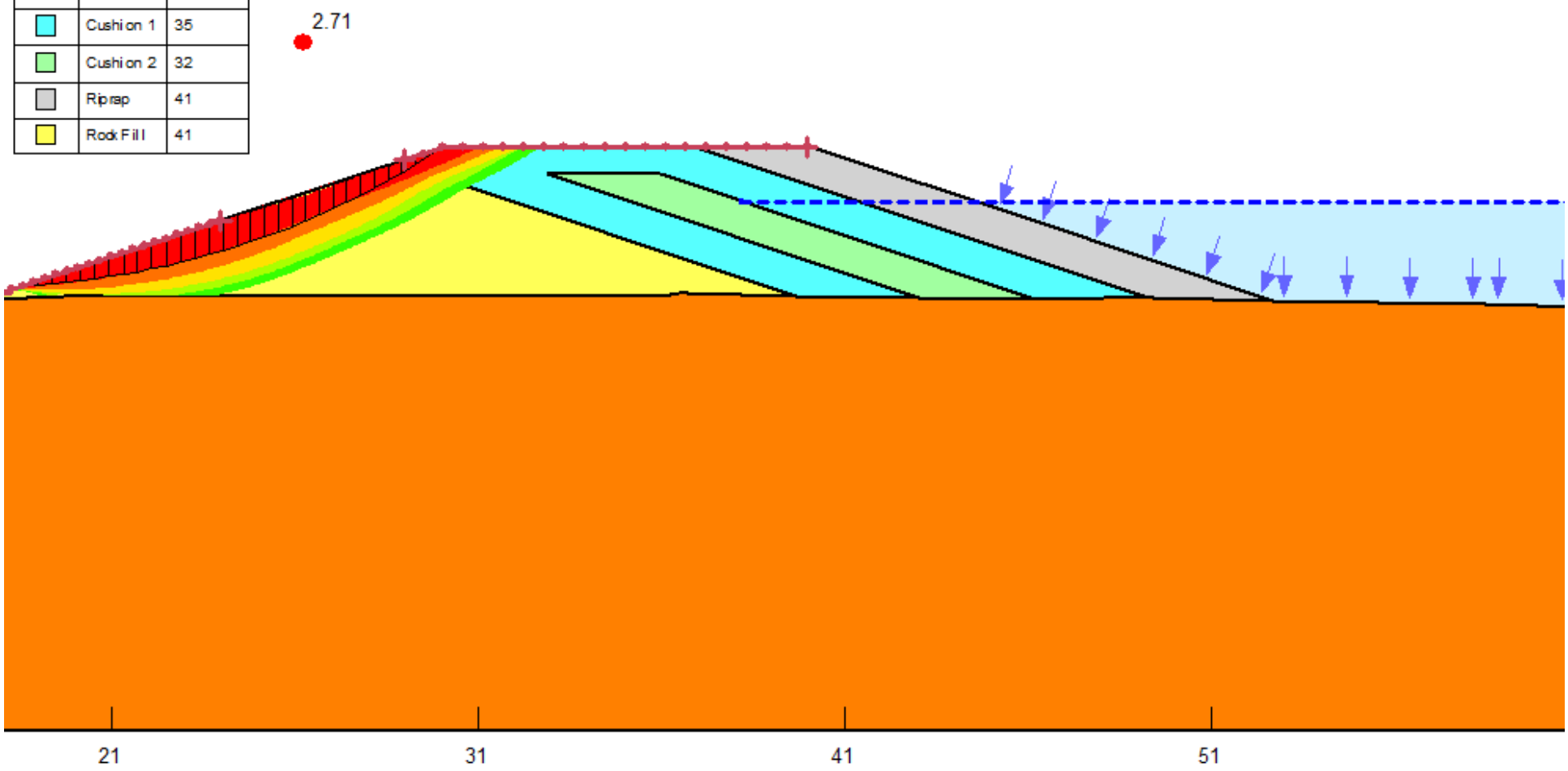
DYKE 4
IDF: UPSTREAM

DRAFT

ARCADIS

FIGURE
4.5

| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1 | 35 |
| | Cushion 2 | 32 |
| | Riprap | 41 |
| | Rock Fill | 41 |



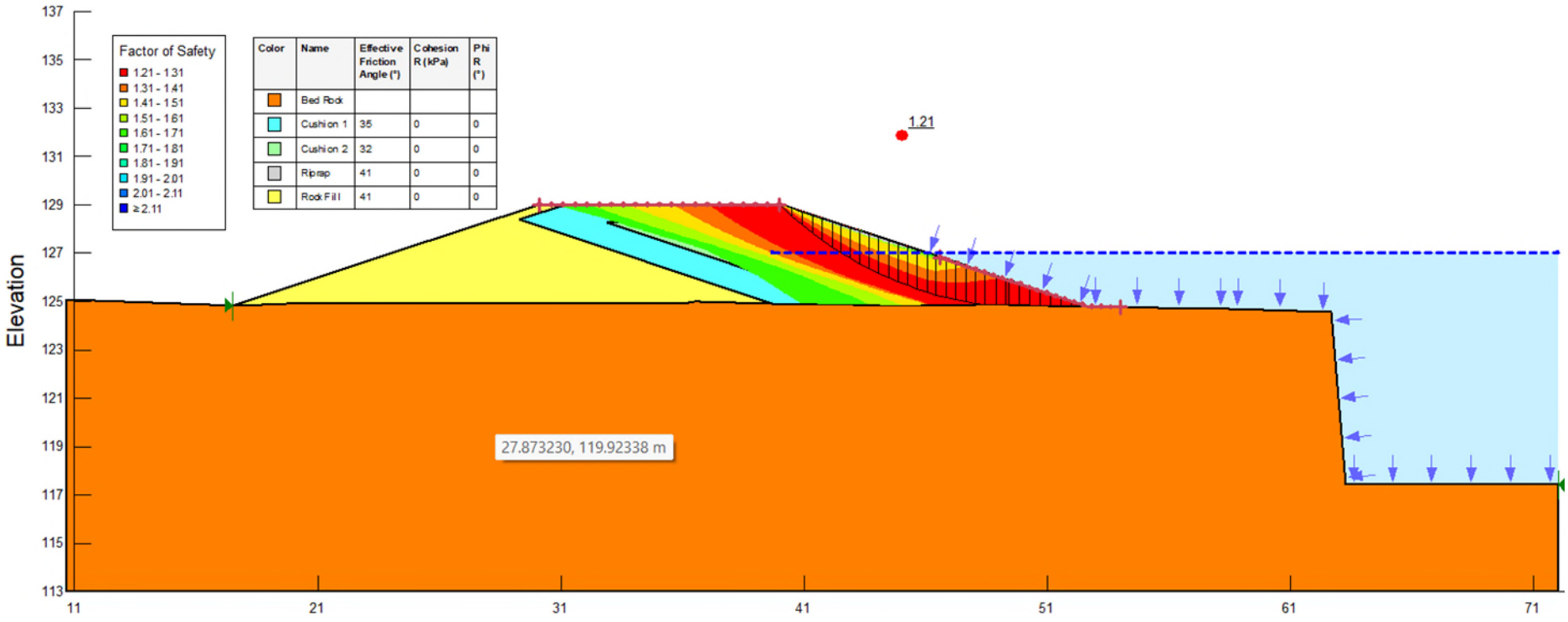

SLOPE STABILITY ANALYSIS

DYKE 4
IDF: DOWNSTREAM

DRAFT

ARCADIS

FIGURE
4.6



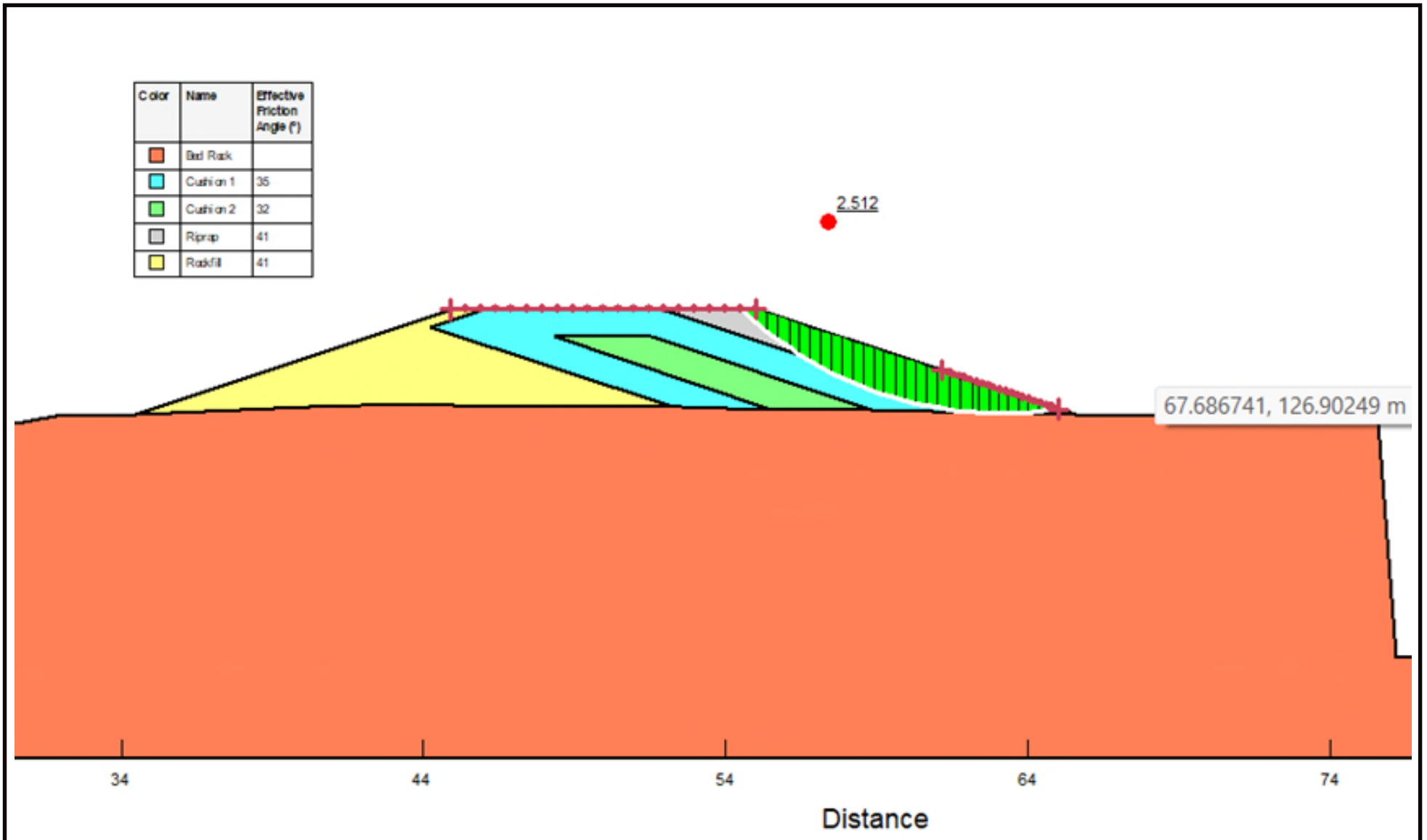

SLOPE STABILITY ANALYSIS

DYKE 4
SEISMIC: UPSTREAM

DRAFT

ARCADIS

FIGURE
4.7




SLOPE STABILITY ANALYSIS

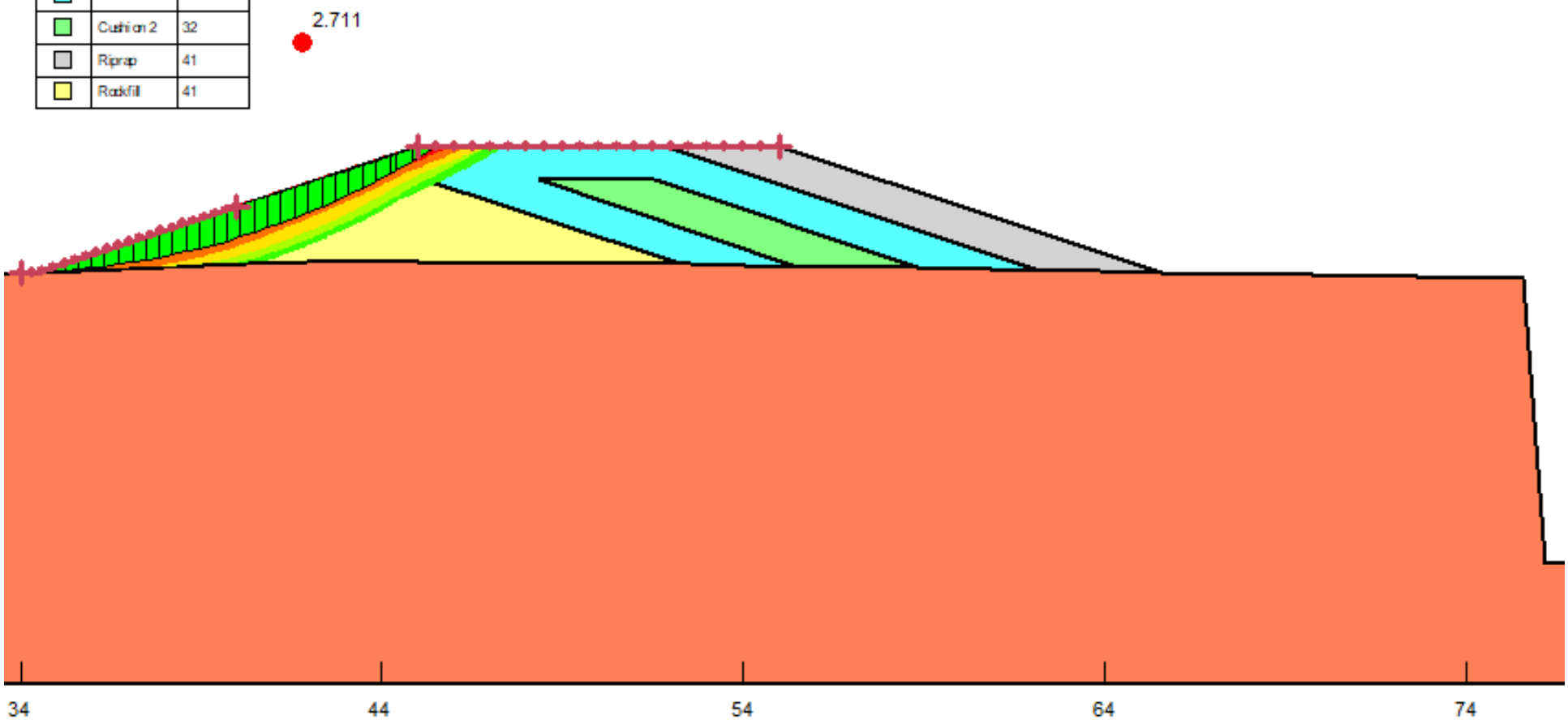
DYKE 5
END OF CONSTRUCTION: UPSTREAM

DRAFT

ARCADIS

FIGURE
5.1

| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1 | 35 |
| | Cushion 2 | 32 |
| | Riprap | 41 |
| | Rockfill | 41 |




SLOPE STABILITY ANALYSIS

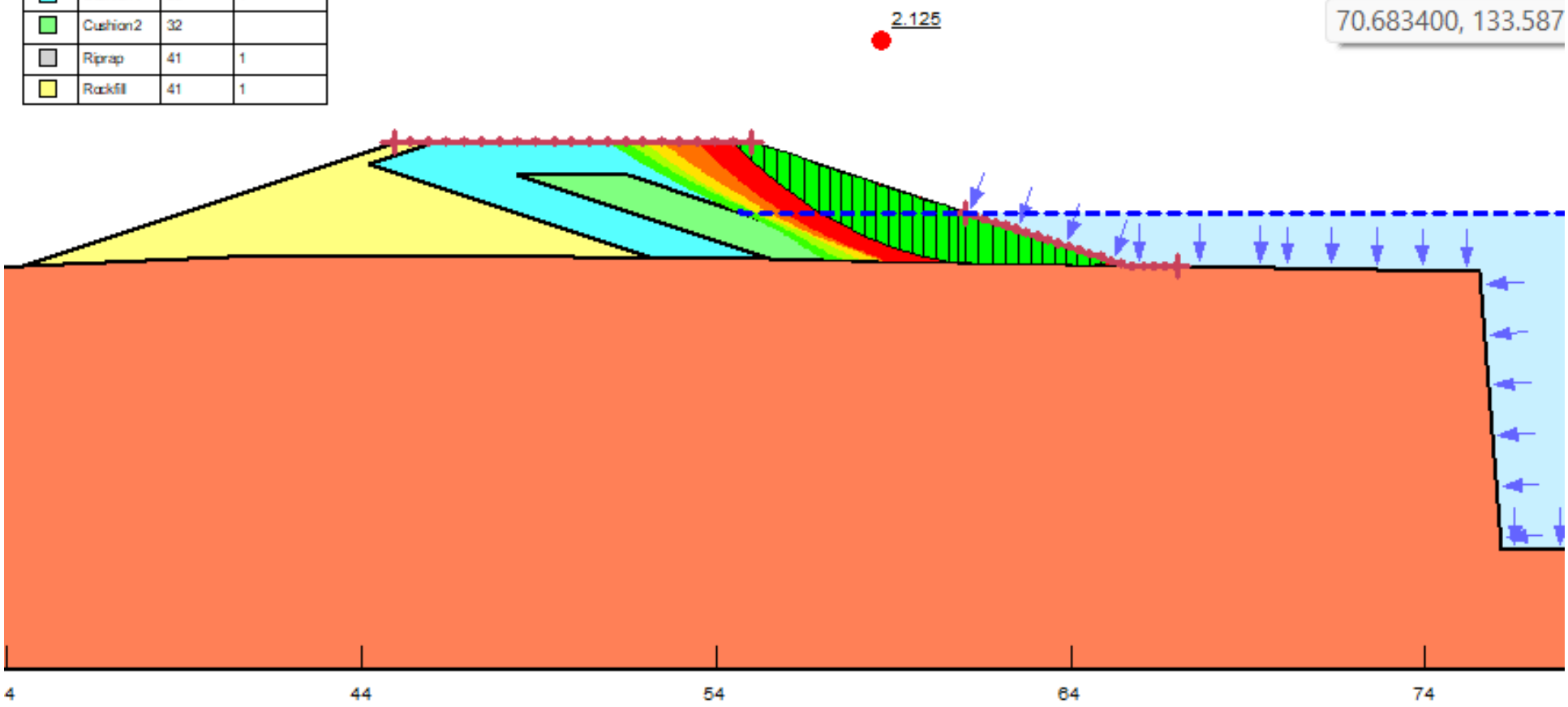
DYKE 5 END OF CONSTRUCTION: DOWNSTREAM

ARCADIS

FIGURE 5.2

DRAFT
DRAFT

| Color | Name | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|
| | Bed Rock | | 1 |
| | Cushion1 | 35 | 1 |
| | Cushion2 | 32 | |
| | Riprap | 41 | 1 |
| | Rockfill | 41 | 1 |



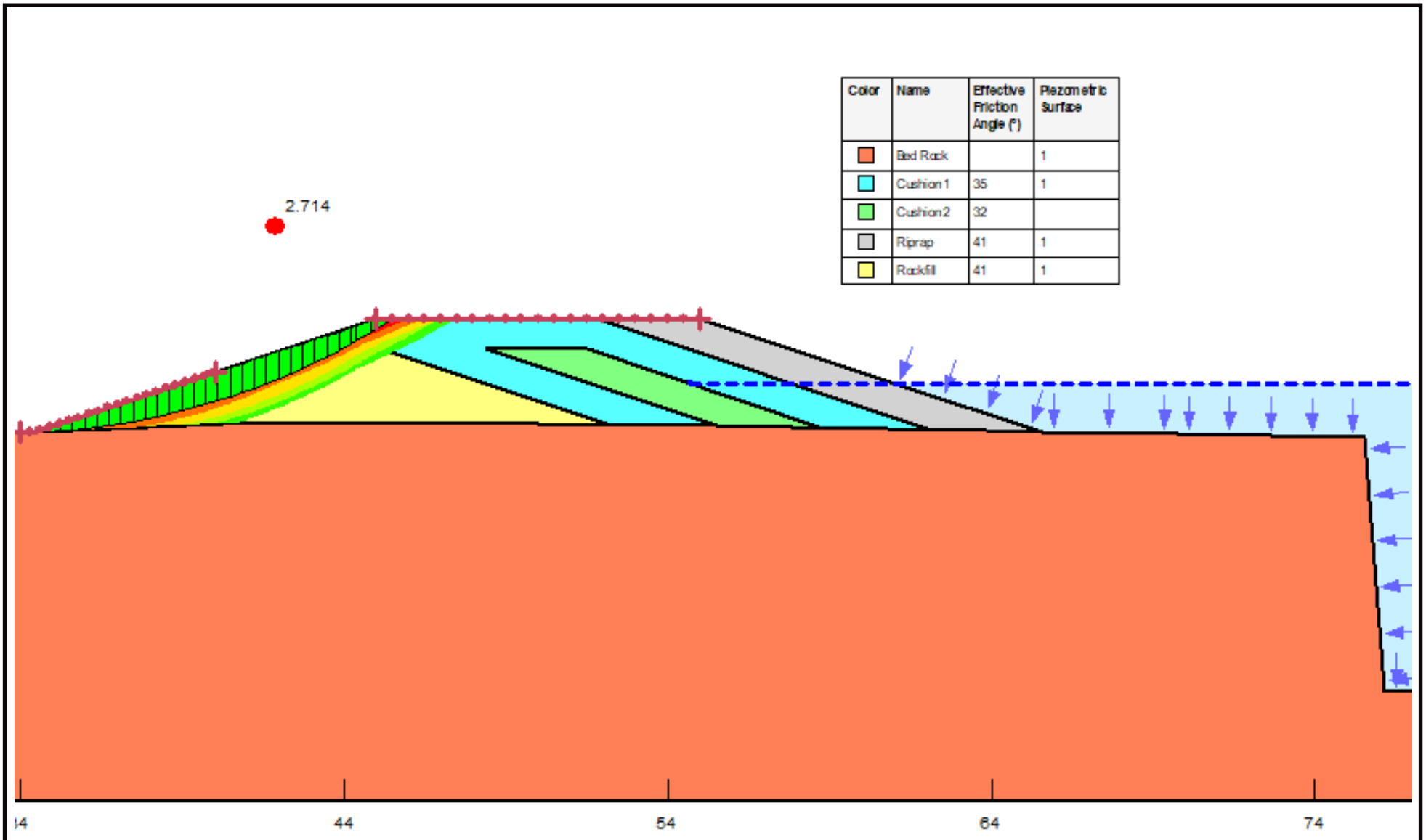

SLOPE STABILITY ANALYSIS

DYKE 5
STEADY STATE: UPSTREAM

DRAFT

ARCADIS

FIGURE
5.3




SLOPE STABILITY ANALYSIS

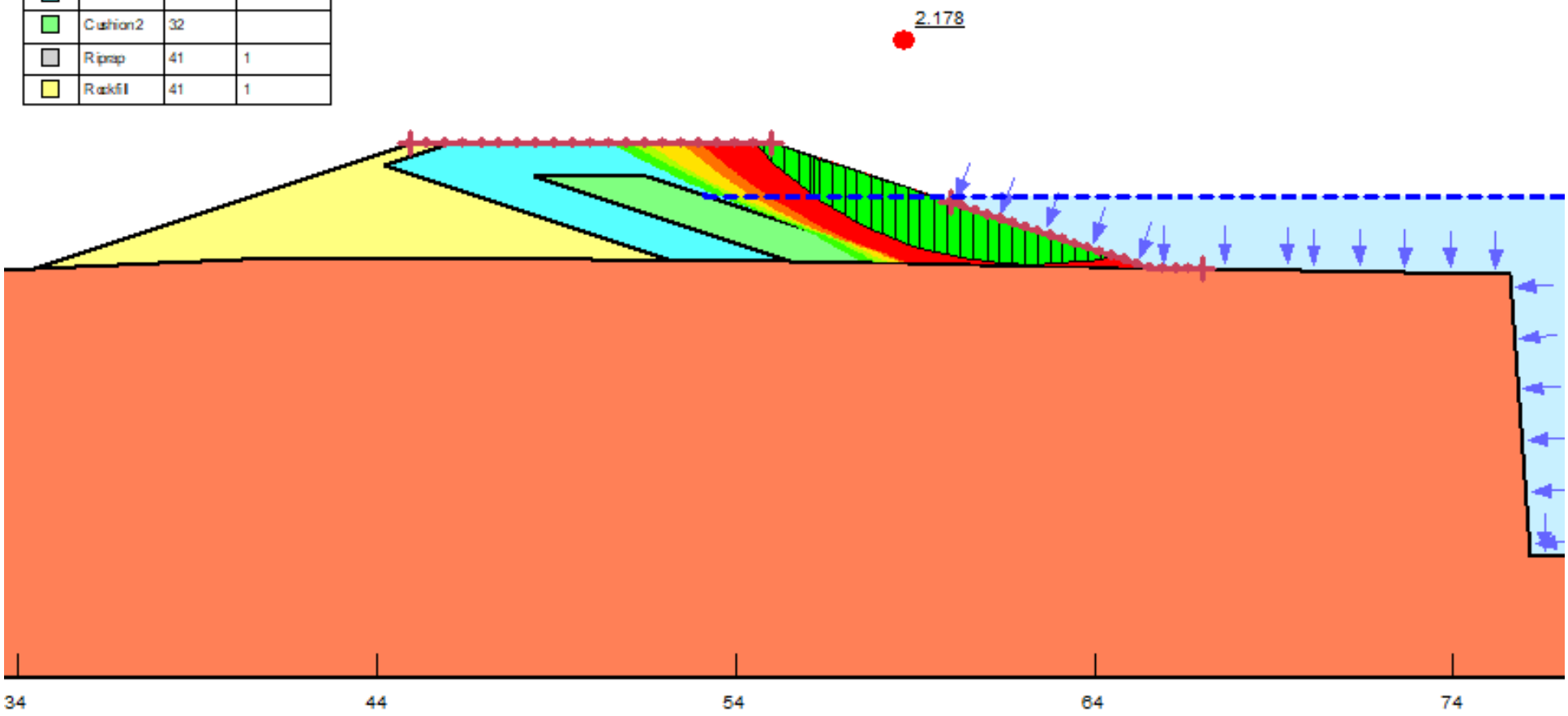
DYKE 5
STEADY STATE: DOWNSTREAM

DRAFT

ARCADIS

FIGURE
5.4

| Color | Name | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|
| | Bed Rock | | 1 |
| | Cushion1 | 35 | 1 |
| | Cushion2 | 32 | |
| | Riprap | 41 | 1 |
| | Rockfill | 41 | 1 |



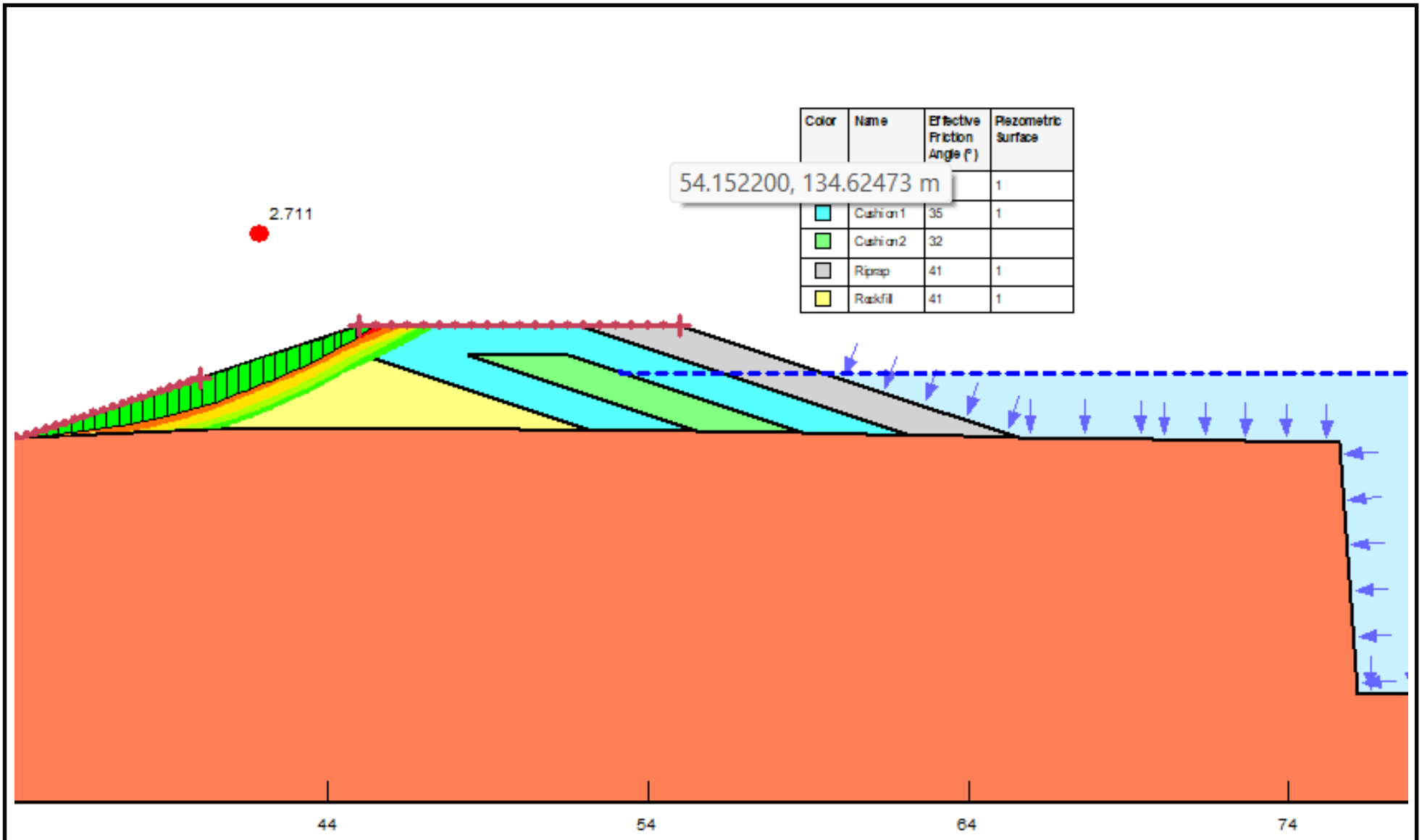

SLOPE STABILITY ANALYSIS

DYKE 5
IDF: UPSTREAM

DRAFT

ARCADIS

FIGURE
5.5



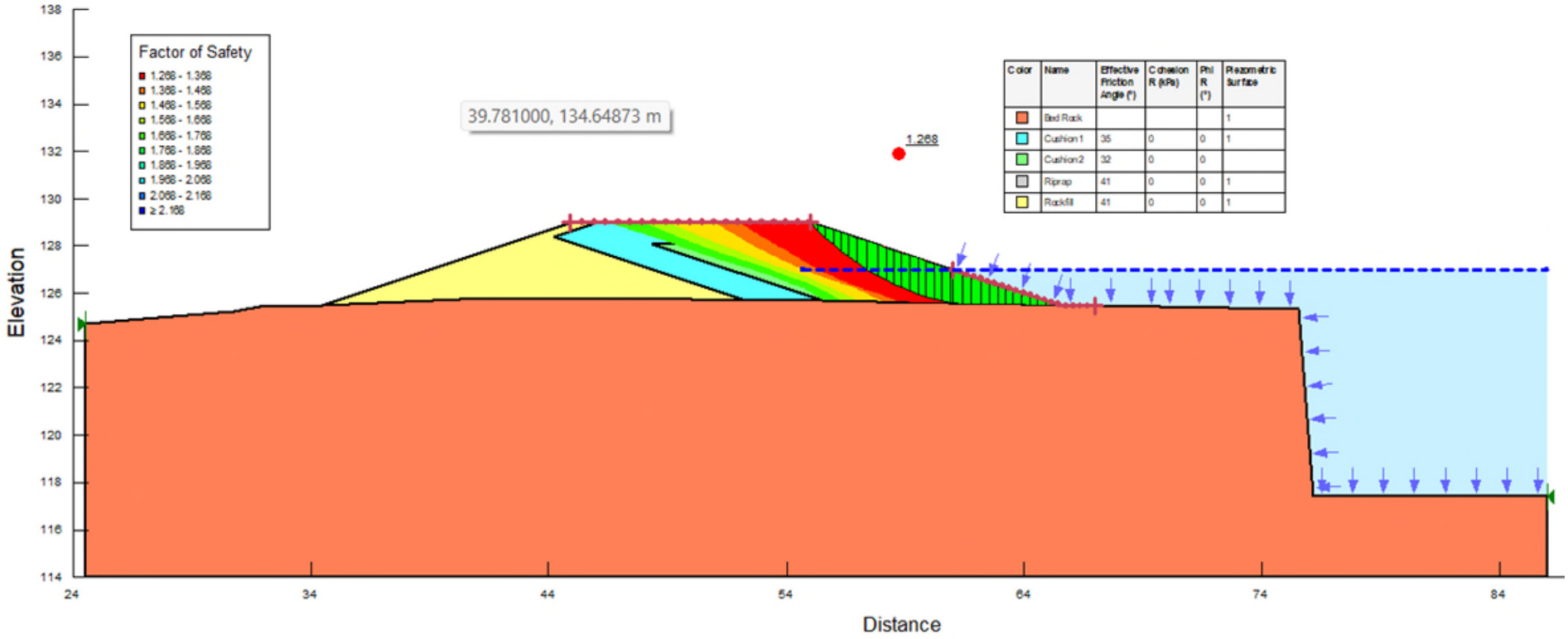

SLOPE STABILITY ANALYSIS

DYKE 5
IDF: DOWNSTREAM

DRAFT

ARCADIS

FIGURE
5.6




SLOPE STABILITY ANALYSIS

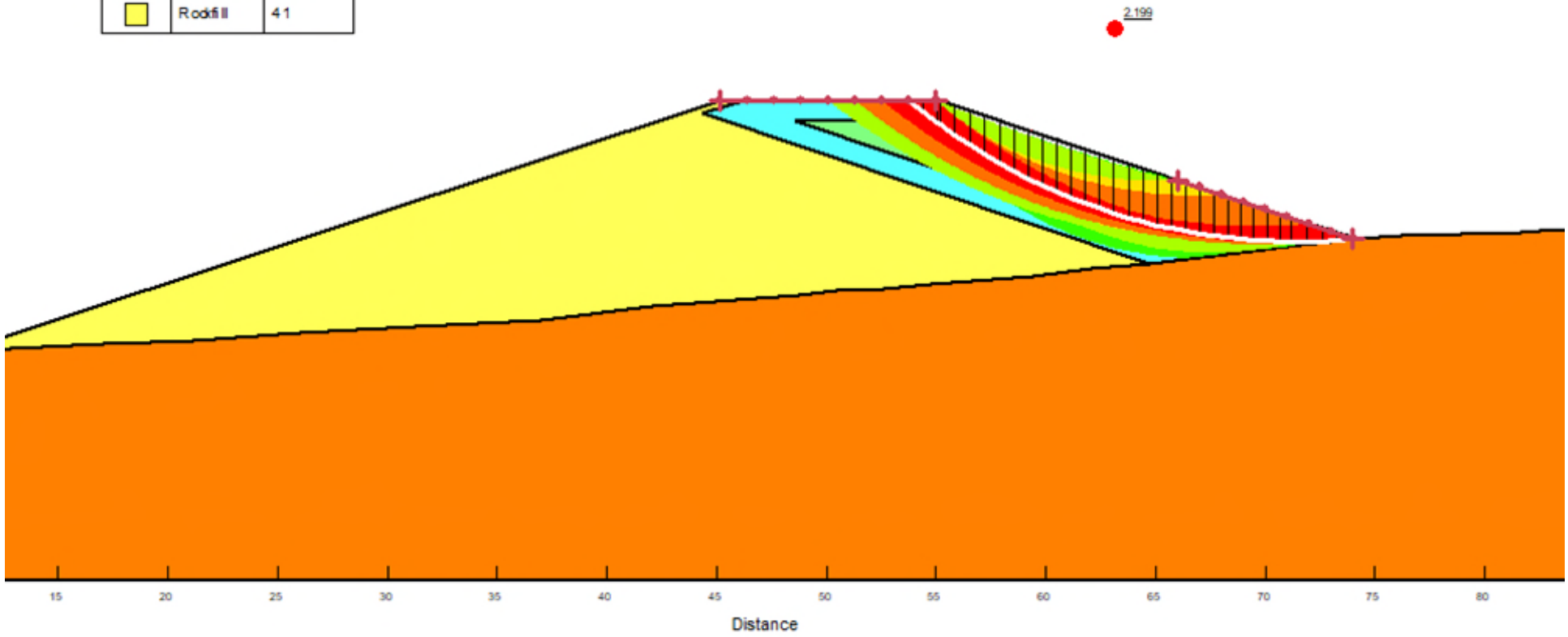
DYKE 5
SEISMIC: UPSTREAM

DRAFT

ARCADIS

FIGURE
5.7

| Color | Name | Effective Friction Angle(°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1 | 35 |
| | Cushion 2 | 32 |
| | Riprap | 41 |
| | Rockfill | 41 |




SLOPE STABILITY ANALYSIS

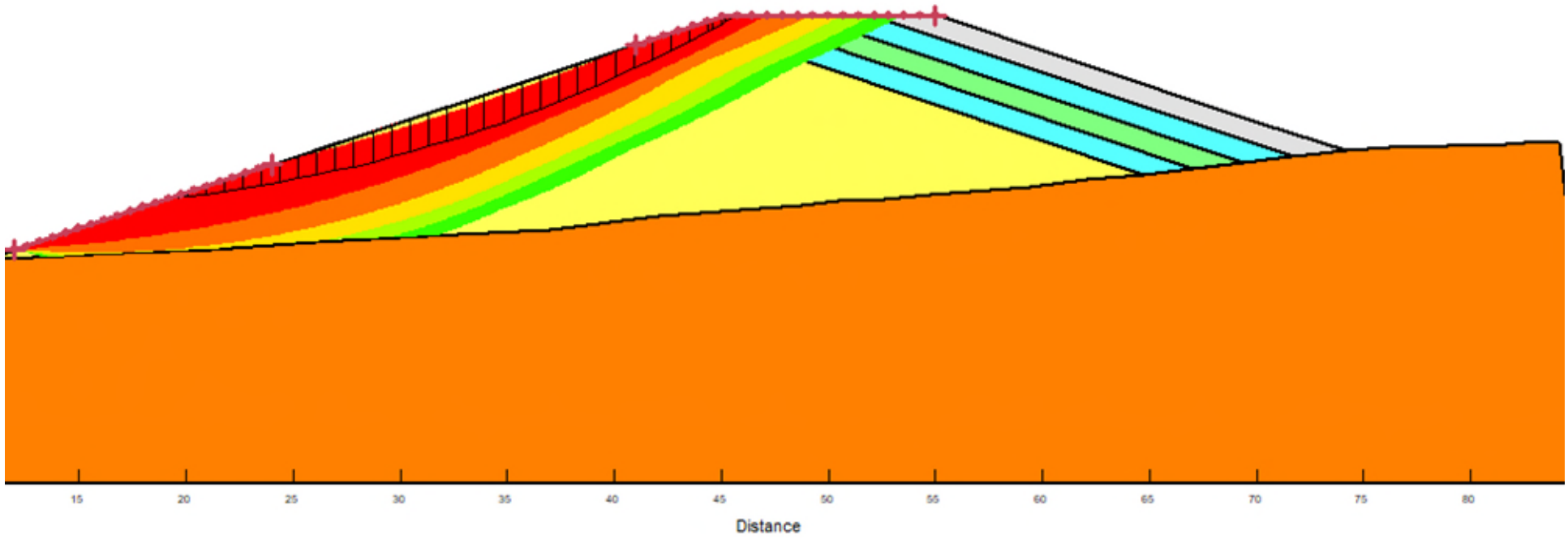
DYKE 6
END OF CONSTRUCTION: UPSTREAM

DRAFT

ARCADIS

FIGURE
6.1

| Color | Name | Effective Friction Angle(°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1 | 35 |
| | Cushion 2 | 32 |
| | Riprap | 41 |
| | Rockfill | 41 |




SLOPE STABILITY ANALYSIS

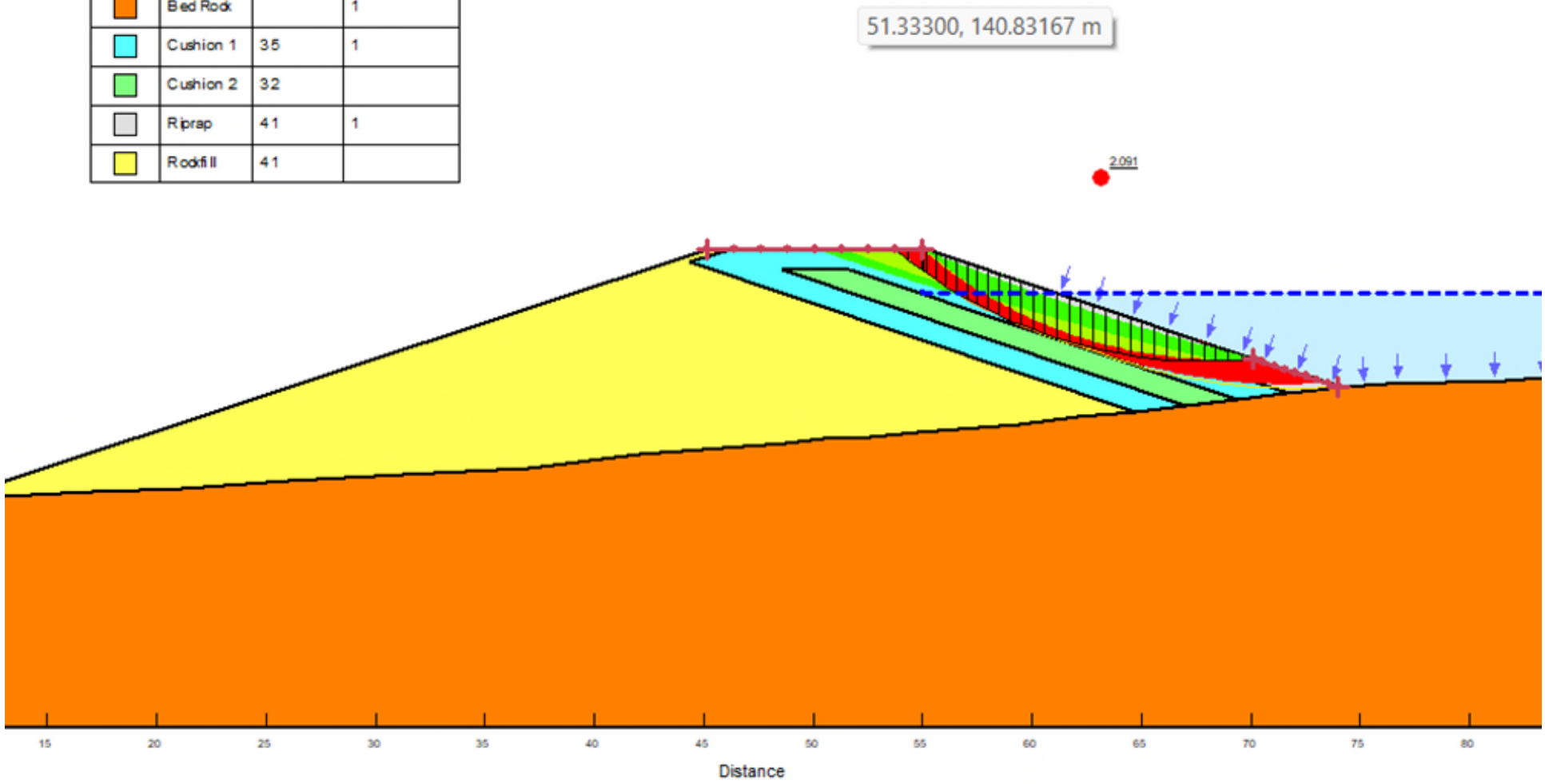
DYKE 6 END OF CONSTRUCTION: DOWNSTREAM

ARCADIS

FIGURE 6.2

DRAFT
DRAFT

| Color | Name | Effective Friction Angle(°) | Piezometric Surface |
|---|---|---|---|
| | Bed Rock | | 1 |
| | Cushion 1 | 35 | 1 |
| | Cushion 2 | 32 | |
| | Riprap | 41 | 1 |
| | Rockfill | 41 | |




SLOPE STABILITY ANALYSIS

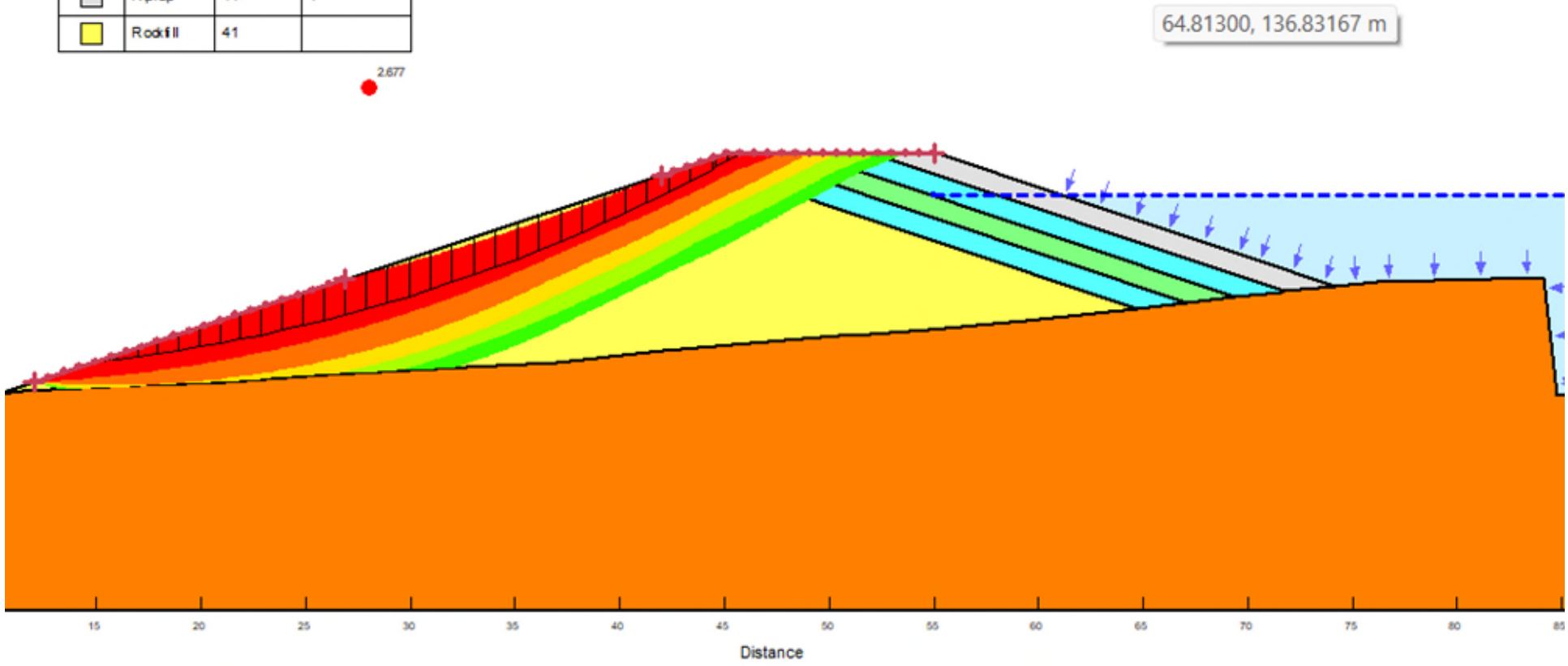
DYKE 6
STEADY STATE: UPSTREAM

DRAFT

ARCADIS

FIGURE
6.3

| Color | Name | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|
| | Bed Rock | | 1 |
| | Cushion 1 | 35 | 1 |
| | Cushion 2 | 32 | |
| | Riprap | 41 | 1 |
| | Rockfill | 41 | |




SLOPE STABILITY ANALYSIS

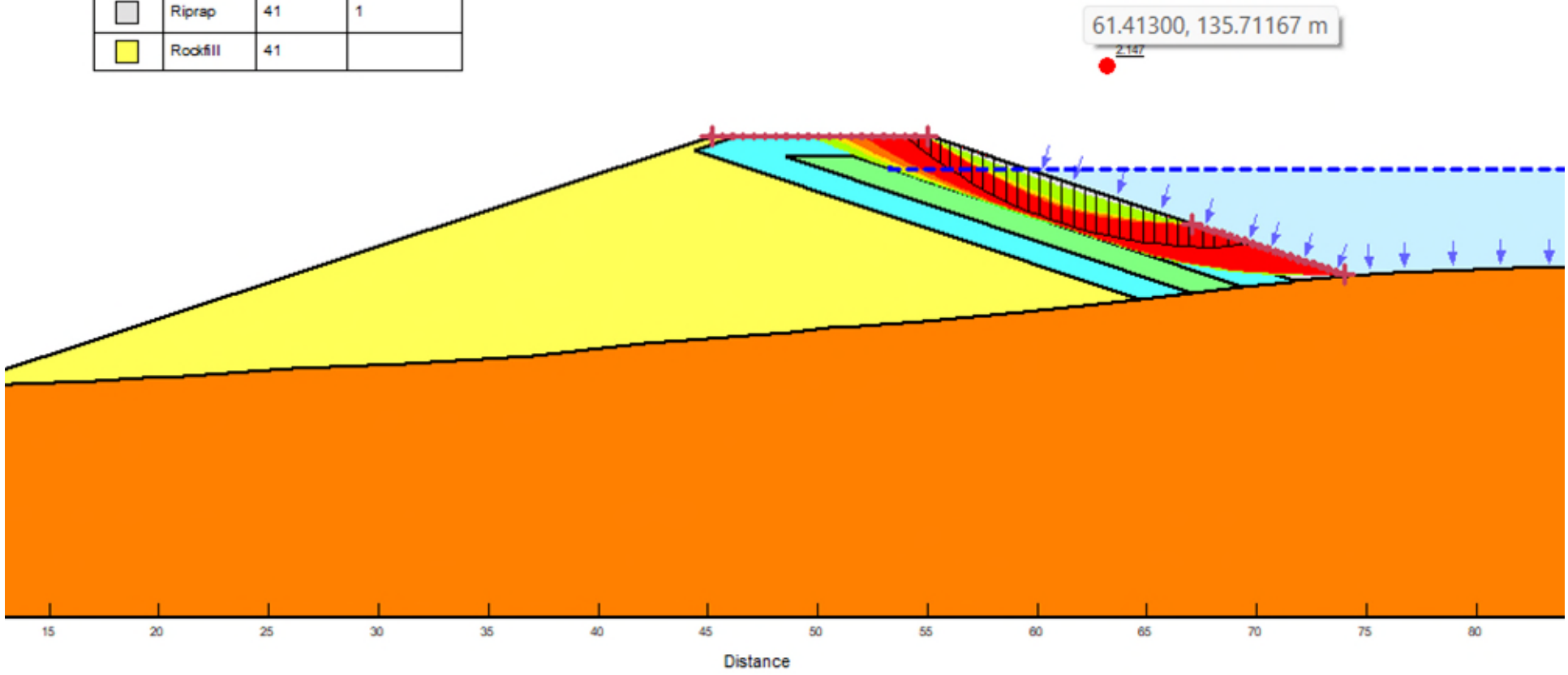
DYKE 6
STEADY STATE: DOWNSTREAM

DRAFT

ARCADIS

FIGURE
6.4

| Color | Name | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|
| | Bed Rock | | 1 |
| | Cushion 1 | 35 | 1 |
| | Cushion 2 | 32 | |
| | Riprap | 41 | 1 |
| | Rockfill | 41 | |




SLOPE STABILITY ANALYSIS

DYKE 6
IDF: UPSTREAM

DRAFT

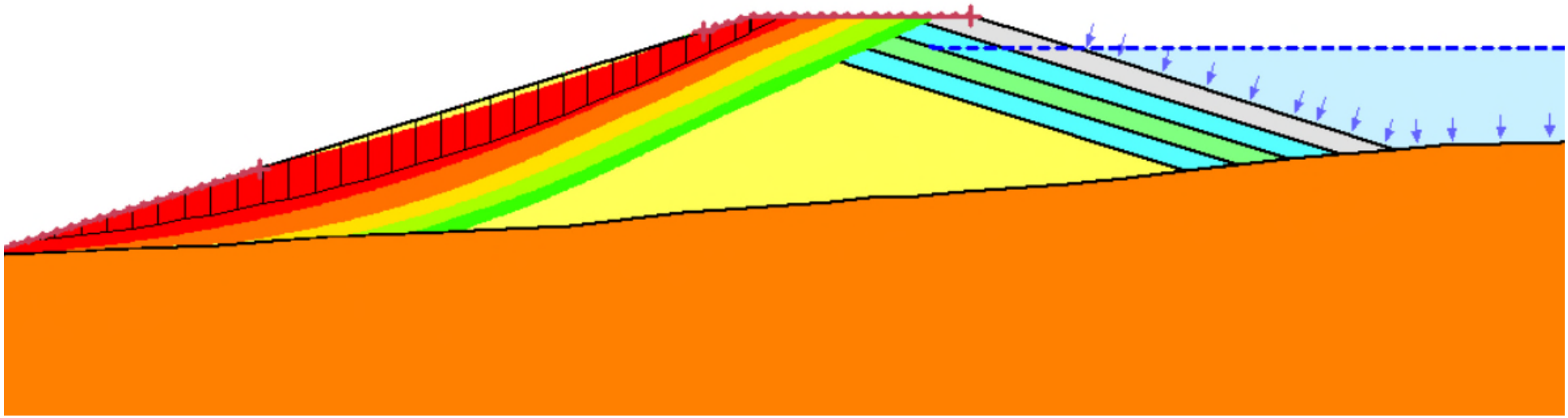
ARCADIS

FIGURE
6.5

| Color | Name | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|
| | Bed Rock | | 1 |
| | Cushion 1 | 35 | 1 |
| | Cushion 2 | 32 | |
| | Riprap | 41 | 1 |
| | Rockfill | 41 | |

2.695

68.53300, 138.52501 m



SLOPE STABILITY ANALYSIS

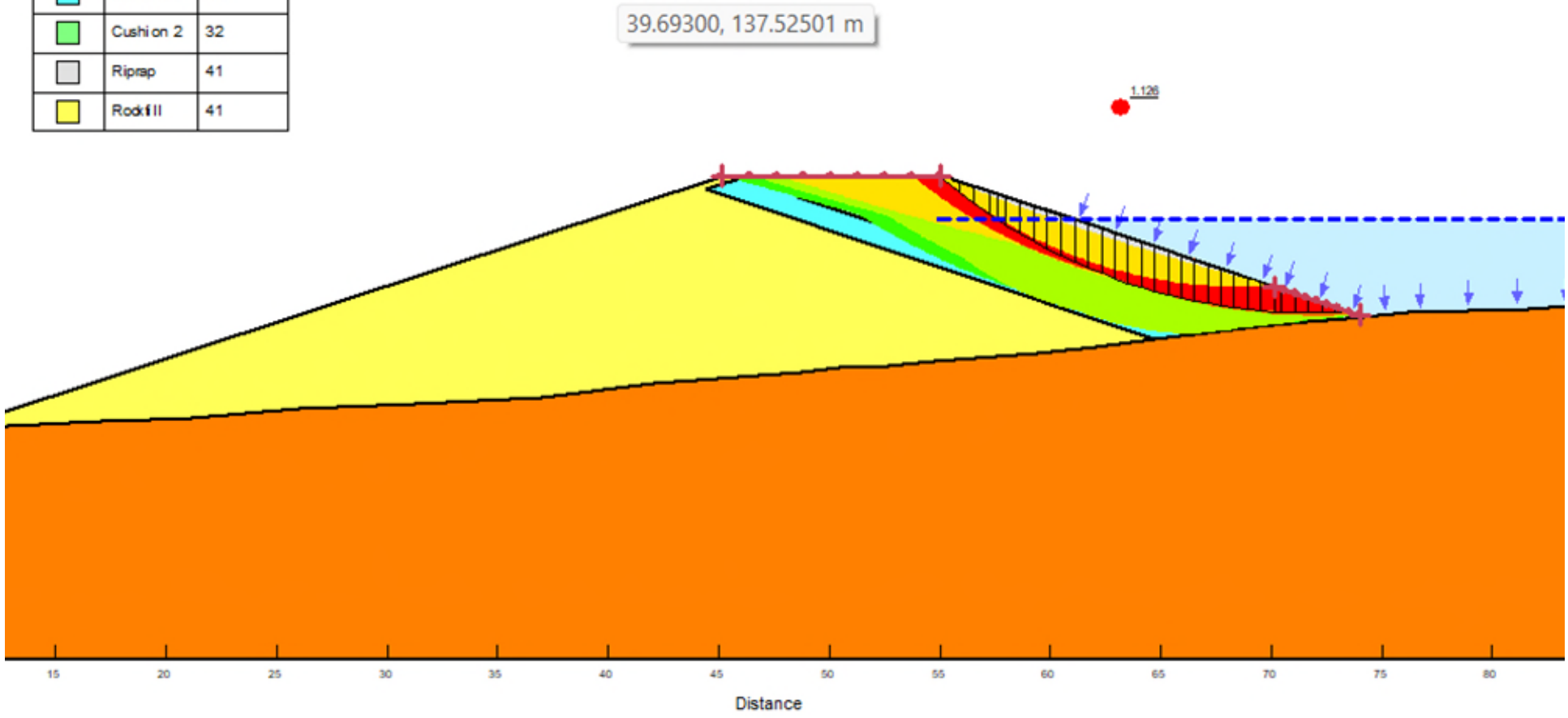
DYKE 6
IDF: DOWNSTREAM

DRAFT

ARCADIS

FIGURE
6.6

| Color | Name | Effective Friction Angle (°) |
|---|---|---|
| | Bed Rock | |
| | Cushion 1 | 35 |
| | Cushion 2 | 32 |
| | Riprap | 41 |
| | Rockfill | 41 |



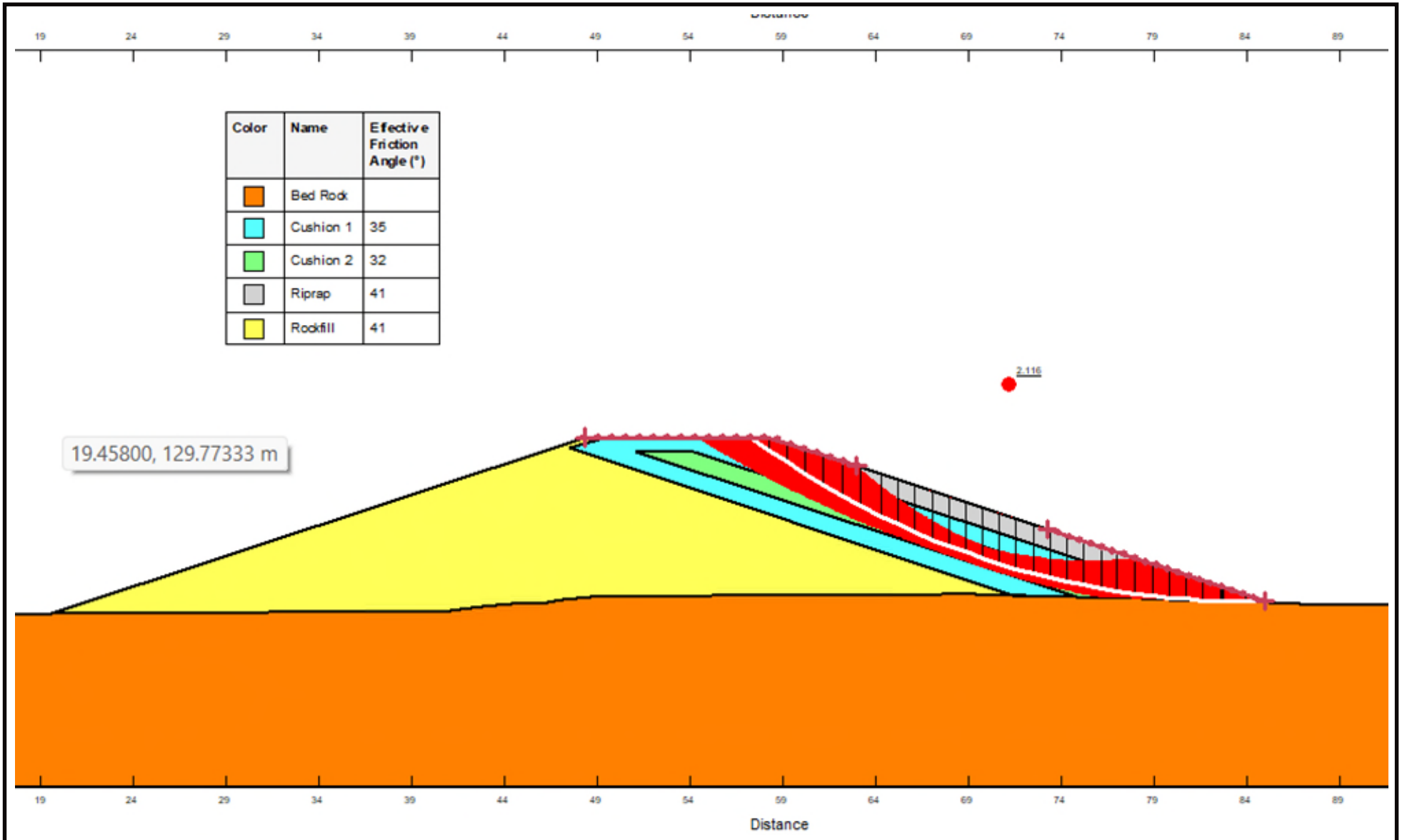

SLOPE STABILITY ANALYSIS

DYKE 6
SEISMIC: UPSTREAM

DRAFT

ARCADIS

FIGURE
6.7



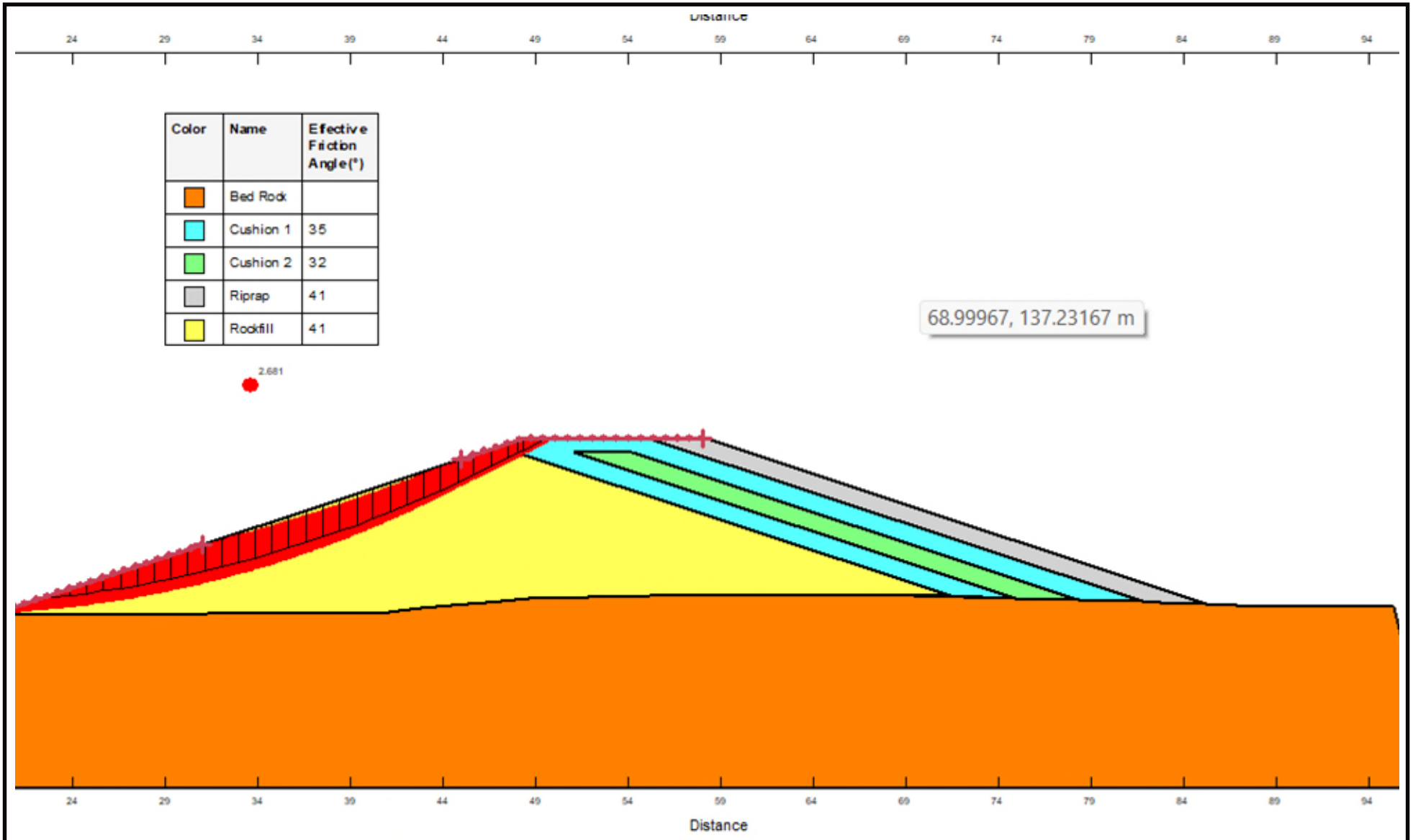

SLOPE STABILITY ANALYSIS

DYKE 8
END OF CONSTRUCTION: UPSTREAM

DRAFT

ARCADIS

FIGURE
7.1



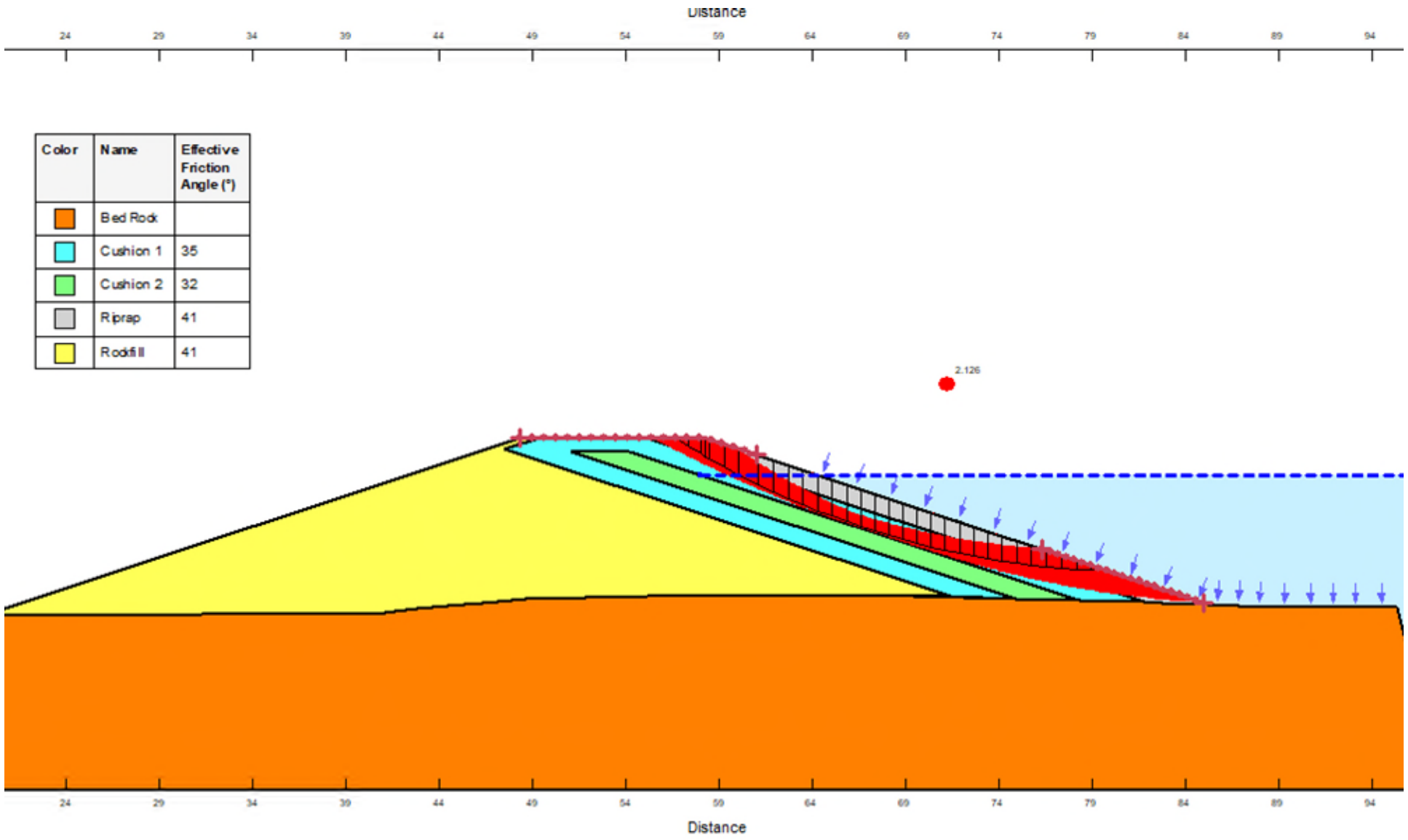

SLOPE STABILITY ANALYSIS

DYKE 8 END OF CONSTRUCTION: DOWNSTREAM

ARCADIS

FIGURE 7.2

DRAFT
DRAFT



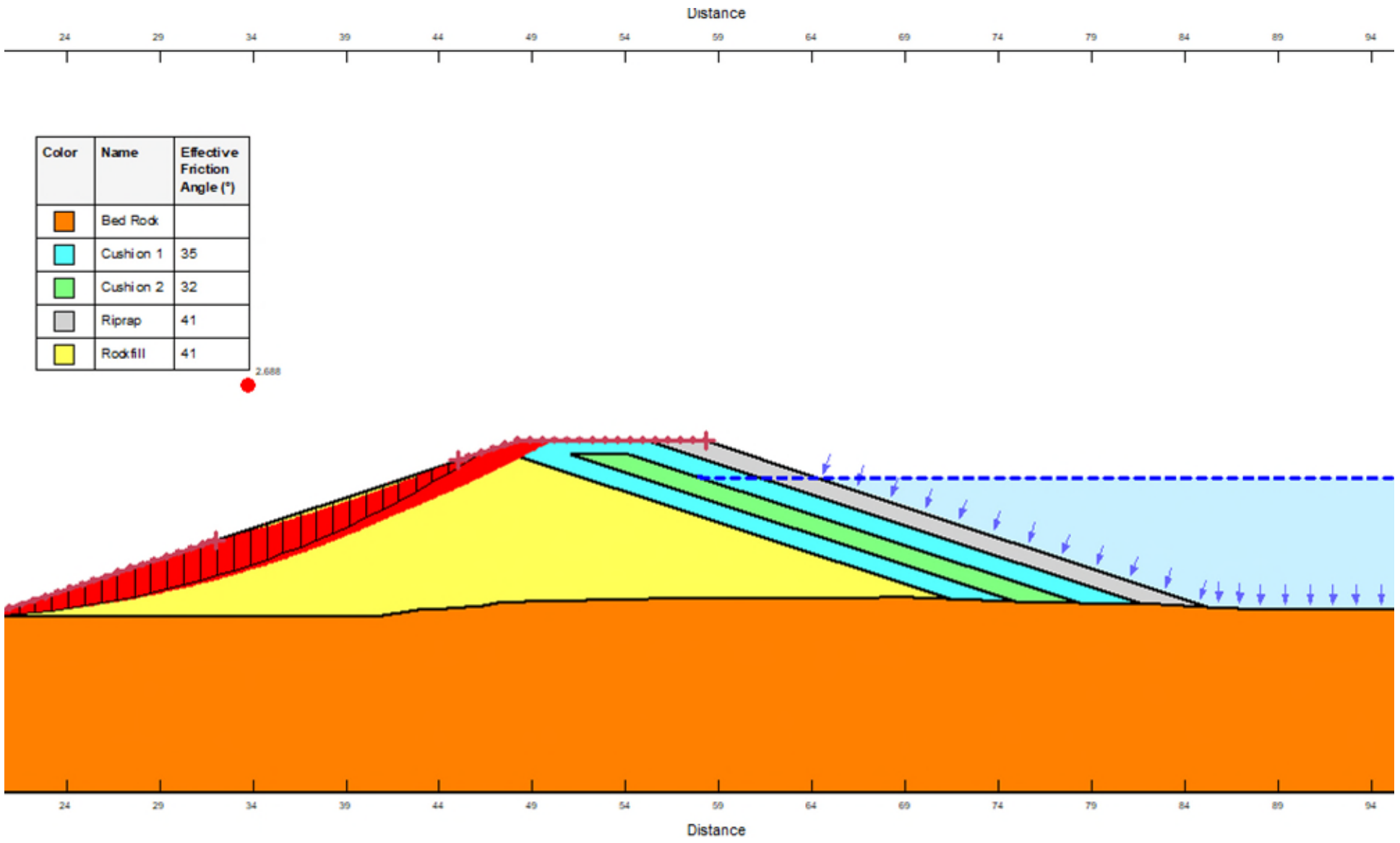

SLOPE STABILITY ANALYSIS

DYKE 8
STEADY STATE: UPSTREAM

DRAFT

ARCADIS

FIGURE
7.3



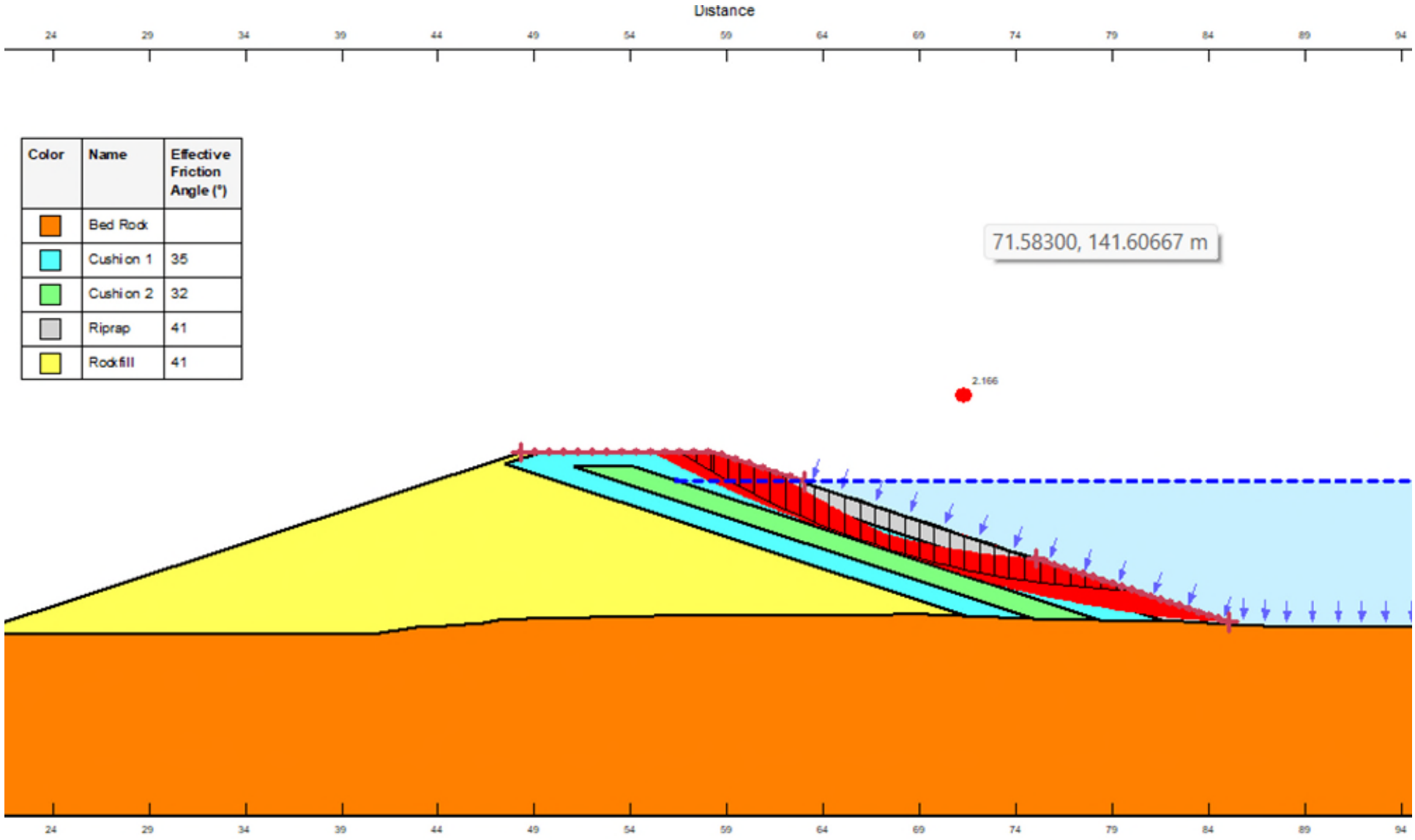

SLOPE STABILITY ANALYSIS

DYKE 8
STEADY STATE: DOWNSTREAM

DRAFT

ARCADIS

FIGURE
7.4



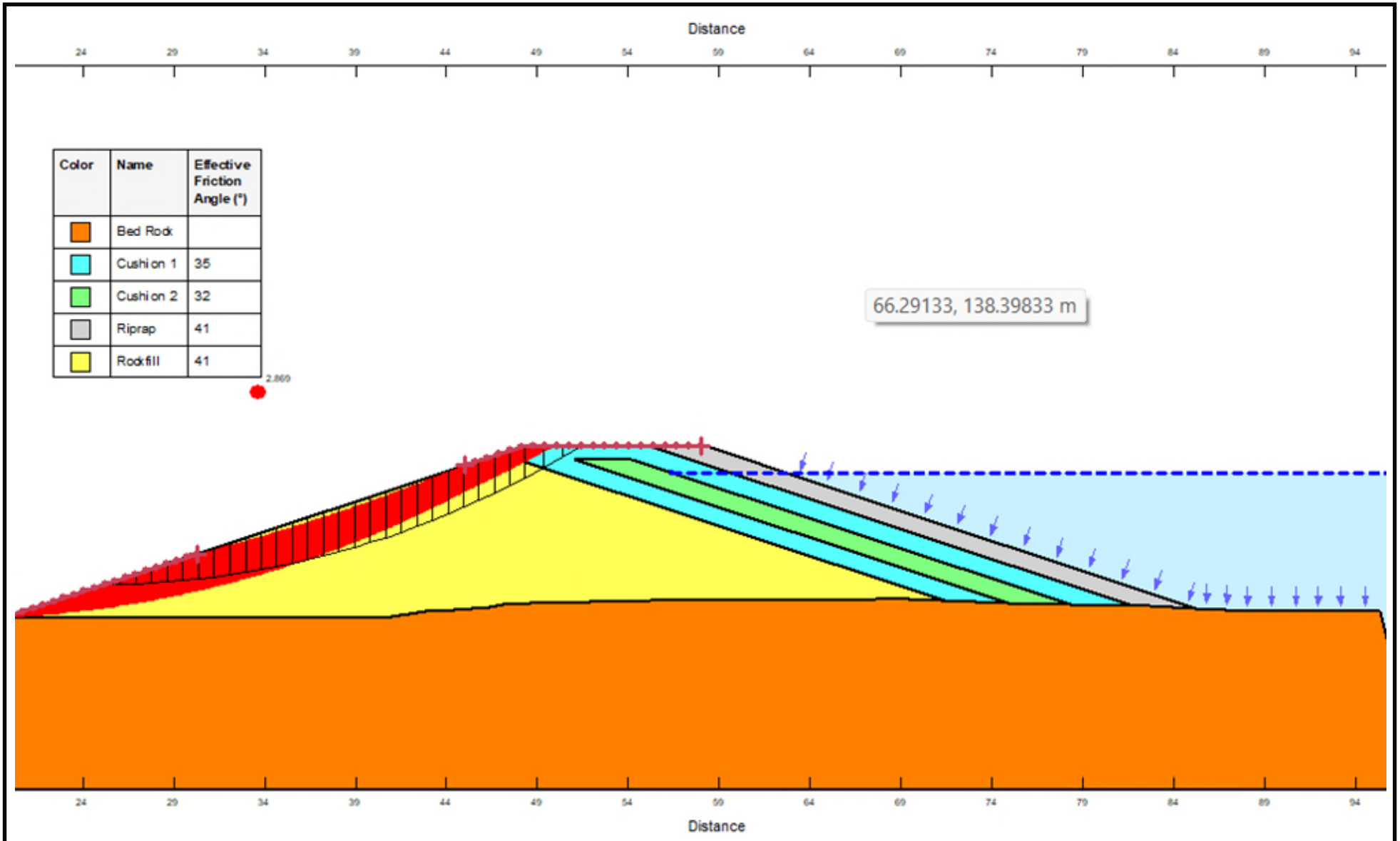

SLOPE STABILITY ANALYSIS

DYKE 8
IDF: UPSTREAM

DRAFT

ARCADIS

FIGURE
7.5



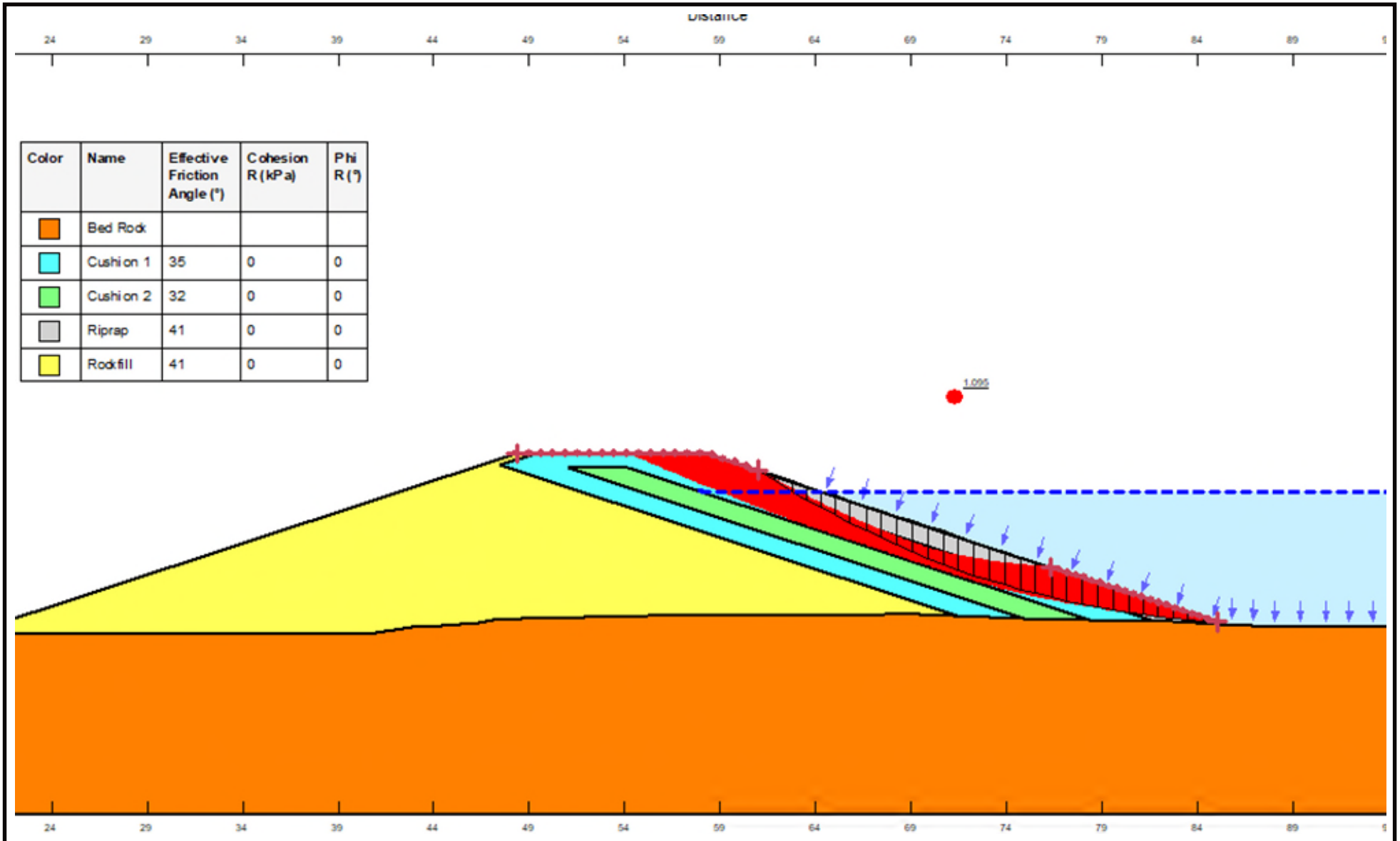

SLOPE STABILITY ANALYSIS

DYKE 8
IDF: DOWNSTREAM

DRAFT

ARCADIS

FIGURE
7.6




SLOPE STABILITY ANALYSIS

DYKE 8
SEISMIC: UPSTREAM

DRAFT

ARCADIS

FIGURE
7.7