Dewey Dam
Seismic Assessment

2005 Tri-Service Infrastructure Systems Conference

St. Louis, MO

Huntington District

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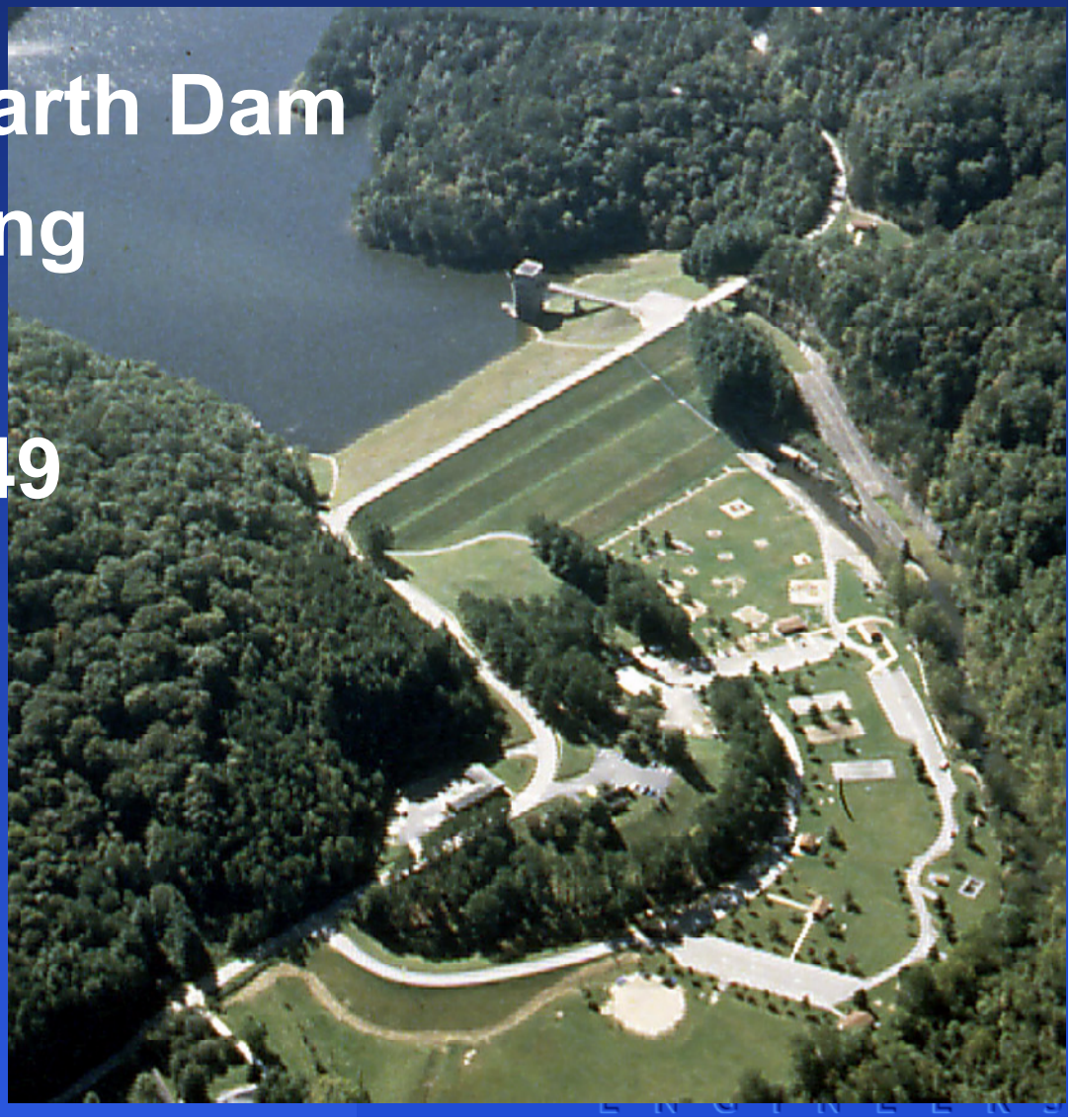
Site Location

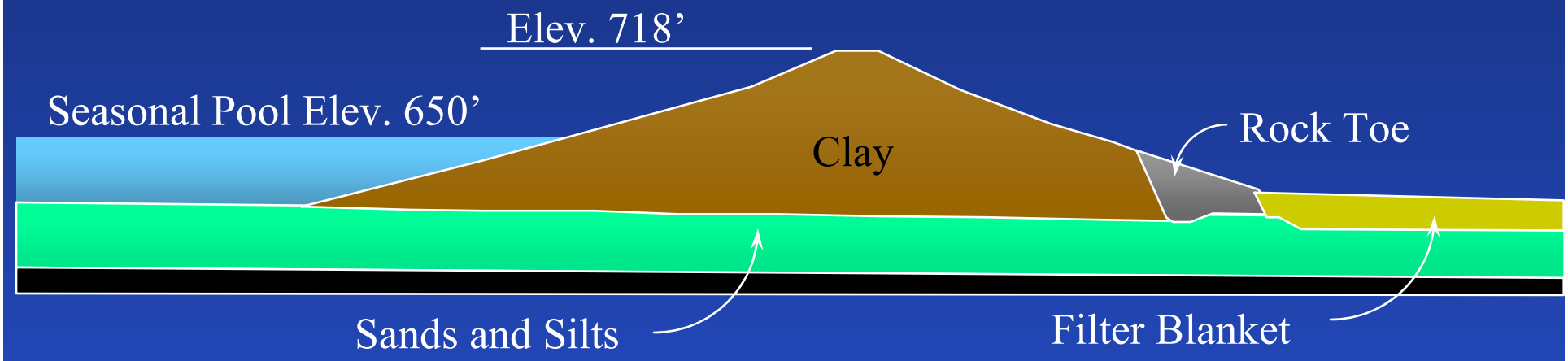
Project Description

- **Homogeneous Earth Dam**
- **118' Tall; 913' Long**
- **On John's Creek**
- **Completed in 1949**



Project Description

Typical Embankment Section



Station 3+50

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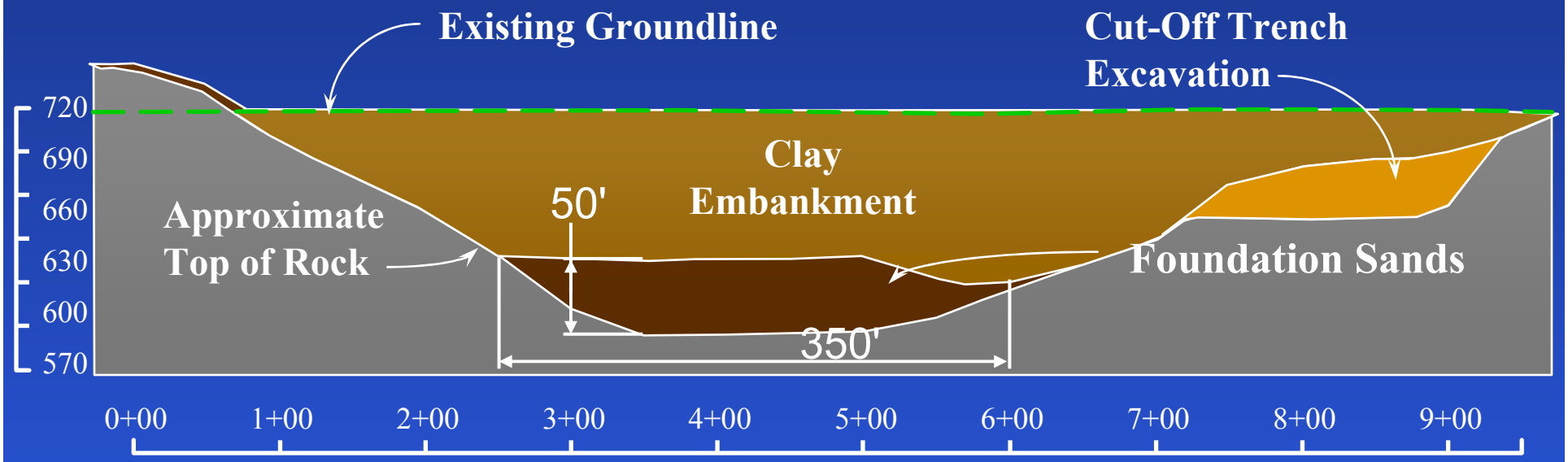
Project Description

Profile Along Dam Centerline



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Seismic Assessment

- Intermediate Seismic Assessment 1995
- Feature Design Memorandum 1997
- SPT & CPT Tests 1996-98
- Seismic Assessment Report 1998

View of Downstream Area

1998 Seismic Analysis Report

Conclusions

- Remediation Cost ≅ $13 Million

Recommendations

- Site Specific Seismic Study (2000)
- Additional Field Work (1999)
- Hydro-fracture Potential (1999)
- Specific Design Criteria (pending)

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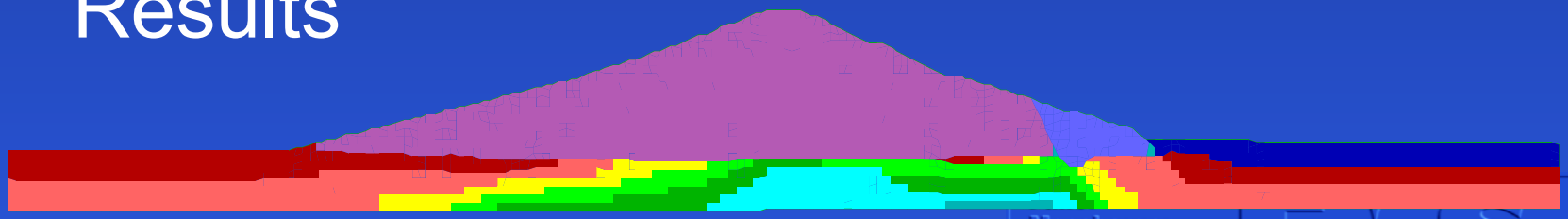
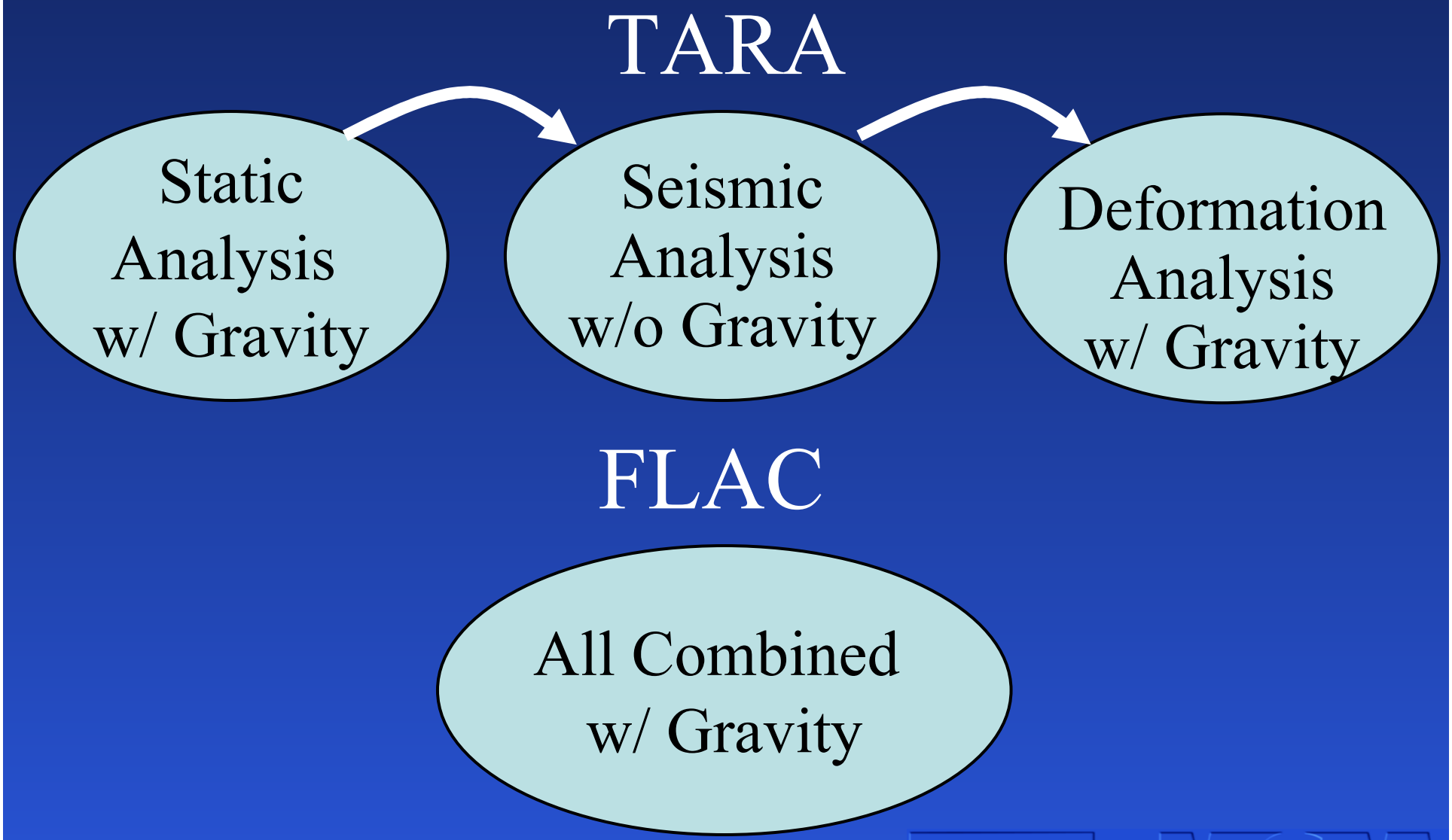
TARA – FLAC Comparison

- Incorporated the TARA model into FLAC
- Obtained Parameters used by Dr. Finn
- Completed 1998 TARA Analysis using FLAC
- Dr. Finn Reviewed & Concurred with Results



TARA – FLAC Comparison



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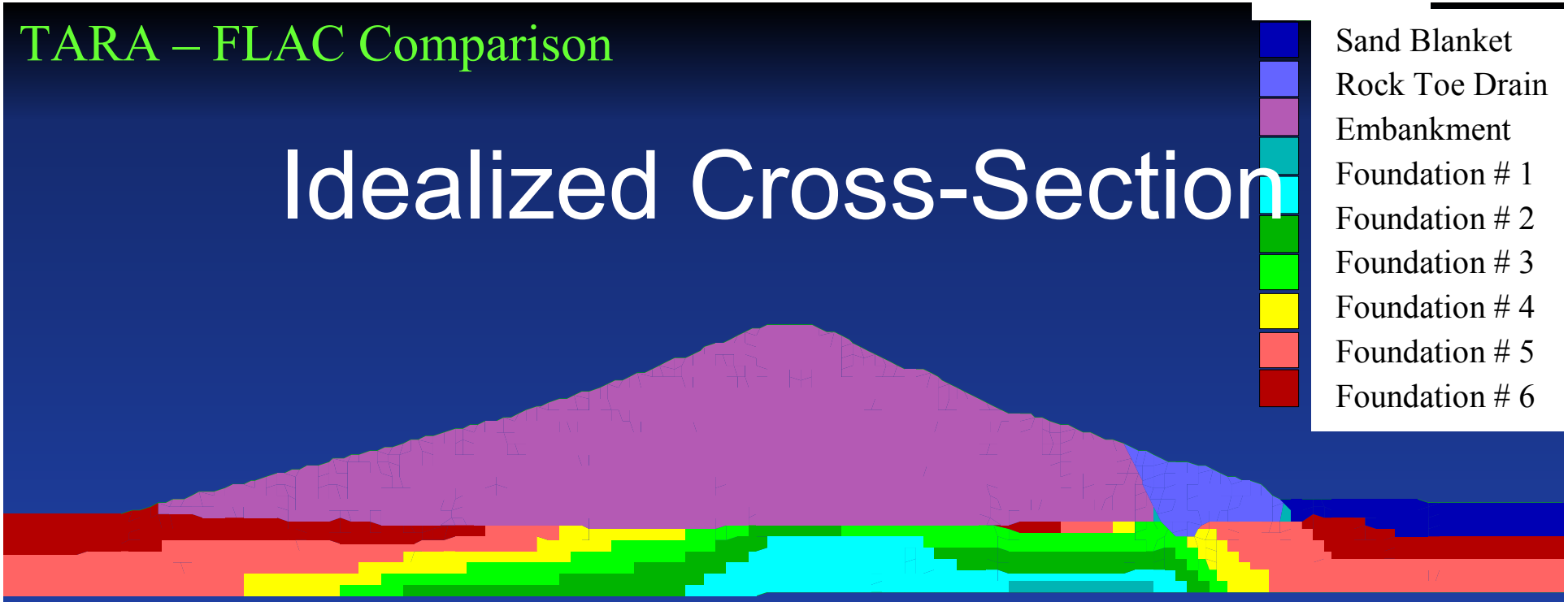
TARA – FLAC Comparison

Idealized Cross-Section

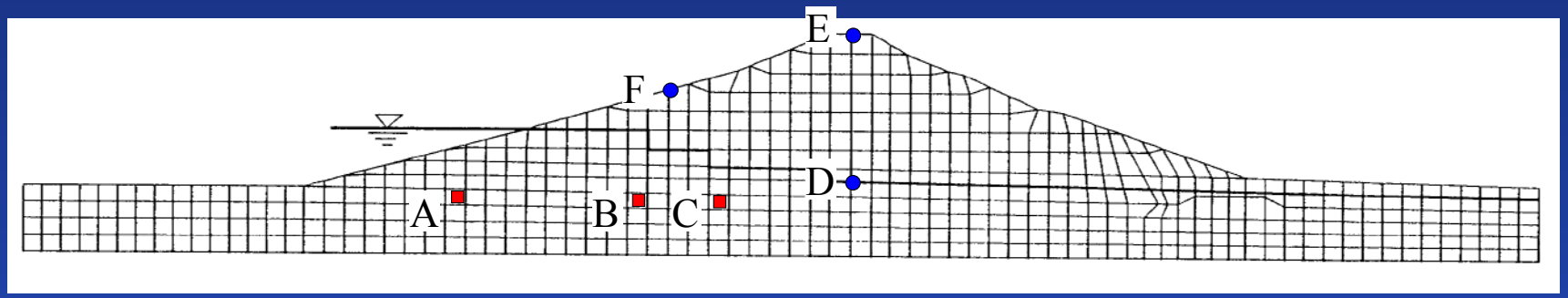


Region	Unit Weights		Undrained Strength		Drained Strength		Clean Sand	Residual Strength	Shear Modulus	PWP[1] Model
	γ_m (pcf)	γ_{sat} (pcf)	ϕ (deg)	c (ksf)	ϕ' (deg)	c' (ksf)	$(N_1)_{60}$	$c_{residual}$ (ksf)	K_{2max}	K_r
Embankment	127	130	18	2.0	29.0	0.0	--	--	60-80	--
Filter Blanket	--	130	16	1.8	34.0	0.0	--	--	60	--
Toe Drain	110	110	--	--	38.0	0.0	--	--	61	--
Foundation #1	--	133	16	1.8	34.0	0.0	16	0.7	27	0.0366-0.0389
Foundation #2	--	133	16	1.8	34.0	0.0	15	0.6	27	0.0316-0.0323
Foundation #3	--	133	16	1.8	34.0	0.0	14	0.5	27	0.0279-0.0287
Foundation #4	--	128	21	0.6	30.0	0.0	13	0.4	27	0.0043-0.0087
Foundation #5	--	128	21	0.6	30.0	0.0	11	0.3	27	0.0035-0.0071
Foundation #6	--	128	21	0.6	30.0	0.0	9	0.2	27	0.0034-0.0081
Foundation #7	--	128	21	0.6	30.0	0.0	5	0.1	27	0.0027-0.0078

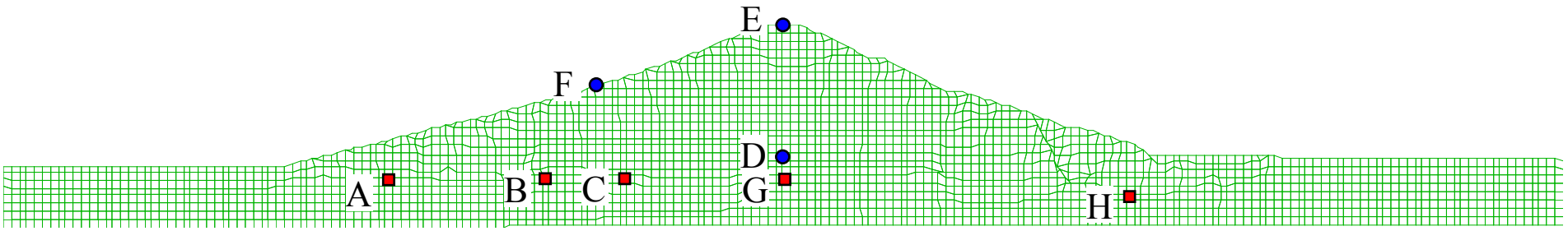
[1] C_1= 0.76; C_2 = 0.53

TARA – FLAC Comparison

TARA



FLAC



FLAC PWP Calibration

- FLAC Modeling Calibrated with Time History and ENC.
- Results for both analyses shown for comparison.

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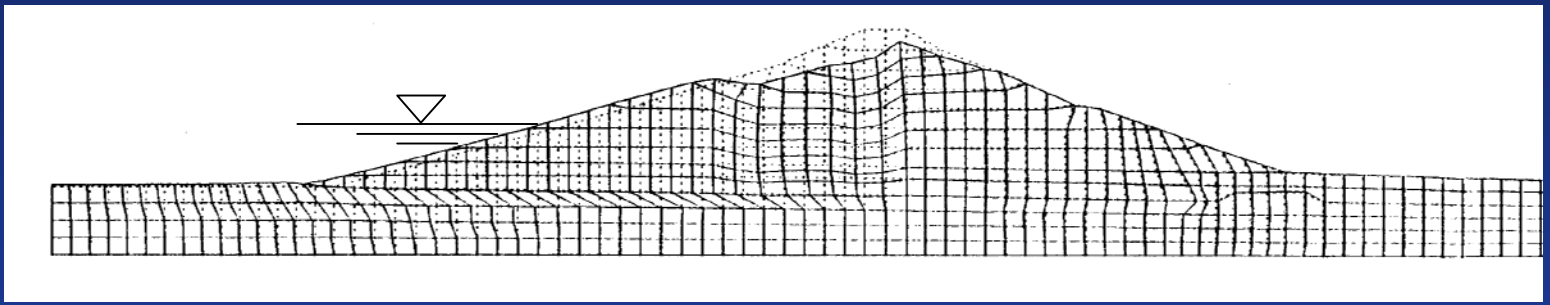
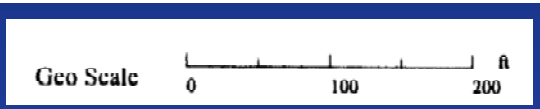
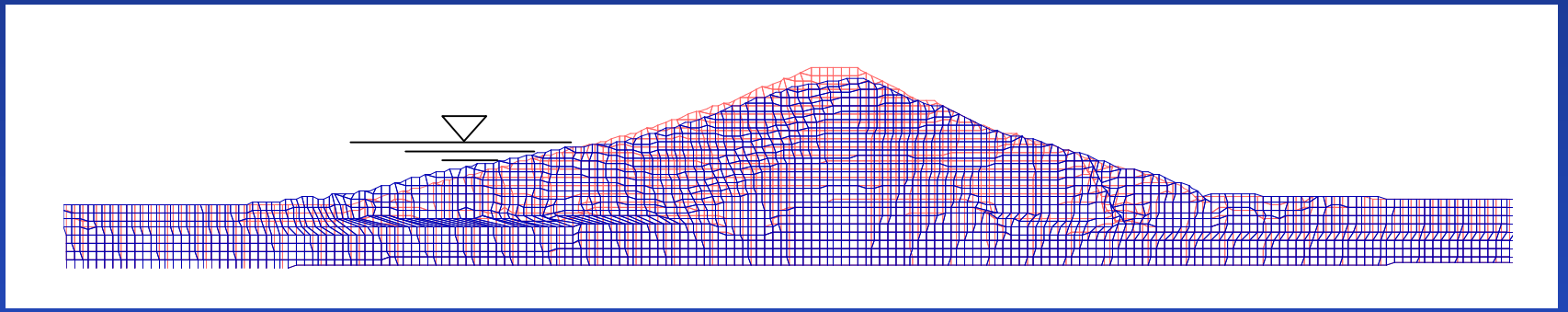
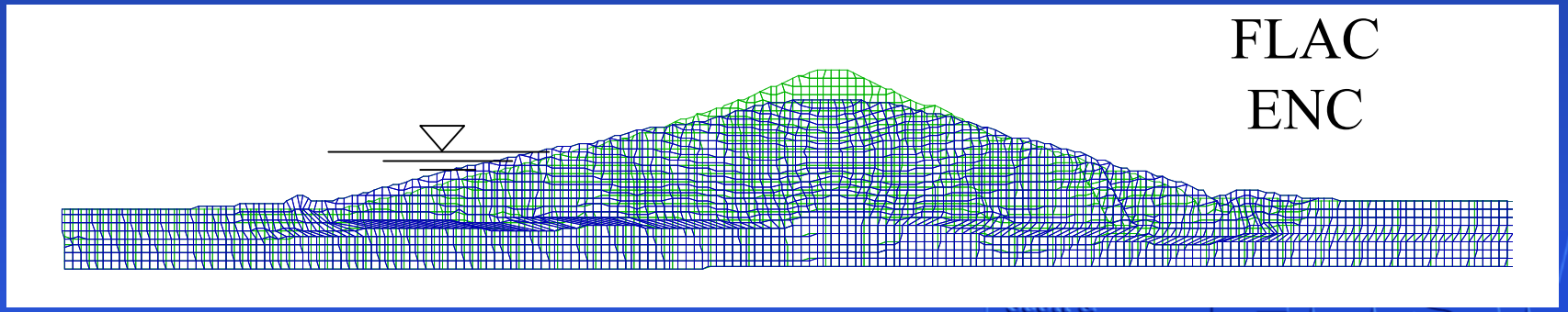
TARA – FLAC Comparison









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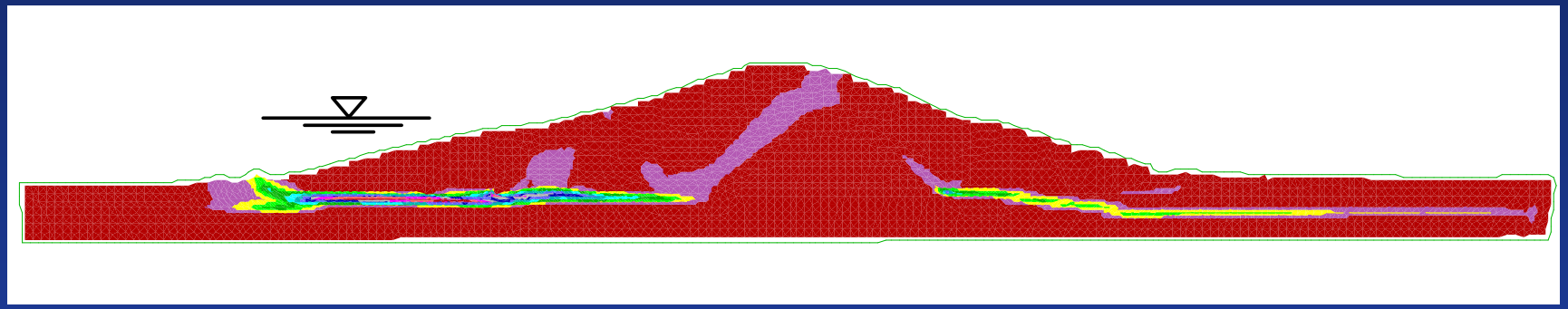
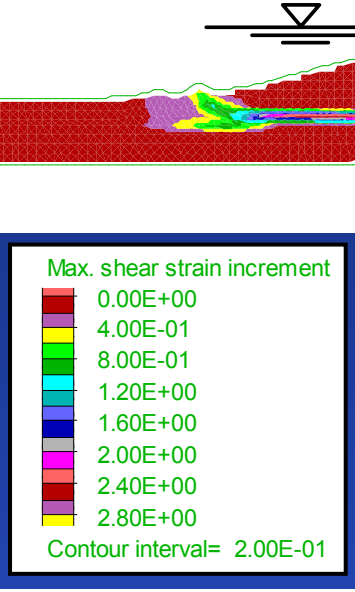
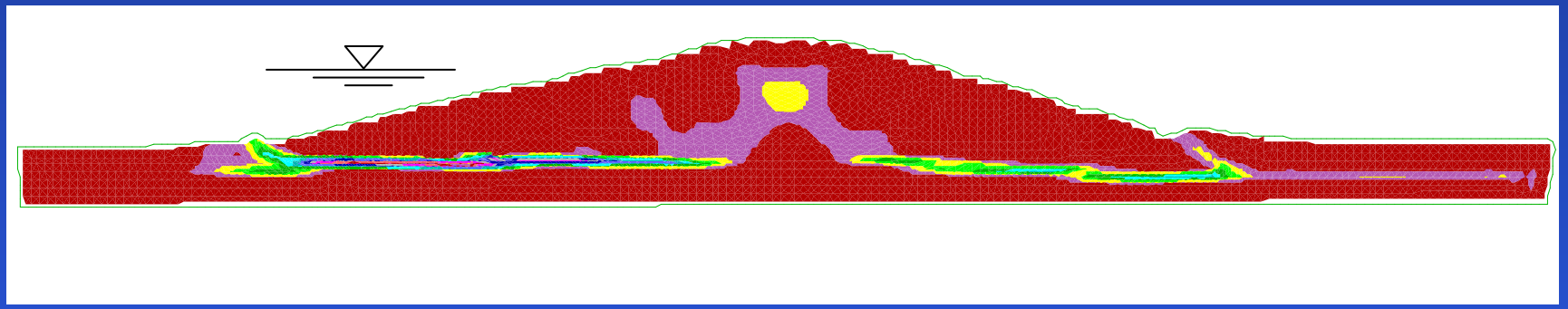




Shear Strain Contours



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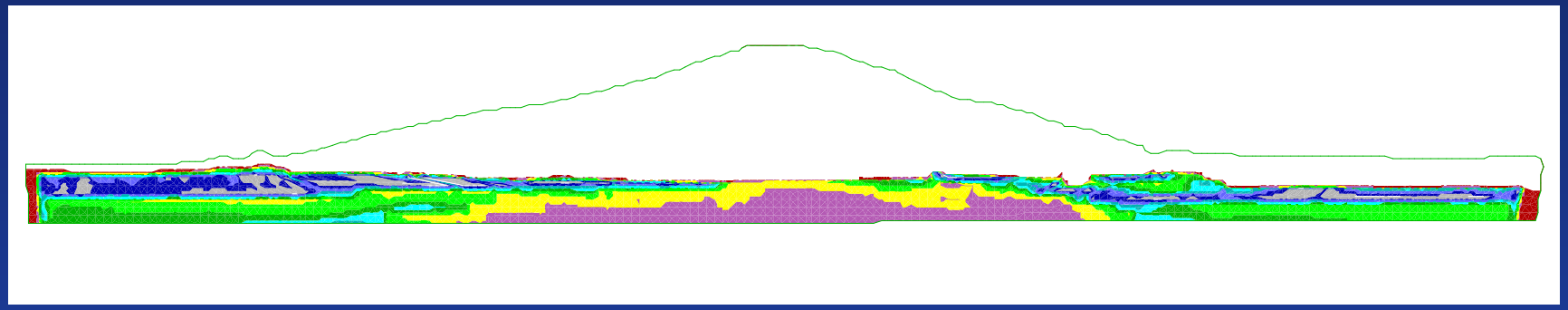
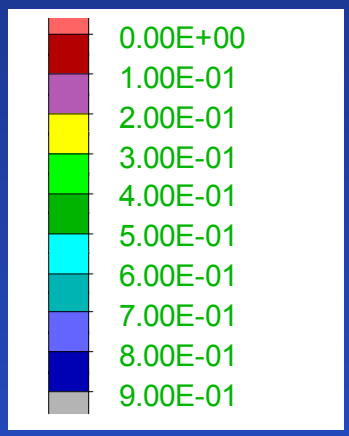
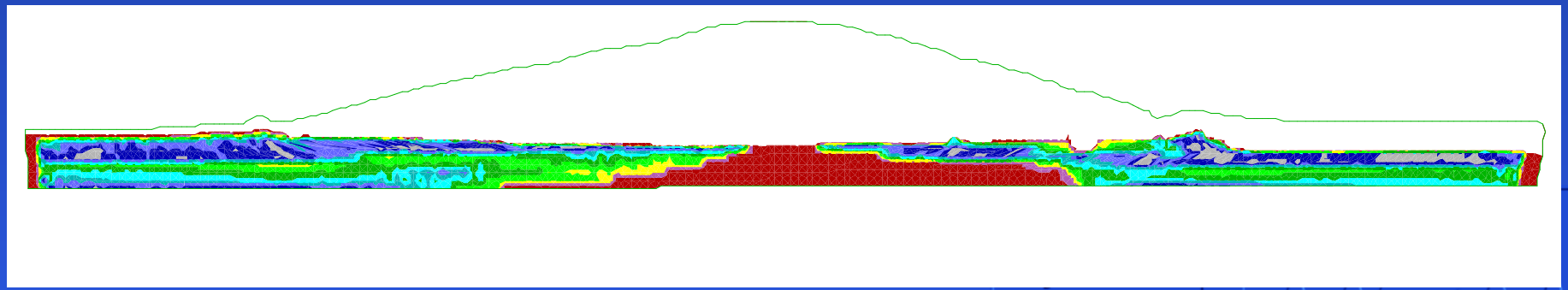




Excess PWP Ratio Contours



Existing Condition Analyses

- New Design Earthquake, M_w = 5.5, PGA=0.17
- Three Time Histories
- Improved Characterization of Foundation
- Undrained Strengths in Embankment
- Review and Concurrence by Dr. Finn

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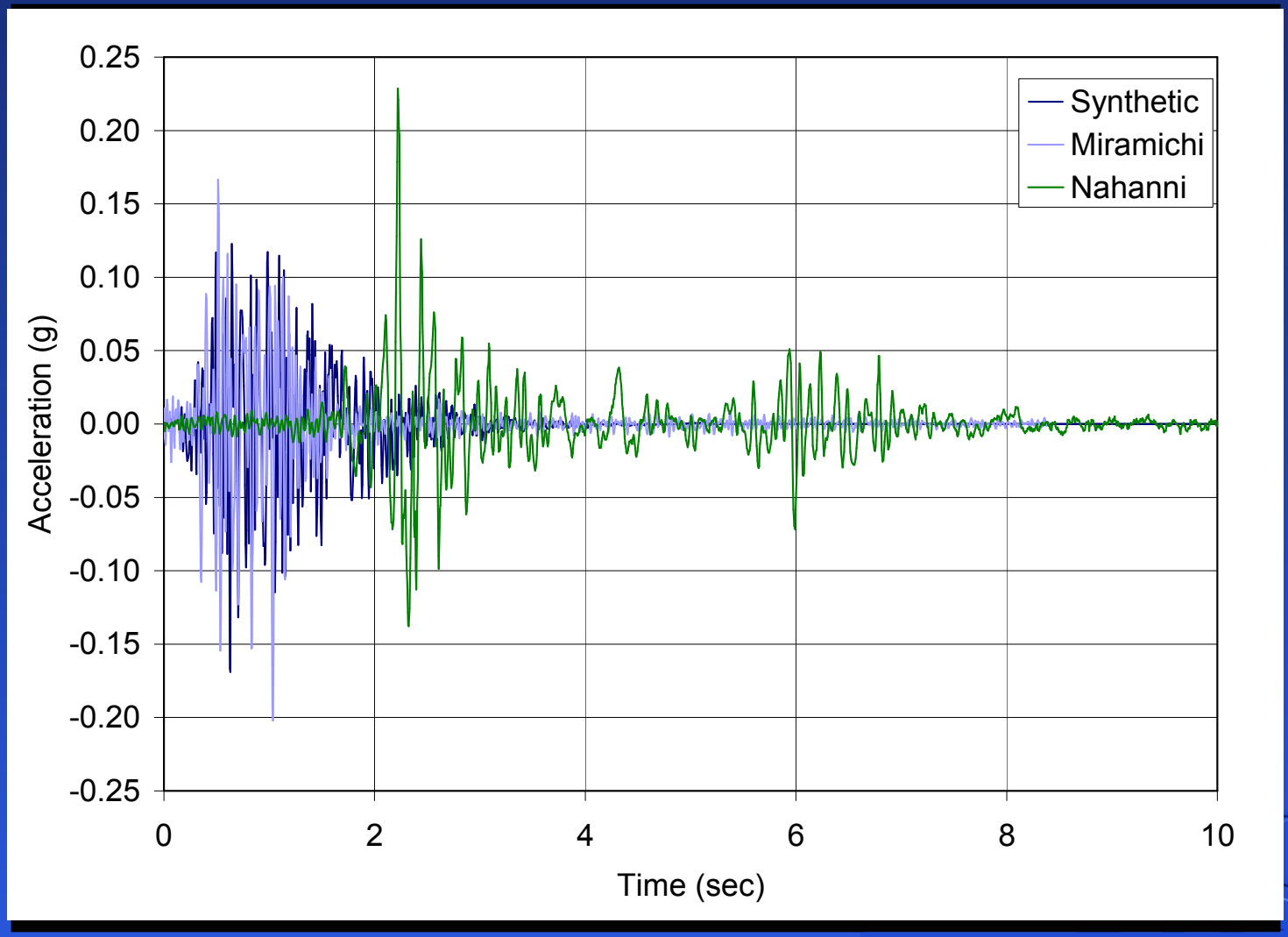
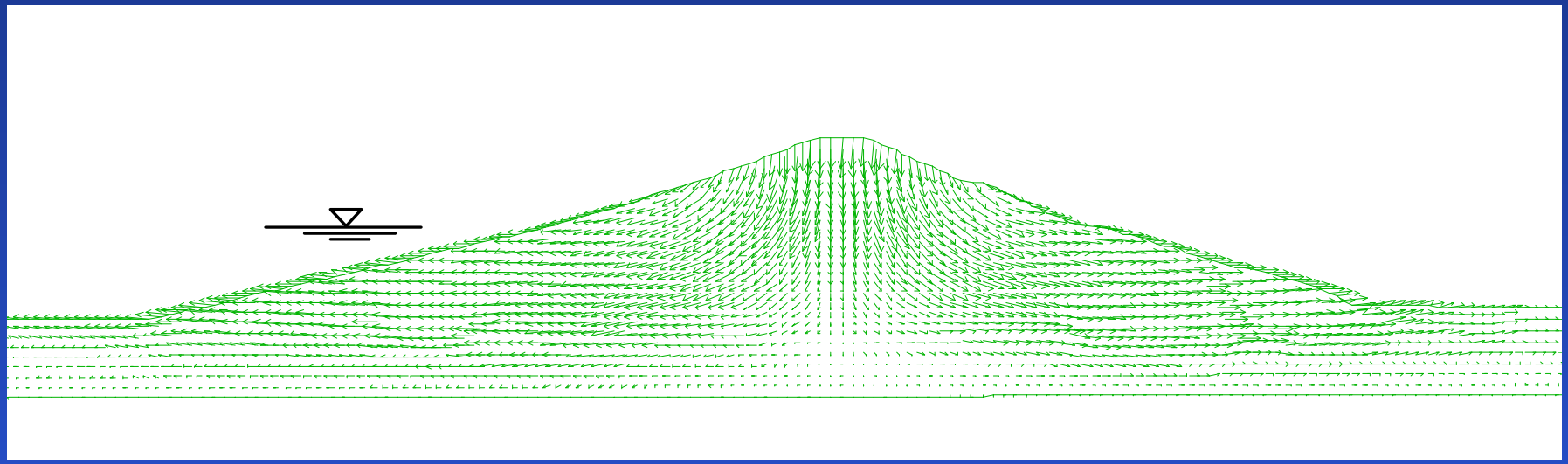
Design Time Histories



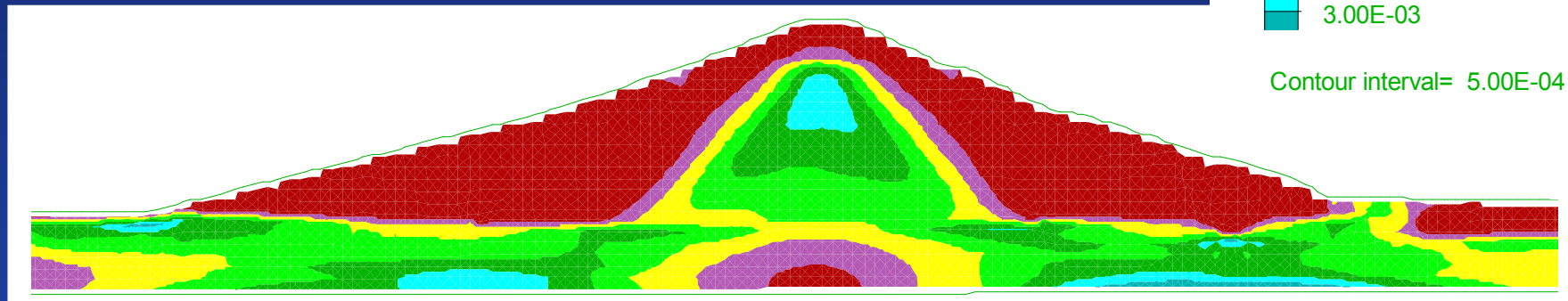
Deformations

Maximum Displacement 0.25 feet

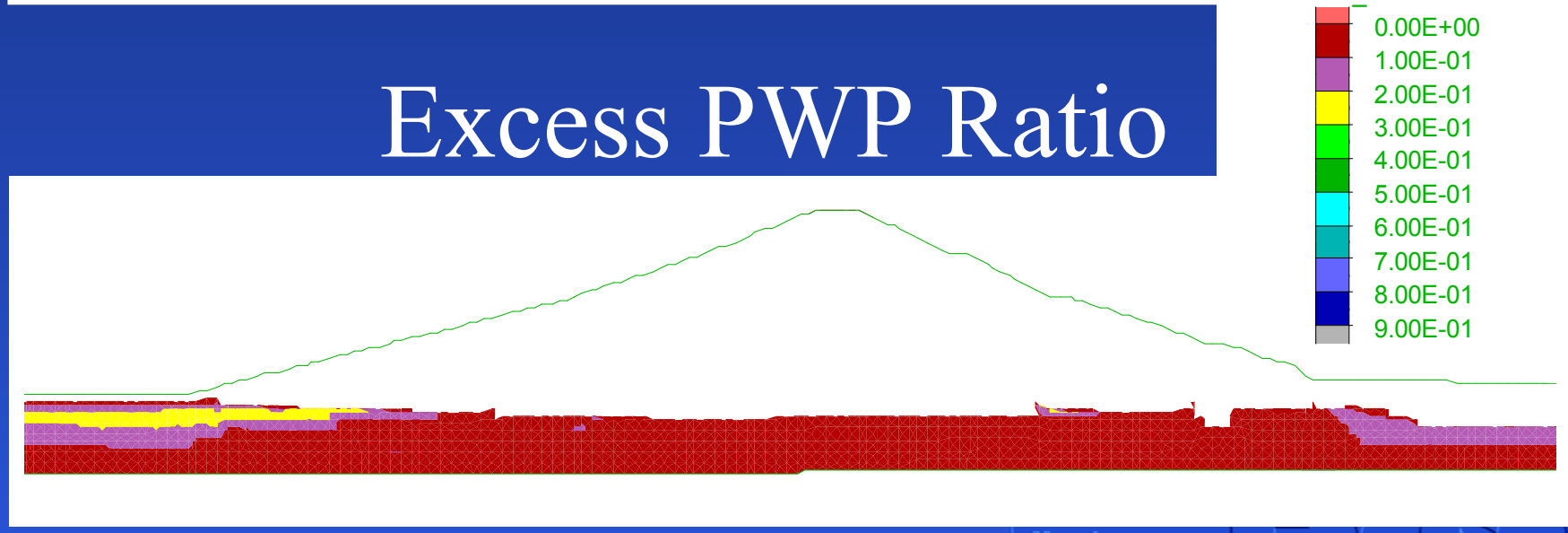


Existing Condition Analyses

Shear Strain



Excess PWP Ratio



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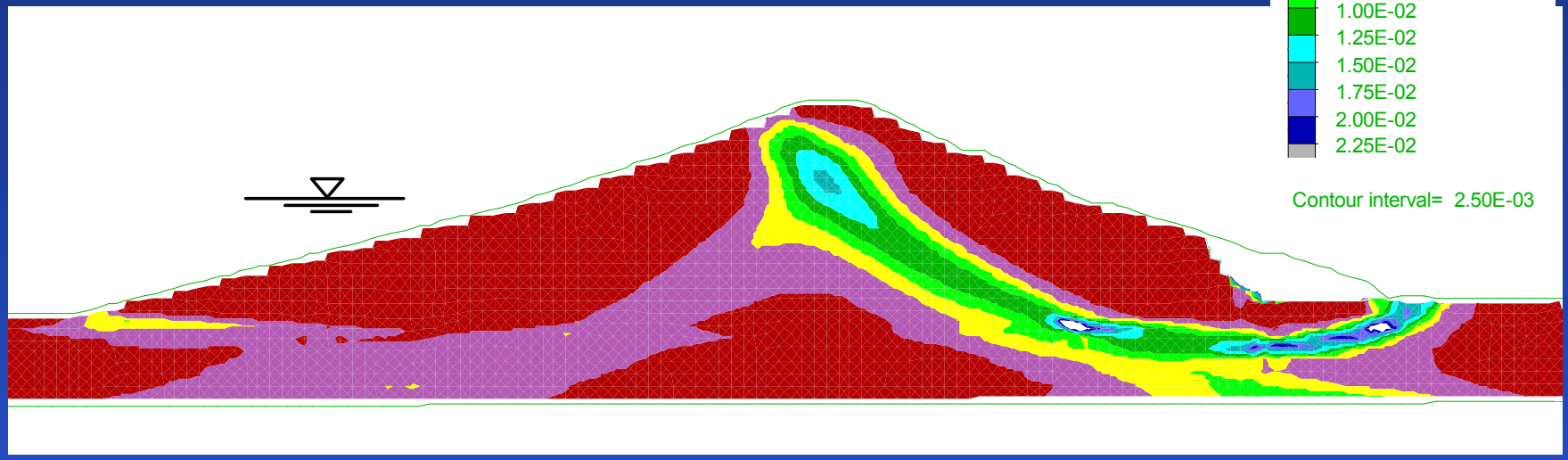
Limit Equilibrium

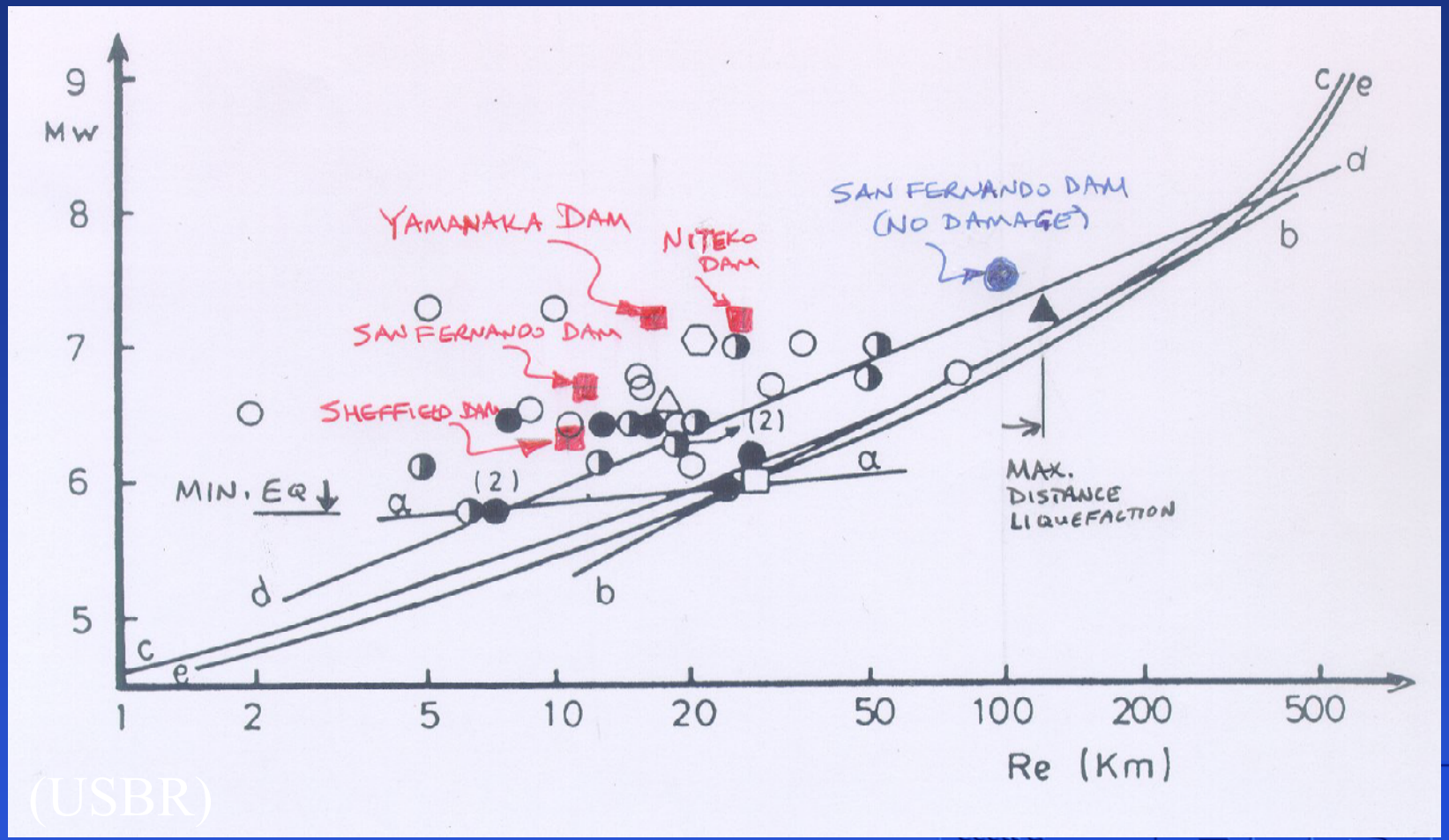


Post Earthquake SF = 1.6

1998 TARA Analyses for OBE

- OBE M_w = 5.0 w/ PGA=0.09g
- New Design MCE M_w = 5.5 w/ PGA = 0.17g
- TARA OBE used M_w = 5.5 w/ PGA = 0.09g
  - System Stable w/ Excess PWP < 13%
- FLAC New MCE
  - System Stable w/ Excess PWP < 25%

Distance and Magnitude



(USBR)

Summary

- TARA model incorporated into FLAC
- FLAC analyses compare well with TARA
- New existing condition analyses indicate a stable dam because:
  - Reduced earthquake magnitude
  - Use of undrained strengths in embankment
  - Improved foundation characterization
- Dr. Finn reviewed and concurred with results.

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Recommendations

- Remediation of Dewey Dam unwarranted at this time.
- Further assessment warranted only upon advancement of the state-of-the-art.
- Prepare a comprehensive seismic analysis report incorporating the present study.

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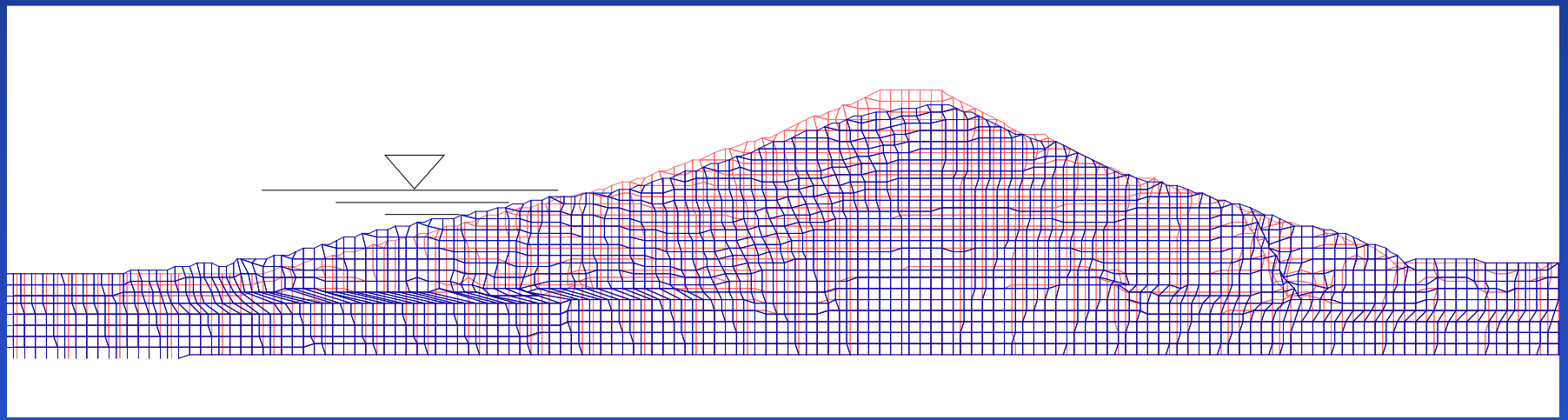

Teaming to Provide Practical Solutions to Complex Problems