The Geo-Institute

of the American Society of Civil Engineers

Presents

The Competition Rules for the 16th *Annual* National

GeoPREDICTION at

2025 Geo-Congress - Louisville, KY

Important Dates

GeoPrediction Reports Due……...…….December 20, 2024 6:00PM EST

Invitation to GeoPrediction Finale……..……....…. January 17, 2025

2025 Geo-Congress……...…..……March 2 – 5, 2025

Geo-Congress 2025 Information…….…….……https://www.geocongress.org/

GeoPrediction Presentations…….……...……..March 3, 2025

16th Annual National GeoPrediction Rules – 2025 Geo-Congress

1. Objective: The objective of the GeoPrediction competition is to develop an accurate prediction of geotechnical behavior given information regarding subsurface, boundary, and initial conditions, as well as the geotechnical/ structural/hydraulic loading. The GeoPrediction competition may involve using available geotechnical software, empirical correlations, or developing a simple but accurate computer code for making this prediction.

For the 2025 GeoPrediction, the competing teams will develop seepage models and predict piezometer response to reservoir levels of an earthen dam.

2. Geotech data: Input data for the problem including problem description, cross sections, and soil information are found on the following sheets.

3. Eligibility: A GeoPrediction team will consist of one or two students. Teams of two can include two undergraduate students, or one undergraduate and one graduate student. Two graduate students cannot form a team. However, graduate students can submit their own prediction. Students must be enrolled during the Spring 2025 Semester or Quarter.

4. Submittal: Each GeoPrediction team will submit a GeoPrediction Report that will, at a minimum, contain the following information.

a. The Report shall be no more than three (3) pages long (not including any references and title page). One inch margins, single spacing, and 12 point Time New Roman font are required.
b. Include the provided Table 1 (completed) in your report.
c. The Report shall contain the methods (assumptions, correlations, analytical procedures, numerical procedures, computers software, etc.) that the team employed to develop the GeoPrediction. Methods must be referenced properly.
d. The cover page must include the name of the institution; names, email addresses, and status (i.e., graduate or undergraduate) of each team member; as well as the name and contact information of the faculty that advised the team in developing their prediction.
e. Submit your report electronically in PDF format to Dr. Matthew Sleep (sleepmw@uc.edu) by 6pm Eastern Standard Time on December 20, 2024 with the subject line "2025 Geo-Congress GeoPrediction Submittal – *School Name*". Sender will receive confirmation of receipt by email. Late submissions are not accepted. If you do not receive a confirmation email within 24 hours of submission, please re-send the information.

5. Judging: The submitted GeoPrediction reports will be judged and ranked by an anonymous panel of geotechnical faculty and engineers. Initial judging will be based on criterial (a) through (d) below.

a.	Format, length, grammar, English usage	10%
b.	Clarity of technical presentation	15%
c.	Logical and concise use of appropriate geotechnical methods and principles	15%
d.	Accuracy of GeoPrediction	30%
e.	Presentation at the 2024 Geo-Congress	30%

6. Selection: The winning team will receive the prestigious Mohr's Circle Award. Up to fifteen (15) teams may be invited to the GeoPrediction Presentation based on the ranking of their GeoPrediction reports. The selected teams will be notified by January 17, 2025. The top teams (based total score of items a-d listed in section #5) will receive partial reimbursement for student registration and travel (amount to be determined) for up to two team members.

7. Presentations: Teams invited to present their GeoPrediction Results will prepare an 8 - minute (maximum) presentation that describes their methods and GeoPrediction for viewing by judges and the public. The order and location of the presentations will be determined at the conference site. It is expected that a room with a projector and computer will be used for these presentations.

As noted in Item 5, the Presentation will constitute the final 30% of each invited team's final GeoPrediction score.

8. Questions: Questions should be emailed to Matthew Sleep (sleepmw@uc.edu). It is anticipated that these questions will be uploaded for all to review at the GeoWorld Website (TBD).

9. Modeling Software: Seepage modeling is commonly performed with software. To allow for all students to have access to software, a GeoPrediction sponsor, Rocscience, will provide free access, limited to the timeframe of the GeoPrediction problem, to any requesting student. *If you plan on submitting a GeoPrediction*, you may request software access here: https://forms.gle/yBnY5LQjkSWiMw7G8 Please allow 2 – weeks (approximate) to gain access.

Project Description

Interpreting the ground profile, observing and measuring soil behavior, and modeling a geotechnical problem or system are interconnected components of geotechnical engineering. In the profession, updating models, with measured data, is necessary to fully understand the observed and predicted behavior of a system of components. The 2025 GeoPrediction is to create a geotechnical model of a large, earthen dam and use that model to predict the response of field instrumentation.

A large, earthen dam has been constructed. This dam, as shown in Figure 1, has an impervious core, earth shell, and steel sheetpile near the centerline. This dam has been operating for many years.

A component of dam safety and monitoring includes field-installed piezometers. There are many types of piezometers available, but all in some way monitor pore pressure. Pore pressures are monitored in dams to determine the pattern of water flow. Continuous monitoring also provides historical trends of pore pressure. Deviations from historical trends can indicate potentially hazardous conditions. Piezometer tips (bottom elevation) are placed in specific geological layers to understand the behavior of the different layers.

Your objective is to use the data provided and create a model for one cross section of an embankment dam. Provided to you are the geometric conditions of the cross section, limited information about the core and shell materials, and a description of the subsurface geology. To calibrate your model, the response of two piezometers (A and B) along with reservoir elevation data are provided. Your prediction is to determine the measured piezometer water level (total head in feet) of three other piezometers at two different moments in time (reservoir elevations). This prediction will come in the form of completed Table 1 (include in your report). Reservoir elevation started monitoring at Day '0.' Your prediction is for Day 753 and Day 1846.

All piezometer locations are provided in Figure 2 with additional information provided in Table 2. Piezometers (A, B, 1, 2 and 3) are all located along this same cross section (station) but at different elevations.

Unfortunately, due to the age of this structure, limited subsurface information is provided apart from the geologic descriptions of Figure 2.

As mentioned in section 9, Rocscience will provide Slide2 for a limited time to students that will be submitting a GeoPrediction. If you would like a time-limited version of Slide2, please complete this form https://forms.gle/yBnY5LQjkSWiMw7G8 .

To aid in your modeling efforts, a spreadsheet has been provided here with the reservoir elevations and piezometer water level values for A and B.
https://docs.google.com/spreadsheets/d/1ANpdhIs_7Od0gzP4oSBwkVfRH02XbQ6Nosgb3HQN0HU/edit?usp=sharing

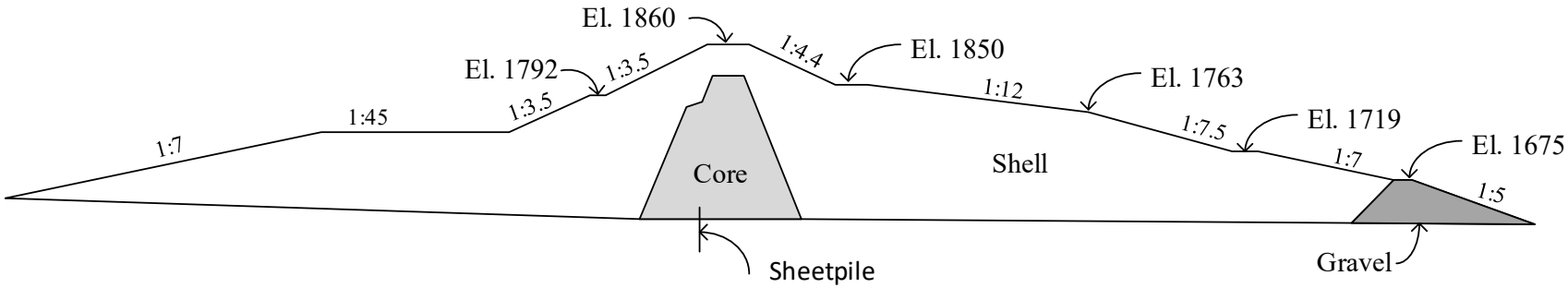

Figure 1 – Typical embankment dam cross section

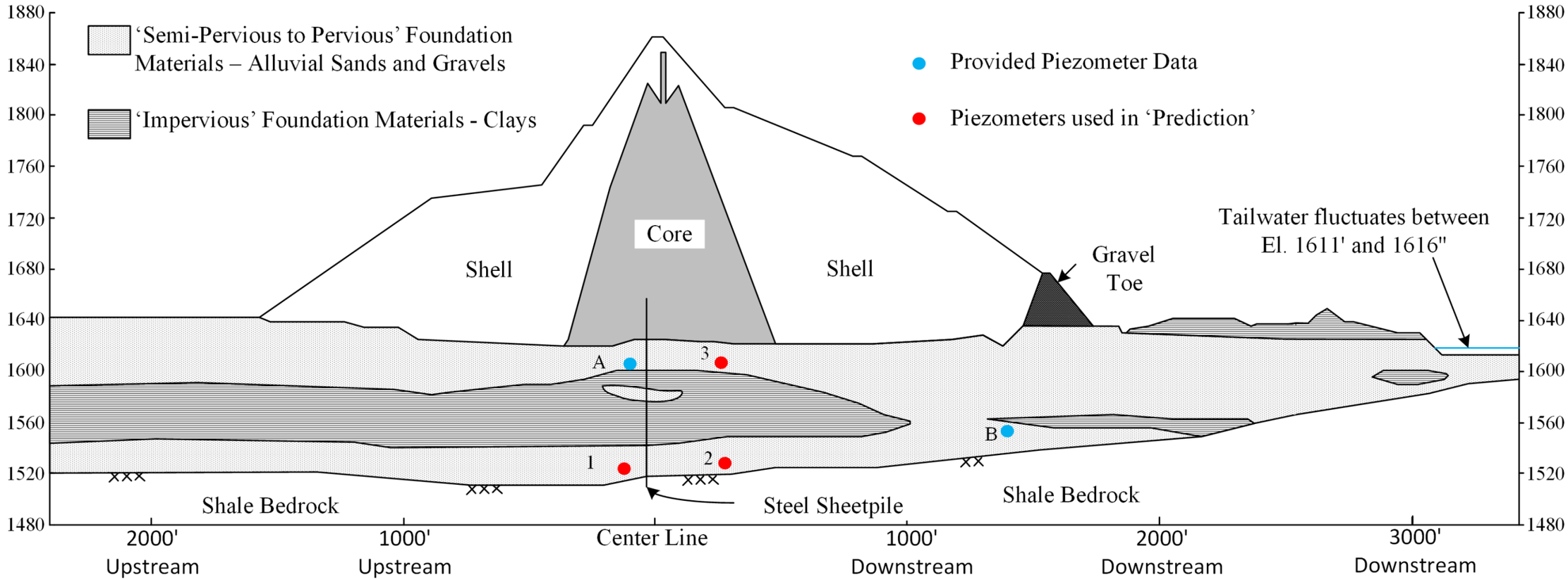

Figure 2 – Cross section of embankment dam for Prediction
*** Note: piezometers are aligned at the same station in this section**

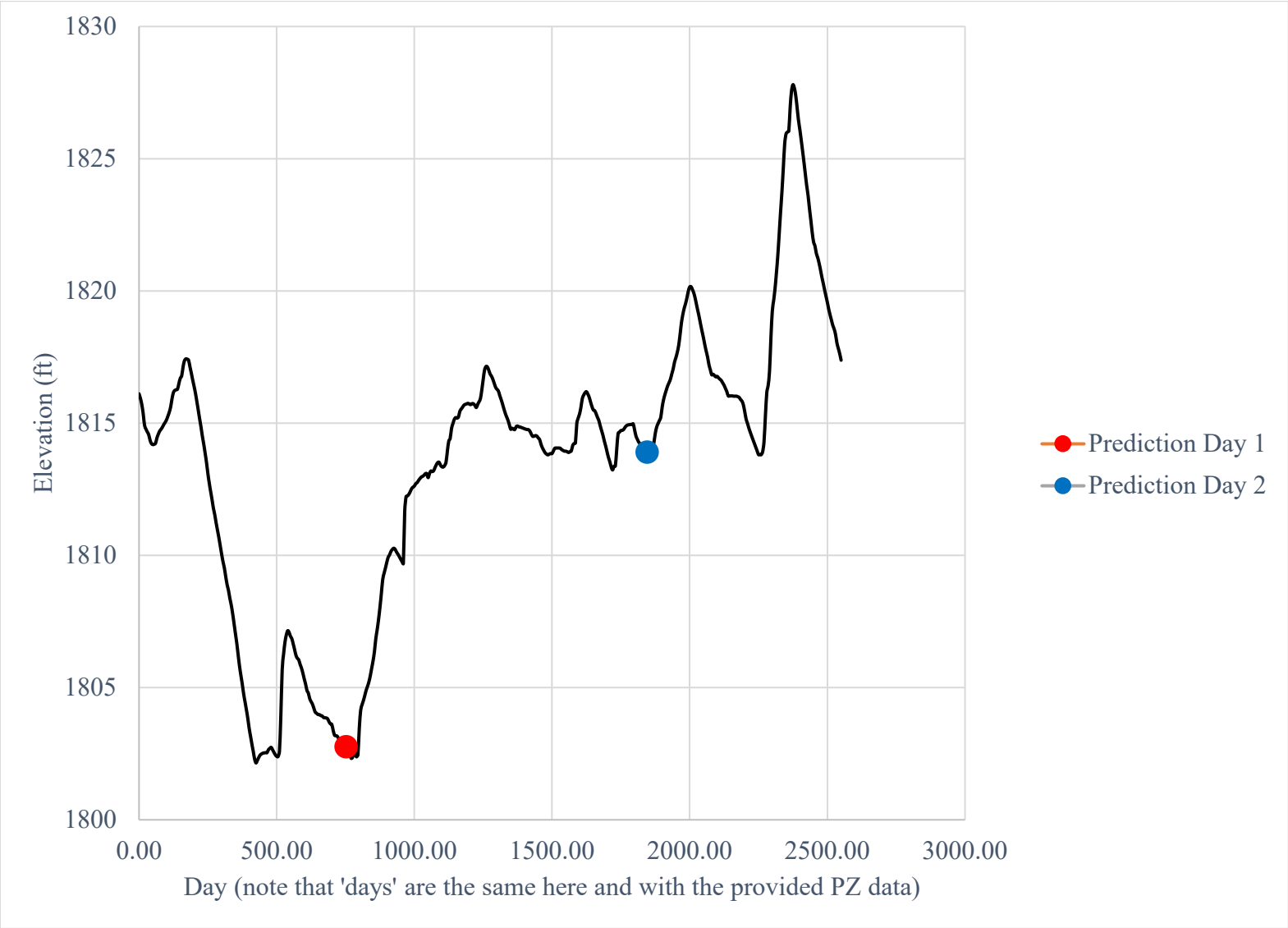

Figure 3 – Upstream reservoir elevation with time

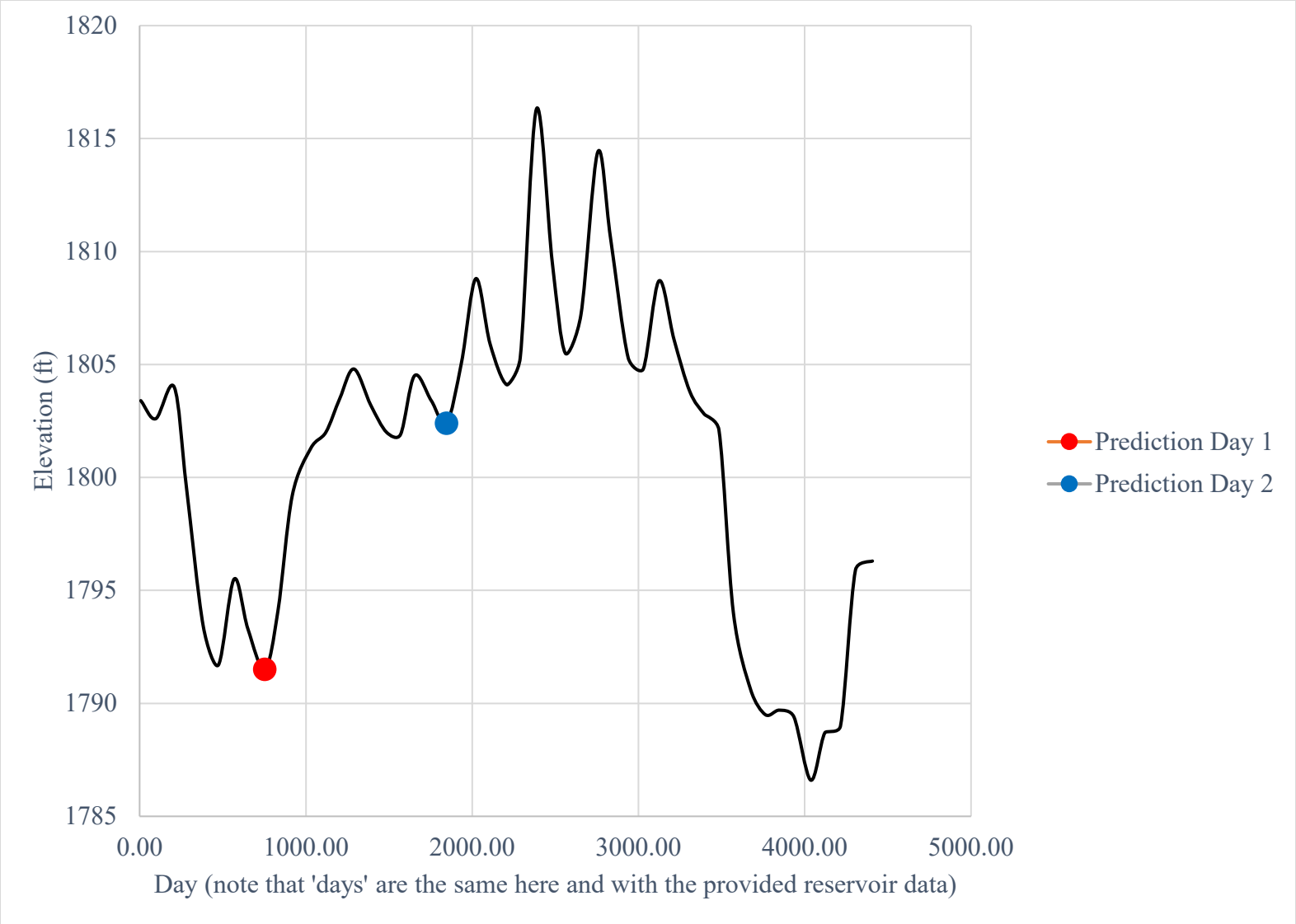

Figure 4 – Piezometer 'A' reading with time

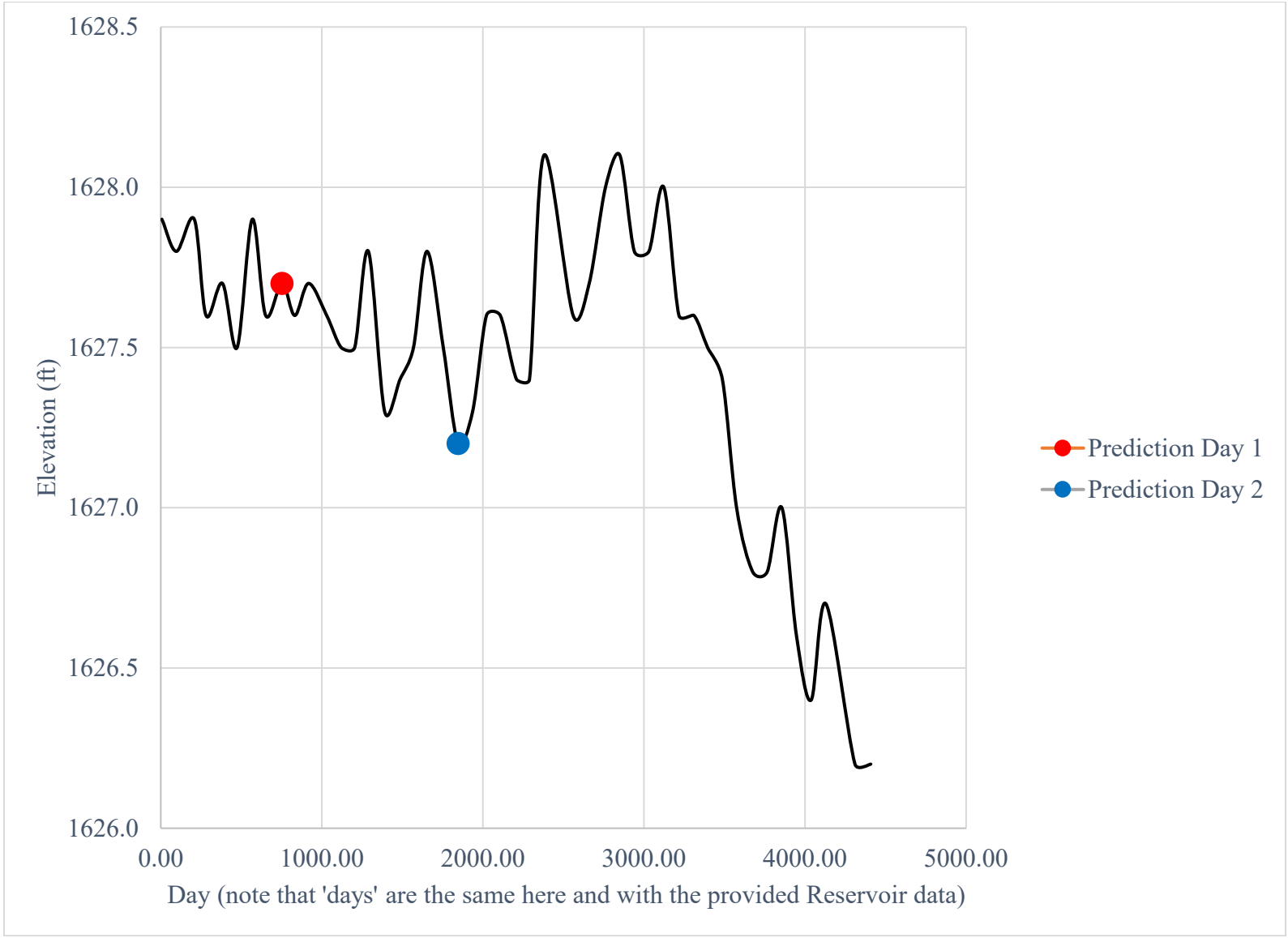

Figure 5 – Piezometer ‘B' reading with time

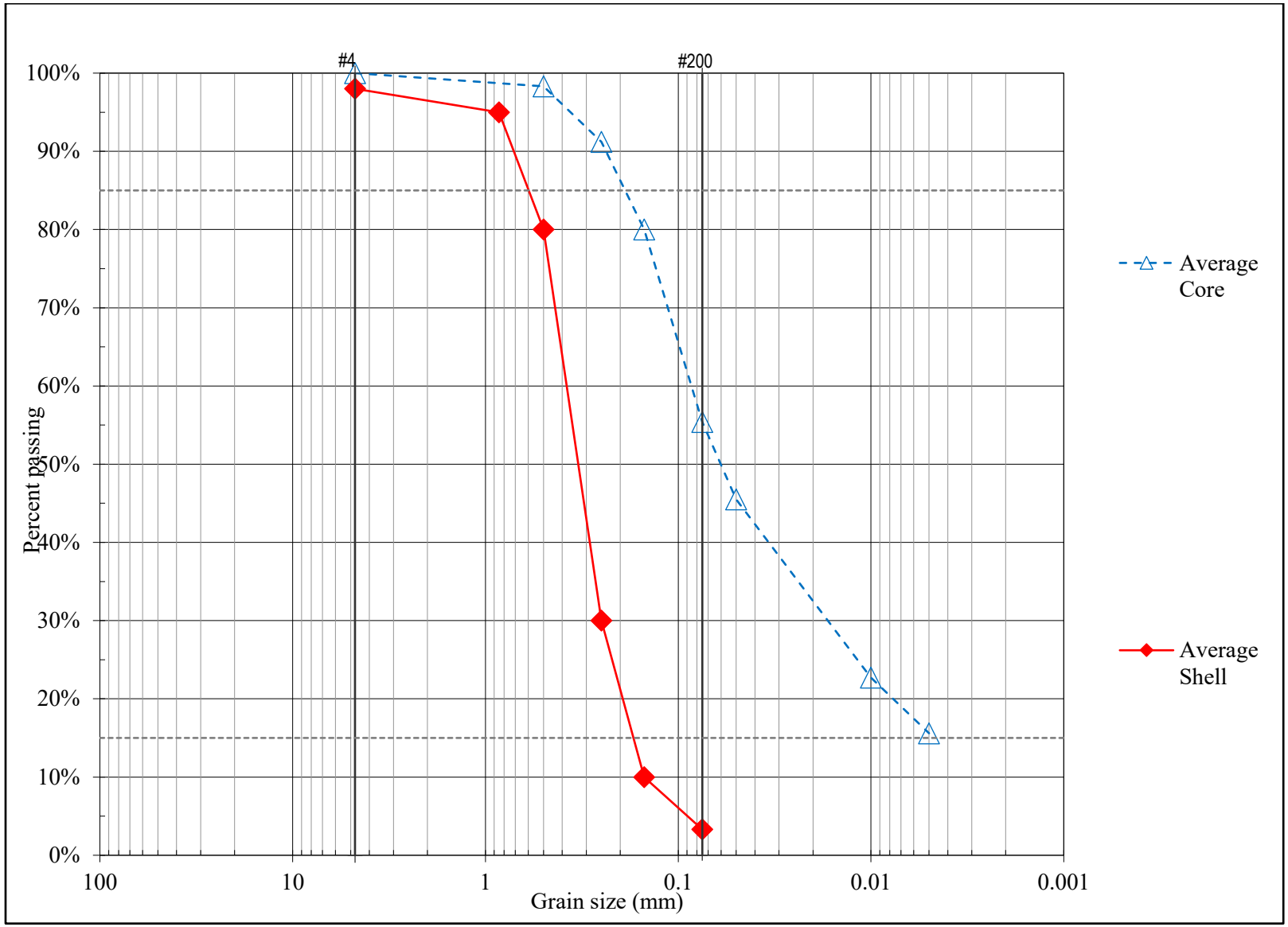

Figure 6 – Grain size distribution of embankment 'core' and 'shell' materials

Table 1. Table to be completed and included with prediction submittal
***Note: report predicted piezometer levels to the nearest tenths of a foot (i.e. 1644.6 ft)**

PZ	Day 753 Prediction (ft)	Day 1846 Prediction (ft)
1		
2		
3		

Table 2. Piezometer information

Given		
PZ	Elevation (ft)	Location to Sheetpile
A	1603	100' Upstream
B	1551	1400' Downstream

Prediction		
PZ	Elevation (ft)	Location to Sheetpile
1	1522	125' Upstream
2	1527	275' Downstream
3	1603	275' Downstream