72-22

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SUBMITTAL OF COMMITMENT RESOLUTION #4 INFORMATION
DOCKET NO. 72-22 / TAC NO. L22462
PRIVATE FUEL STORAGE FACILITY
PRIVATE FUEL STORAGE L.L.C.

Reference:
1. PFS Letter, Parkyn to Director, Office of Material Safety and Safeguards, Responses to Request for Additional Information, dated February 10, 1999
2. PFS Letter, Donnell to Delligatti, Submittal of Commitment Resolution Information, dated March 24, 1999
3. PFS Letter, Donnell to Delligatti, Submittal of Commitment Resolution Information, dated March 31, 1999
4. PFS Letter, Donnell to Delligatti, Commitment Resolution Letter #4, dated April 14, 1999

In reference No. 4 PFS committed to provide a report explaining how the Standard Penetration Test Blow Counts (N-values) were used in developing the PFSF Safety Analysis Report. The report providing this explanation is enclosed.

If you have any questions regarding this response, please contact me at 303-741-7009.

Sincerely,

John L. Donnell

John L. Donnell
Project Director
Private Fuel Storage L.L.C.

Enclosure

NF ok

cc:
John Parkyn
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REPORT ON HOW N-VALUES WERE USED IN DEVELOPING THE PFSF SAFETY ANALYSIS REPORT

A review was performed of the geotechnical sections of the SAR and the geotechnical calculations to identify where reference was made to the Standard Penetration Test blow counts (N-values).

The N-values were used primarily to characterize the subsurface profile. As shown in Figure 2 in SAR Appendix 2A, the generalized subsurface profile consists of a layer of silt, silty clay, and clayey silt, with average blow counts of ~15 blows/ft, overlying very dense fine sand and silt layers. Because of the extremely high blow counts in the underlying fine sand and silt layers, the performance of foundations will be controlled by the behavior of the upper, "Layer 1" soils (upper 25-30 ft).

Correlations between engineering properties and blow counts were used in these calculations only to corroborate values specified based on data presented in the geotechnical literature for similar soils (e.g., G_{max} and k_s values in Calculation 05996.01-G(B)-01). The settlement analyses did not utilize correlations of compressibility as a function of N-value, and the bearing capacity analyses did not utilize correlations of strength as a function of N-value.

The SAR sections and applicable paragraphs that discuss SPT N-values are included on the following pages. Additionally, we have listed the geotechnical calculations and identified where in the calculation that SPT N-values are discussed.

SAR SECTIONS THAT MENTION STANDARD PENETRATION TEST BLOW COUNTS (N-VALUES).

2.6.1.6 Relationship of Major Foundations to Subsurface Materials (Paragraphs 2 & 3)

Figure 2.6-5 presents Foundation Profile A-A', which shows the locations of the proposed structures in relationship to the subsurface materials encountered in the borings. As indicated, the generalized subsurface profile consists of three layers. The uppermost layer extends to a depth of between 25 and 35 ft below existing grade and is mainly interlayered silt, silty clay, and clayey silt. ***Standard Penetration Test (SPT) N-values for this layer are mostly between 8 and 20 blows per ft, with an average value of 16 blows per ft and a median value of 14 blows per ft, indicating that these are "stiff" or "medium dense" materials.*** The proposed structures will be constructed on strip and spread footings and the casks will be placed on mat foundations founded in this layer.

A distinct change in material occurs at about 25 to 35 ft, where refusal (***N>100 blows per 6 inches***) conditions are often encountered.

2.6.4.7 Response of Soil and Rock to Dynamic Loading (Paragraphs 3 & 4)

As indicated in Section 2.4.1.2, the groundwater table is greater than 100 ft deep at the site. The top 30 ft of the profile consists of silt, silty clay, and clayey silt. ***The median blow count for this material is 14 blows per ft***, indicating that it is "stiff", it appears to be weakly cemented, and unconsolidated-undrained triaxial tests on this material indicate that it has a cohesion of greater than 2000 psf. Therefore, the technique for estimating dynamic settlements of soils above the groundwater table is not applicable for these materials, since they are not expected to compact as a result of soil grain slip.

This material is underlain by very dense, fine sands, which have ***uncorrected blow counts that commonly exceed 100 blows per ft***. This material is underlain ***by silts that have even higher blow counts***. Because of their very dense nature, these materials are not susceptible to settlement due to the dynamic settlement mechanism applicable for soils above the groundwater table; i.e., compaction due to grain slip.

2.6.4.8 Liquefaction Potential (Paragraph 2)

Figure 2.6-5 illustrates that from a depth of about 30 ft down to 100 ft (the depth of the deepest boring) the soils are very dense, as the ***standard penetration test N-values for these soils typically exceed 100 blows per ft***, and they increase with depth.

SAR Figure 2.6-2   Foundation Profile A-A', Looking Northeast

N-values are shown at the boring locations.

SAR APPENDIX 2A – GEOTECHNICAL DATA REPORT:

- Generalized subsurface profile description is similar to SAR Section 2.6.1.6, shown above.
- Figure 2 "Generalized Subsurface Profile" indicates N~15 blows/ft for Layer 1 soils and N>100 blows/ft for underlying layers.

GEOTECHNICAL CALCULATIONS

G(B)-01-1 Document Bases for Recommended Values of Dynamic Soil Properties and Coefficient of Subgrade Reaction

Page 5 Similar text regarding generalized subsurface profile to that in SAR Section 2.6.1.6, shown above.

Page 12 G_{max} values calculated based on blow counts are similar to G_{max} values based on seismic refraction survey for lower range of N-values for Layer 1. Thus, blow count data were used to corroborate the G_{max} value calculated based on seismic refraction data.

Page 22 The coefficient of subgrade reaction, k_s, for a 1' x 1' plate for Layer 1 silt was assumed to be comparable to the lower bound value for medium dense sands presented in Terzaghi (1955), which equals 60 tons/ft^3. Page 22 of this calculation indicates that this value is comparable to the k_s value calculated based on Equation 4.49 of Das (1995) with N=10 blows/ft. Thus, the N-values were used to corroborate specified values of k_s.

Page 29 Figure 1 "Generalized Subsurface Profile" indicates N~15 blows/ft for Layer 1, N>100 blows/ft for underlying layers.

G(B)-02-1 The PMF and the 100-yr Flood Flow at the Access Road Crossing and the PFSF Site

Results were not developed based on N-values.

G(B)-03-2 Estimate Static Settlement of Storage Pads

This calculation estimates settlement due to Layer 1 based on consolidation tests performed at z ~11 ft. These analyses did not utilize correlations of compressibility as a function of N-value.

Page 12 indicates the soils in Layers 2 – 4 are very dense based on N >100 blows/ft.

Page 31 Figure 2 "Generalized Subsurface Profile" indicates N~15 blows/ft for Layer 1, N>100 blows/ft for underlying layers.

Page 32 Figure 3 N>100 blows/ft for Layer 3.

G(B)-04-3 Stability Analyses of Storage Pads

Stability analyses were not based on N-values. Rather, this calculation used strengths based on c from UU tests and φ estimated based on the plasticity index to determine the bearing capacity of Layer 1 soils.

G(B)-05-0 Document Bases for Geotechnical Parameters Provided in Geotechnical Design Criteria

Page 15 Concludes differential settlements should be less of a concern "because of the uniform nature of the upper layer ... as evidenced by the N-values in Table 1". Note, "*uniform*" is used to here to mean that the N-values across the site are *consistent from location to location.*

Page 25 Table 1 presents N-values vs elevation and average and median values for 5-ft elevation intervals, documenting the basis for the statements made in the other calculations and the SAR regarding the average and median blow counts for the soils in Layer 1 (upper 25 to 30 ft).

Page 26 Figure 1 "Generalized Subsurface Profile" indicates N>100 blows/ft for Layer 3, based on the boring logs included in SAR Appendix 2A.

G(B)-06-1 Evaluate the Liquefaction Potential of the Soils Underlying the Proposed Site

Page 3 N typically exceeds 100 blows/ft for Layer 2.

Page 5 Figure 1 "Generalized Subsurface Profile" indicates N~15 blows/ft for Layer 1, N>100 blows/ft for underlying layers.

G(B)-07-1 Allowable Bearing Capacity and Static Settlement of Strip and Square Footings

Bearing capacity analyses were not based on N-values. Rather, this calculation used strengths based on c from UU tests and φ estimated based on the plasticity index to determine the bearing capacity of Layer 1 soils.

Settlements were estimated using criteria from G(B)-05 and the same methods described in Calculation 05996.01-G(B)-03. Basically, settlement due to Layer 1 was calculated based on results of consolidation tests performed at z ~11 ft. These analyses did not utilize correlations of compressibility as a function of N-value.

Page 24 Figure 1 "Generalized Subsurface Profile" indicates N~15 blows/ft for Layer 1, N>100 blows/ft for underlying layers.

G(B)-08-1 HEC-1 Flood Hydrograph Package, Microcomputer (v. 4.0) Software Test QS 2-7

Results were not developed based on N-values.

G(B)-09-0 HEC-2 Microcomputer Version 4.6.2 Software Test

Results were not developed based on N-values.

G(B)-10-0 HEC-RAS Microcomputer Version 1.2 Software Test

Results were not developed based on N-values.

G(B)-11-0 Dynamic Settlements of the Soils Underlying the Site

Page 3 With respect to Layer 1: "As documented in Calculation 05996.01-G(B)-05-0, the median blow count for this material ~14 blows/ft, indicating that it is "stiff" ...

Page 4 Blow counts exceed 100 blows/ft for the underlying layers.

Page 6 Figure 1 "Generalized Subsurface Profile" indicates N~15 blows/ft for Layer 1, N>100 blows/ft for underlying layers.

G(B)-12-1 PFSF Flood Analysis with Larger Drainage Basin

Results were not developed based on N-values.

G(B)-13-0 Allowable Bearing Capacity of the Canister Transfer Building Supported on a Mat Foundation

Results were not developed based on N-values. Rather, this calculation used strengths based on c from UU tests and φ estimated based on the plasticity index to determine the bearing capacity of Layer 1 soils.

Page 4 References Figure 1 and indicates N≥100 blows/ft for Layer 3.

Page 37 Figure 1 "Generalized Subsurface Profile" indicates N~15 blows/ft for Layer 1, N>100 blows/ft for underlying layers.

G(B)-14-0 Static Settlement of the Canister Transfer Building Supported on a Mat Foundation

This calculation estimates settlement due to Layer 1 based on consolidation tests performed at z ~11 ft. These analyses did not utilize correlations of compressibility as a function of N-value.

Page 10 Layers 2 & 3 are very dense (N>100 blows/ft and N>100 blows/6").

Page 12 Layers 3 & 4 consist of very dense silt (N>>100 blows/ft).

Page 23 Figure 1 "Generalized Subsurface Profile" indicates N~15 blows/ft for Layer 1, N>100 blows/ft for underlying layers.

Page 24 Figure 2 "Foundation Profile – Canister Transfer Building" indicates N>100 blows/ft for Layer 3.

G(B)-15-0 Determination of Aquifer Permeability from Constant Head Test and Estimation of Radius of Influence for the Proposed Water Well

Results were not developed based on N-values.

G(B)-16-0 PFSF Flood Analysis at 3-mile-long Portion of Rail Spur

Results were not developed based on N-values.

G(B)-17-0 PFSF Flood Analysis with Proposed Access Road and Railroad Embankments

Results were not developed based on N-values.

G(B)-18-0 Determine the Thickness of Structural Fill Required in Areas Where the Transporter Will Travel Carrying Fully Loaded Casks

Results were not developed based on N-values. Rather, this calculation used strengths based on c from UU tests and φ estimated based on the plasticity index to determine the bearing capacity of Layer 1 soils.

This calculation estimates settlement due to Layer 1 based on consolidation tests performed at z ~11 ft. These analyses did not utilize correlations of compressibility as a function of N-value.

Page 3 References Figure 1 and indicates N≥100 blows/ft for soils below Layer 1 (0-30 ft).

Page 14 Figure 1 "Generalized Subsurface Profile" indicates N~15 blows/ft for Layer 1, N>100 blows/ft for underlying layers.

G(PO5)-1-1 Development of Soil and Foundation Parameters in Support of Dynamic Soil-structure Interaction Analyses

Results were not developed based on correlations between engineering properties and SPT N-values. The calculation mentions SPT N-values in discussion of the generalized subsurface profile, as follows:

Page 4 Indicates Standard Penetration Test (SPT) were performed ... In addition, it includes similar text regarding the generalized subsurface profile to that in SAR Section 2.6.1.6, shown above.

Page 5 Indicates SPT blow counts generally exceed 100 blows/ft for soils below Layer 1.

Page 22 States "SPT N-value mostly between 8-20 bl/ft" and that "SPT N-values commonly exceed 100 bl/ft" for soils from depths of 25 to ~35 ft below the ground surface.

G(PO5)-2-0 Deterministic Ground Motion Calculations for Skull Valley Utah

Results were not developed based on N-values.

REFERENCES:

Das, B.M., (1995), "Principles of Foundation Engineering", PWS Publishing, Boston, MA.

Terzaghi, K, "Evaluation of Coefficients of Subgrade Reaction," Geotechnique, Vol 5, 1955, pp 297-325.