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21G-14-0104
GOV-01-55-06
ACF-14-0146

June 25, 2014

Director, Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Reference:
1) Docket No. 70-143; SNM License 124
2) Letter from B. Marie Moore to NRC, submittal of North Site Decommissioning Plan, Revision 3, (21G-06-0049) dated May 2, 2006
3) Letter from NRC to B. Marie Moore, Nuclear Fuel Services, Inc., Acknowledgement and Acceptance of Revision 3 to North Site Decommissioning Plan (TAC L31949), dated May 18, 2006
4) Letter from M. P. Elliott to the NRC, Final Status Survey Final Report for Survey Units 13, 14, and 15, (21G-13-0212) dated September 30, 2013
5) Letter from NRC to M. P. Elliott, Nuclear Fuel Services, Inc., Acceptance for Review of Final Status Survey Report for Survey Units 13, 14, and 15 (TAC L33291) dated November 26, 2013
6) Letter from R. J. Freudenberger to the NRC, Supplemental Information for Final Status Survey Report for Survey Units 13, 14, and 15, (21G-14-0022), dated January 28, 2014
7) Letter from NRC to R. J. Freudenberger, Nuclear Fuel Services, Inc., Request for Additional Information Concerning Final Status Survey Report for Survey Units 13, 14, and 15 (TAC L33291), dated June 3, 2014

Subject: **Response to Request for Additional Information Concerning Final Status Survey Report for Survey Units 13, 14, and 15**

As requested in Reference 7, Nuclear Fuel Services, Inc. (NFS) hereby submits its response to your request for additional information concerning the Final Status Survey Report for Survey Units 13, 14, and 15 (Reference 4). NFS will revise and resubmit the report upon NRC acceptance of NFS' responses.

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If you or your staff have any questions, require additional information, or wish to discuss this, please contact me, or Mr. Scott Morie, Decommissioning Environmental Unit Manager, at (423) 735-5616. Please reference our unique document identification number (21G-14-0104) in any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.

Richard J. Freudenberger, Director
Safety and Safeguards

CSM/pdj

Attachment: Response to Request for Additional Information Concerning Final Status Survey Report for Survey Units 13, 14, and 15

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21G-14-0104
GOV-01-55-06
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Attachment

Response to Request for Additional Information Concerning Final Status Survey Report for Survey Units 13, 14, and 15

8 pages to follow

Response to Request for Additional Information Concerning
Final Status Survey Report for Survey Units 13, 14, and 15

1. Adjustment of Corehole Density for Survey Units 13 and 15

Request:

Describe the evaluation of corehole density of neighboring survey units sharing similar historical properties to determine corehole density for Survey Units 13 and 15. Update Chapter 2, Appendix A, and other sections of the Final Status Survey (FSS) Report, as appropriate to address revisions.

Basis:

In response to the NRC staff Acceptance for Review letter dated November 26, 2013, NFS provided supplemental information in a letter dated January 28, 2014. The supplemental information addresses the planned corehole sampling density for Survey Units 13 and 14. NFS stated that the final survey design of Survey Units 13 and 15 was based on professional judgment relying on consideration of three mathematical points: (i) the corehole frequency determined using historical data; (ii) the corehole frequency of the neighboring survey units sharing similar historical properties; and (iii) areal frequency as suggested by the Multi-Agency Radiation Survey and Site Investigation Manual. NFS provided additional information addressing points (i) and (iii). However, NFS did not address point (ii) regarding corehole frequency of neighboring survey units. For Survey Unit 15, NFS' survey design was for a corehole density of 10 m^2 per corehole. For Survey Units 13 and 14, the survey design was for a density of 50 m^2 per corehole. Survey Unit 14 mostly surrounds (on three of four sides) Survey Unit 15, so NRC staff considers Survey Unit 15 to be a neighbor of Survey Unit 14. NFS has not specifically addressed why the higher density of corehole sampling for Survey Unit 15 is not also applicable to Survey Unit 14.

NRC staff also notes that much of the additional information provided by NFS in the January 2014 supplemental information is a significant revision to the survey design that is provided in the FSS Report (September 30, 2013). In the supplemental information, NFS stated that the historical data of Survey Units 13 and 15 in Appendix A of the FSS Report will be replaced in its entirety with the data shown in Tables 2 and 4 of the supplemental information. However, other than that statement, NFS has not revised the FSS Report or described what part of the FSS Report is to be revised based on the supplemental information.

NFS Response:

Survey Unit 13

The final design of Survey Unit 13 was ultimately determined in 2006 using professional judgment relying on the consideration of three mathematical points; 3.0 m^2 determined using pre-remediation data no longer considered representative of the radiological status, the corehole frequency of the neighboring survey units which share similar historical properties (50 m^2, 49 m^2, and 50 m^2 for Survey Units 12, 14, and 17, respectively), and 100 m^2 as suggested by the MARSSIM (USNRC 2000) to evaluate areas of elevated radioactivity for open land areas. Because surface scanning is not applicable for subsurface soil characterization and

known elevated concentrations of residual radioactivity existed in these areas in the past, a conservative approach was taken. The reference system spacing area identified in MARSSIM (100 m^2) was reduced by a factor of two, resulting in a reference system spacing surface area of 50 m^2 (approximately every 7 meters).

The NRC requested further clarification as to how *(ii), the corehole frequency of neighboring survey units,* was evaluated in the design of Survey Unit 13. The corehole frequency of neighboring survey units that share historical properties with Survey Unit 13 was considered based on the following information.

The northwest border of Survey Unit 13 lies at the extent of this FSS characterization project. The remaining borders of Survey Unit 13 are bound by Survey Units 12, 14, 16, and 17. Survey Units 12, 14, and 17 were all located in the former ponds area of the North Site and share similar historical properties with Survey Unit 13.

Survey Unit 12 lies to the northeast and forms the longest border with Survey Unit 13. The corehole frequency for Survey Unit 12 was calculated using the method approved in the NFS Site-specific DP, Appendix B Section 3.2 (NFS 2006) and described in detail in the technical basis document entitled "Development & Application of Subsurface Soil DCGLs, North site Decommissioning Project, Nuclear Fuel Services Site," (MACTEC 2005). The calculated corehole frequency was constrained by the WRS Test and resulted in a corehole frequency of 50 m^2.

Survey Unit 14 lies to the southwest of Survey Unit 13. The corehole frequency was determined using the method approved in the NFS Site-specific DP, Appendix B Section 3.2 (NFS 2006) and described in detail in the technical basis document entitled "Development & Application of Subsurface Soil DCGLs, North site Decommissioning Project, Nuclear Fuel Services Site," (MACTEC 2005). The calculated corehole frequency was constrained by the WRS Test and resulted in a corehole frequency of 49 m^2. The east edge of Survey Unit 13 shares a short border with Survey Unit 17, which was sampled with a corehole frequency of 50 m^2, ultimately decided using professional judgment.

The southeast edge of Survey Unit 13 shares a short border with Survey Unit 16. The corehole frequency was determined using the method approved in the NFS Site-specific DP, Appendix B Section 3.2 (NFS 2006) and described in detail in the technical basis document entitled "Development & Application of Subsurface Soil DCGLs, North site Decommissioning Project, Nuclear Fuel Services Site," (MACTEC 2005). The calculated corehole frequency was constrained by the "expected maximum concentration" calculation, and resulted in a corehole frequency of 23 m^2. Survey Unit 16 is distinct from Survey Unit 13 in that Survey Unit 16 encompasses the area where Pond 1 was formerly located. As such, Survey Unit 16 underwent different historical uses and remedial actions than Survey Unit 13. Although considered as a useful data point, the corehole frequency implemented in Survey Unit 16 was deemed less relevant to the determination of the necessary corehole frequency for Survey Unit 13.

Thus, the selected corehole frequency of 50 m^2 for Survey Unit 13 is appropriate when the corehole frequencies of neighboring survey units are considered as a complete set, with emphasis placed on the survey units that share similar historical properties. Section 2.6 of the FSS Report will be amended to include the first paragraph of this response.

Survey Unit 13 Historical Dataset

The explanation provided to the NRC in a letter dated January 28, 2014 regarding the historical dataset of Survey Unit 13 results in the addition of the following text to Section 2.5 of the FSS Report:

> In 2013, NFS provided a supplemental dataset to MACTEC that included 36 historical analytical sample results located within Survey Units 13 and 15. The supplemental dataset is comprised of analytical results from volumetric samples collected in September and October 2008 following remedial activities in Survey Units 13 and 15. The dataset is representative of radiological conditions of the site at the time of FSS sampling activities and is considered the relevant historical dataset for Survey Units 13 and 15 and is included in Appendix A.

The following text will be added to Section 2.6 of the FSS Report:

> Demarcation of the survey unit was performed using the criteria described in Section 2.3. The northwest border of Survey Unit 13 lies at the extent of characterization and all remaining borders are bound by Survey Units 12, 14, 16, and 17. The entire survey unit lies south and east of the security fencing system placing it within NFS secured property. The area encompassed by Survey Unit 13 was a former pond. Survey Unit 13 was remediated in 2008, resulting in steep excavation banks demarcating the west, south, and east borders of Survey Unit 13. Field records indicate that the survey unit was excavated down 3 - 4 meters below 1640 feet above mean sea level (msl) with volumetric sampling occurring throughout and at the conclusion of the excavation process. However, the post-remedial action sample results from the 2008 remedial actions were not included in the 2006 dataset used to aid in designing the corehole density of Survey Unit 13 as detailed in the Characterization Plan (MACTEC 2007).
>
> Upon receipt of the supplemental historical dataset in 2013 (described in Section 2.5 as post-remediation samples collected in October 2008), AMEC re-evaluated the Survey Unit 13 corehole spacing using the same final design criteria as outlined in Sections 2.7.2 and 2.7.3 used during the design of Survey Unit 14. To reevaluate the Survey Unit 13 corehole design, the post-remediation sample results were plotted into SADA to verify their locations within Survey Unit 13. Next, the dataset was inputted into the Subsurface Soil DCGL calculators as the historical dataset, replacing the pre-remediation samples from circa 1992, 1993, and 2005. This test was performed to determine what the resultant corehole spacing would have been, if the post-remediation data had been available and were used during the survey design. This evaluation confirmed the conservative nature of the survey design for Survey Unit 13. It affirmed that corehole spacing prescribed in the design (one corehole every 50 m^2) was far more densely spaced than would be reasonably required to assess the dose consequences of locally elevated pockets of residual radioactivity in the survey unit. Using the post-remedial action data, the Subsurface Soil DCGL calculators conclude that the *Minimum Areal Sample Frequency required to Satisfy DCGLEMC 90th Percentile* is 999 m^2 and that the *Minimum Areal Sample Frequency required to Satisfy DCGLEMC Observed Maximum* is 999 m^2 (the default maximum size of the Subsurface Soil DCGL calculators).

The historical dataset of Survey Unit 13, Appendix A, is the analytical results of the 2008 post-remediation samples.

Figure 5-39 in Section 5.7.3 of the FSS Report will be replaced to reflect the change to the historical dataset.

Survey Unit 15

The final design of Survey Unit 15 was ultimately determined in 2006 using professional judgment relying on the consideration of three mathematical points; 1 m^2 determined using pre-remediation data no longer considered representative of the radiological status, 49 m^2 determined for the neighboring Survey Unit 14 which shares similar historical properties, and 100 m^2 as suggested by the MARSSIM (USNRC 2000) to evaluate areas of elevated radioactivity for open land areas. Because surface scanning is not applicable for subsurface soil characterization and known elevated concentrations of residual radioactivity existed in these areas in the past, a conservative approach was taken. The reference system spacing area identified in MARSSIM (100 m^2) was reduced by a factor of ten, resulting in a reference system spacing surface area of 10 m^2 (Approximately every 3 meters).

The NRC requested further clarification as to how *(ii), the corehole frequency of neighboring survey units*, was evaluated in the design of Survey Unit 15. The corehole frequency of neighboring survey units that share historical properties with Survey Unit 15 was considered based on the following information.

Survey Unit 15 comprises a portion of the former ponds area of the site. The survey unit encompasses an area of 99 m^2. Survey Unit 14 lies to the north, west, and south, and Survey Unit 16 lies to the east of Survey Unit 15.

Survey Unit 14 is located in the former pond area and shares similar historical properties with Survey Unit 15. The corehole frequency of Survey Unit 14 was determined using the method approved in the NFS Site-specific DP, Appendix B Section 3.2 (NFS 2006) and described in detail in the technical basis document entitled "Development & Application of Subsurface Soil DCGLs, North site Decommissioning Project, Nuclear Fuel Services Site," (MACTEC 2005). The calculated corehole frequency was constrained by the WRS Test and resulted in a corehole frequency of 49 m^2.

The east edge of Survey Unit 15 shares a border with Survey Unit 16. The corehole frequency of Survey Unit 16 was determined using the method approved in the NFS Site-specific DP, Appendix B Section 3.2 (NFS 2006) and described in detail in the technical basis document entitled "Development & Application of Subsurface Soil DCGLs, North site Decommissioning Project, Nuclear Fuel Services Site," (MACTEC 2005). The calculated corehole frequency of Survey Unit 16 was constrained by the "expected maximum concentration" calculation, and resulted in a corehole frequency of 23 m^2. Survey Unit 16 is distinct from Survey Unit 15 in that Survey Unit 16 encompasses the area where Pond 1 was formerly located. As such, Survey Unit 16 underwent a different historical use and remedial actions than Survey Unit 15. Although considered as a useful data point, the corehole frequency implemented in Survey Unit 16 was deemed less relevant to the determination of the necessary corehole frequency for Survey Unit 15.

The selected corehole frequency of 10 m^2 for Survey Unit 15 is appropriate when the corehole frequencies of neighboring survey units are considered, with emphasis placed on the survey

units that share similar historical properties. Section 2.6 of the FSS Report will be amended to include the first paragraph of this response.

Survey Unit 15 Historical Dataset

The explanation provided to the NRC in a letter dated January 28, 2014 regarding the historical dataset of Survey Unit 15 results in the addition of the following text to Section 2.5 of the FSS Report:

> In 2013, NFS provided a supplemental dataset to MACTEC that included 36 historical analytical sample results located within Survey Units 13 and 15. The supplemental dataset is comprised of analytical results from volumetric samples collected in September and October 2008 following remedial activities in Survey Units 13 and 15. The dataset is representative of radiological conditions of the site at the time of FSS activities and is considered the relevant historical dataset for Survey Units 13 and 15 and is included in Appendix A.

The following text will be added to Section 2.8 of the FSS Report:

> Demarcation of the survey unit was performed using the criteria described in Section 2.3. Visualization of the historical data using iso-contour graphics generated in SADA indicates that elevated readings may still be present in Survey Unit 15, and the area immediately surrounding the survey unit (Figure 2-7). It was necessary, therefore, to demarcate exact survey unit borders by "zooming in" on the historical dataset. Elevated data points causing an exaggerated area of influence were grouped together as a single data population, bound into the survey unit, and taken into account in the design of Survey Unit 15. The area encompassed by Survey Unit 15 was a former pond. Survey Unit 14 lies to the north, west, and south, and Survey Unit 16 lies to the east of Survey Unit 15. Survey Unit 15 was remediated in 2008. Field records indicate that in 2008 the majority of Survey Unit 15 was excavated down 2-3 meters below 1640 feet above mean sea level (msl) with volumetric sampling occurring throughout and at the conclusion of the excavation process. However, the post-remedial action sample results from the 2008 remedial actions were not included in the 2006 dataset used to aid in designing the corehole density of Survey Unit 15 as detailed in the Characterization Plan (MACTEC 2007).
>
> Upon receipt of the supplemental historical dataset in 2013 (described in Section 2.5 as post-remediation samples collected in October 2008), AMEC re-evaluated the Survey Unit 15 corehole spacing using the same final design criteria as outlined in Sections 2.7.2 and 2.7.3 used during the design of Survey Unit 14. To reevaluate the Survey Unit 15 corehole design, the post-remediation sample results were plotted into SADA to verify their locations within Survey Unit 15. Next, the dataset was inputted into the Subsurface Soil DCGL calculators as the historical dataset, replacing the pre-remediation samples from circa 1992 and 1993. This test was performed to determine what the resultant corehole spacing would have been, if the post-remediation data had been available and were used during the survey design. This evaluation confirmed the conservative nature of the survey design for Survey Unit 15. It affirmed that corehole spacing prescribed in the design (one corehole every 10 m^2) was far more densely spaced than would be reasonably required to assess the dose consequences of

locally elevated pockets of residual radioactivity in the survey unit. Using the post-remedial action data, the Subsurface Soil DCGL calculators conclude that the *Minimum Areal Sample Frequency required to Satisfy DCGLEMC 90th Percentile* is 999 m^2 and that the *Minimum Areal Sample Frequency required to Satisfy DCGLEMC Observed Maximum* is 999 m^2 (the default maximum size of the Subsurface Soil DCGL calculators).

The historical dataset of Survey Unit 15, Appendix A, is the analytical results of the 2008 post-remediation samples.

Figure 5-39 in Section 5.7.3 of the FSS Report will be replaced to reflect the change to the historical dataset.

Survey Unit 14

In the Basis for Request #1, the NRC requests clarification as to why the higher density of corehole sampling in Survey Unit 15 is not also applicable to Survey Unit 14. The number of corehole locations for Survey Unit 14 was calculated using the method approved in the NFS Site-specific DP, Appendix B Section 3.2 (NFS 2006) and described in detail in the technical basis document entitled "Development & Application of Subsurface Soil DCGLs, North site Decommissioning Project, Nuclear Fuel Services Site," (MACTEC 2005). This method uses the sum-of-fraction (SOF) values calculated from the historical dataset to determine the number of coreholes and, consequently, the corehole density within Survey Unit 14. The result of this methodology dictated a corehole density of 49 m^2, constrained by the WRS Test, which was utilized in the final sampling design for Survey Unit 14. The corehole frequency determination for Survey Unit 14 is detailed in Section 2.7 of the FSS Report.

2. Possible Surface Soils needing a Surface Survey

Request:

Provide (i) justification that none of the soils in Survey Units 13, 14, and 15 will be original surface soils, (ii) a commitment that any surface soils will receive a surface survey, or (iii) a commitment to a process, at the time backfill and grading of the North Site takes place, to evaluate original surface soils that remain after backfill and grading.

Basis:

In the review of the FSS Report for Survey Units 1, 3, and 10, NRC staff identified that a surface soil survey had not been completed. Subsequently, NFS performed a surface survey for Survey Units 1 and 2. As documented in the NRC staff Safety Evaluation Report for Survey Units 1, 3, and 10 (letter dated June 15, 2010, ML101600349), NFS has stated that there is a backfill plan for the North Site and some survey units will be backfilled and thus will have no surface soils.

For the present FSS Report, it appears to NRC staff that Survey Unit 14 may contain surface soils. In the FSS Report, Table 4-7 shows the elevations of three coreholes in Survey Unit 14 to be approximately 1639 fee, msl. In addition, Figure 4-59 shows the same three coreholes contain soil mapped to the top 1 m model layer, meaning at depth 0-1 m. In a March 25, 2013, letter (package ML13099A0501), NFS submitted a Grading Plan map of the North Site, showing planned final grade. Based on that map, it appears the final grade for Survey Unit 14 is in the range of 1638-1640 ft. msl. Based on the similarity of the planned final grade and the elevation of the top of the coreholes, it appears that part of Survey Unit 14 may not have received backfill.

NFS Response:

The NRC notes that at the time of FSS sampling, areas in Survey Unit 14 had elevations that were similar (+/- 1 ft) to the elevations at final grade as delineated by the Grading Plan map of the North Site, and that original surface soils may still be present. The information described below satisfies *(i) justification that none of the surface soils in Survey Units 13, 14, and 15 will be original surface soils.*

Survey Units 13, 14, and 15 underwent remedial activities in 2007 and 2008, and were excavated down 2 - 4 meters with disposal of the excavated materials offsite. One result of the remedial actions (material excavation) left a steep grade at the edges of the excavation areas (i.e. the southwest and south boundaries of the North Site).

Three coreholes were mapped to depth layer 1 in Survey Unit 14; Coreholes 360, 363, and 366. Coreholes 360, 363, and 366 are located in the west and south areas of Survey Unit 14 (see Figure 2-17 - Survey Unit 14 Corehole Locations in the Final Status Survey Final Report for Survey Units 13, 14, and 15) in the southwest corner of the North Site (see Figure 2-13 - Survey Unit 14 Location Map in the Final Status Survey Final Report for Survey Units 13, 14, and 15). Following remedial activities and prior to collecting FSS samples, NFS backfilled the west and south areas of Survey Unit 14 with clean backfill material in order to provide a safe and stable platform for the roto-sonic drill rig used to collect soil cores from the otherwise inaccessible and unsafe areas. Coreholes 360, 363, and 366 are located in this backfilled area.

During FSS sampling activities, an AMEC geologist recorded, among other things, the lithology of each soil core in a soil boring log (described in Section 3.4.1 of the FSS Report). The soil boring logs for Coreholes 360, 363, and 366 (Appendix D of the FSS Report and Attachment 1 of this RAI Response) are summarized in Table 1. In all three coreholes, the geologist notated that the surface and near surface materials were composed of backfill material and that original site materials were not encountered until 8.0 - 10.5 feet below the ground surface at the time of FSS sampling.

Table 1 Depth of Fill Material - Coreholes 360, 363, 366

Corehole Number	Date Collected	Depth of Fill Material [ft below grade]
360	10/23/2008	8.0
363	10/23/2008	10.5
366	10/23/2008	10.0

The elevations of original site soils notated in the geologic soil boring logs for Coreholes 360, 363, and 366 are also consistent with the 2008 post-remediation grade in the neighboring coreholes, shown in Table 2. This further supports that the areas represented by Coreholes 360, 363, and 366 underwent remediation by excavation in 2007 and 2008 and were subsequently backfilled following remedial activities.

Table 2 Elevation of Original Site Soils in Neighboring Coreholes, Survey Unit 14

Corehole Number	Elevation of Original Site Soils [ft above msl]
359	1631.2
360	1630.9
361	1631.6
362	1630.9
363	1628.5
364	1632.0
365	1629.8
366	1629.1
367	1632.2
368	1628.3
369	1628.8
370	1625.7

21G-14-0104
GOV-01-55-06
ACF-14-0146

Supplemental Attachment

Soil Boring Record

4 pages to follow

SOIL BORING RECORD

NFS Subsurface Soil Characterization and Final Status Survey

MACTEC Project 9120-07-1235

BORING NO. 0360

Date Started: 10/23/06 Drilling Contractor: BOART LONGYEAR Page 1 of 1

Date Completed: 10/23/06 Driller: JAMES ROBINSON Survey Unit: 14

Logged By: Rodney Clark Equipment: MINISONIC Elevation: TBD

DEPTH (ft)	DEPTH (m)	RUN / RECOVERY	STRATA / UNIT	USCS	DESCRIPTION
1	0.3	0'-5'	Fill	ML	0'-8' gr. sa. SILT. (ML) strong brown (7.5YR 5/6), gr. is A. shale/F laminated dolostone/FILL material of mostly weathered Rare Fm. trace organics
2	0.6	5'/5'			
3	0.9				
4	1.2				
5	1.5	5'-10'			
6	1.8				
7	2.1	1'/5'			
8	2.4				
9	2.7		Alluvial	SM/SW	8'-15' gr. si. f-c SAND - SP SAND (SM/SW) (SW/SM), greenish gray (GLEY1 5/10Y/1), micaceous, moist-wet, gr. is trace-little F SR-WR alluvium up to 1" in diameter
10	3.1	10'-15'			
11	3.4				
12	3.7				
13	4.0				
14	4.3				
15	4.6	15'-20'		▽	15'-20' gr. SILT (ML), moist, light brownish gray (2.5Y 5/2), gr. is A. shale/weathered Rare Fm.
16	4.9				
17	5.2				
18	5.5		Residuum	ML	
19	5.8				
20	6.1				Terminate Boring @ 20'

Run = Drill Run Interval; Recovery (%) = Run Interval / Amount Recovered

Strata/Unit = deposition/formation (e.g., fill, alluvial, floodplain, residuum, bedrock, etc.)

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Knowingly or willfully falsifying or concealing a material fact on this form, or making false, fictitious or fraudulent statements or representations herein could consitute a felony punishable under Federal Statutes.

NFS File Classification: DCM-23-05-02

SOIL BORING RECORD

NFS Subsurface Soil Characterization and Final Status Survey

MACTEC Project 9120-07-1235

BORING NO. 0363

Date Started: 10/23/08 **Drilling Contractor:** BOART LONGYEAR **Page** 1 **of** 2

Date Completed: 10/23/08 **Driller:** JAMES ROBINSON **Survey Unit:** 14

Logged By: Rodney Clark **Equipment:** MINISONIC **Elevation:** TBD

DEPTH (ft)	DEPTH (m)	RUN / RECOVERY	STRATA / UNIT	USCS	DESCRIPTION
1	0.3	0'-5' 4/5'	FILL	ML	0'- d.gr. SILT (ML), strong brown (7.5YR 5/6) gr. is A-shale & laminated dolostone FILL material of Weathered Rone Fm
2	0.6				
3	0.9				
4	1.2				
5	1.5	5'-10'			
6	1.8				
7	2.1	5/5'			
8	2.4				
9	2.7				
10	3.1	10'-15'		SM	10.5'-16' si. f-c SAND (SM), moist-wet, greenish gray (GLEY 1 5/10Y(1)), micaceous gr. is trace-little f SR-WR alluvium mostly f-m quartz sand
11	3.4				
12	3.7	5/5'	Alluvial		
13	4.0				
14	4.3				
15	4.6	15'-20'		▽	
16	4.9				16'-20' SAA except marc/increase is SR-WR gr alluvium B coarse Sand
17	5.2	4/5'		SW	
18	5.5				
19	5.8				
20	6.1			CL	~~Terminate Boring @ 20.0~~ RC 10/23/08

Run = Drill Run Interval; Recovery (%) = Run Interval / Amount Recovered

Strata/Unit = deposition/formation (e.g., fill, alluvial, floodplain, residuum, bedrock, etc.)

MACTEC

SOIL BORING RECORD

NFS Subsurface Soil Characterization and Final Status Survey

MACTEC Project 9120-07-1235

BORING NO. 0363

Date Started: 10/23/08 **Drilling Contractor:** BART CONSTAR **Page** 2 **of** 2

Date Completed: 10/23/08 **Driller:** JAMES ROBINSON **Survey Unit:** 14

Logged By: Rodney Clark **Equipment:** MINISONIC **Elevation:** TBD

DEPTH (ft)	DEPTH (m)	RUN / RECOVERY	STRATA / UNIT	USCS	DESCRIPTION
		20'-25'			20' - sa.si.CLAY (CL), moist, brownish yellow (10YR 6/6), Plastic, some f.c Sand, trace gr. gr is A. Shale.
21	6.4		Alluvial	CL	
22	6.7				
		5/5'			23:25'
23	7.0				Weathered Rond FM, gr. si. CLAY (CL), moist, brownish yellow (10YR 6/6) gr is A. shale
24	7.3		Residuum		
25	7.6				Terminate Boring @ 25'
26	7.9				
27	8.2				
28	8.5				
29	8.8				
30	9.2				
31	9.5				
32	9.8				
33	10.1				
34	10.4				
35	10.7				
36	11.0				
37	11.3				
38	11.6				
39	11.9				
40	12.2				

Run = Drill Run Interval; Recovery (%) = Run Interval / Amount Recovered
Strata/Unit = deposition/formation (e.g., fill, alluvial, floodplain, residuum, bedrock, etc.)

MACTEC

NFS File Classification: DCM-23-05-02

SOIL BORING RECORD

NFS Subsurface Soil Characterization and Final Status Survey

MACTEC Project 9120-07-1235

BORING NO. 0366

Date Started: 10/23/08 Drilling Contractor: BOART LONGYEAR Page 1 of 1

Date Completed: 10/23/08 Driller: JAMES ROBINSON Survey Unit: 14

Logged By: Rodney Clark Equipment: MINISONIC Elevation: TBD

DEPTH (ft)	DEPTH (m)	RUN / RECOVERY	STRATA / UNIT	USCS	DESCRIPTION
1	0.3	0'-5'	Fill	ML	0'- cl gr SILT (ML), strong brown (7.5YR 5/6) moist gr is A shale & dolostone Weathered Rome Fm used as fill material / trace organics
2	0.6	4'/5'			
3	0.9				
4	1.2				
5	1.5				
		5'-10'			
6	1.8				
7	2.1	5'/5'			
8	2.4				
9	2.7				
10	3.1			▽	10'-14.5' si f-c SAND (SM), wet, greenish gray (GLEY 1 5/10Y 1), micaceous, gr is fracm-little f SR-WR alluvium mostly fine quartz sand
		10'-14.5'			
11	3.4		Alluvial	SM	
12	3.7	4'/5'			
13	4.0				
14	4.3				14.5'-15' Weathered Rome Fm. gr si-cl MY (CL) moist brownish yellow (10YR 6/6) gr is A shale
15	4.6		Residuum	ML	terminate Boring @ 15'
16	4.9				
17	5.2				
18	5.5				
19	5.8				
20	6.1				

Run = Drill Run Interval; Recovery (%) = Run Interval / Amount Recovered

Strata/Unit = deposition/formation (e.g., fill, alluvial, floodplain, residuum, bedrock, etc.)

MACTEC

Knowingly or willfully falsifying or concealing a material fact on this fom, or making false, fictitious or fraudulent statements or representations herein could consititute a felony punishable under Federal Statutes.

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