March 24, 2006

Mr. David Nelson
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852

SUBJECT: Final Status Survey Report for Survey Units 1 and 2 of Remaining 9.2 Acres of TDCC Bay City, MI, Site

Dear Mr. Nelson,

The purpose of this letter is to provide the Final Status Survey (FSS) report for Survey Units 1 and 2 of the remaining 9.2 acres on the Dow Chemical Company's (TDCC) Bay City, MI, Site. The FSS was conducted in accordance with the methods described in the *Supplement to the Decommissioning Plan* (Amendment No. 12 to TDCC License No. STB-527, October 6, 2005).

This submittal is submitted by Babcock Services, Inc., on the behalf of, and at the request of, Ben Baker, TDCC.

Please contact either Mr. Ben Baker or myself if you have any questions. Thank you.

Sincerely,

David Wojtkowiak
Radiation Safety Officer
TDCC Thorad Project

Final Status Survey Report

Survey Units SU-1 and SU-2

The Dow Chemical Company's Bay City, Michigan Facility

The Dow Chemical Company
Midland, Michigan 48674

March 2006

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1.0 BACKGROUND INFORMATION

The radioactive material at The Dow Chemical Company's (TDCC) Bay City storage site consisted primarily of foundry slag containing Thorium. This material, and similar material originally stored at TDCC's Midland site, was produced in the period from 1940 to 1970 as a residual from the production of a magnesium-thorium alloy. This lightweight alloy was used for defense purposes, including aircraft engines and aeronautical structural components.

Excavation activities were conducted at the Bay City site from 1996 to 1999. During this period, over 70,000 yards of waste was shipped to the Envirocare facility. The successful remediation of 31.3 acres of the 40.4 acre Bay City site was documented in five Final Status Survey (FSS) reports that were submitted to NRC from 1997 to 1999.

Major site remediation activities were temporarily discontinued in 1999 because an internal review concluded that the excavation and FSS methods in use at the time were inefficient and resulted in excessive removal of material below the unrestricted use criteria. To resolve this issue, TDCC began development of the Supplement to the Decommissioning Plan (Supplement). On October 6, 2005, NRC issued amendment No. 12 to TDCC License No. STB-527, approving the Supplement. The Supplement contained revised, more effective methods for conducting radiological surveys and analyzing radiological data for the remaining 9.1 acres of the Bay City Site. The Supplement also addressed the FSS of two land areas, the Support Zone and Rail Loading Area, as well as the onsite buildings, which were not specifically discussed in previous TDCC submittals.

Remediation activities resumed in May 2005 and continued through December 2005. Excavation, sampling, and surveying were completed in the remaining 9.1 acres in accordance with the methods described in the Supplement. The 9.1 acre area was divided into five survey units (SU). This report provides the FSS results for SU-1 and SU-2.

2.0 SITE INFORMATION

2.1 SITE DESCRIPTION

The Bay City site is located on Dow property located near the Town of Bay City, Michigan, about one-mile south of Saginaw Bay. The Bay City site is shown on Figure 2-1 in relation to adjacent land features and other facilities.

The site is located adjacent to and north of an inlet canal, which enters the Saginaw River to the east. The Saginaw River is located to the north and east of the site. Access to Dow property is restricted to authorized personnel.

The remaining 9.1 acres of the site that are addressed in the Supplement are shown in Figure 2-2. For the FSS, the 9.1 acre area was separated into five survey units (see Figure 2-3). This FSS report covers SU-1 and SU-2.

2.2 IDENTITY OF POTENTIAL CONTAMINANTS AND UNRESTRICTED USE CRITERIA

Based on the knowledge of the process that generated the slag material, and the results of the characterization survey, the radiological contaminants were determined to be Th-232, Th-230, and Th-228. The material has been present on the site for over 35 years. As stated in the Supplement, Th-232 is assumed to be in secular equilibrium with Th-228 and the ratio of Th-230:Th-232 is assumed to be 3:1.

2.2.1 Saturated and Unsaturated Zones

The site-specific unrestricted use criteria are 2.9 pCi/g for Th-232, 2.9 pCi/g for Th-228, and 8.7 pCi/g for Th-230 (14.5 total thorium). These criteria apply to the average concentration in both the saturated and unsaturated zones, and compliance must be demonstrated at the 95% confidence level within each survey unit.

Figure 2-1

Bay City Thorium Disposal Site

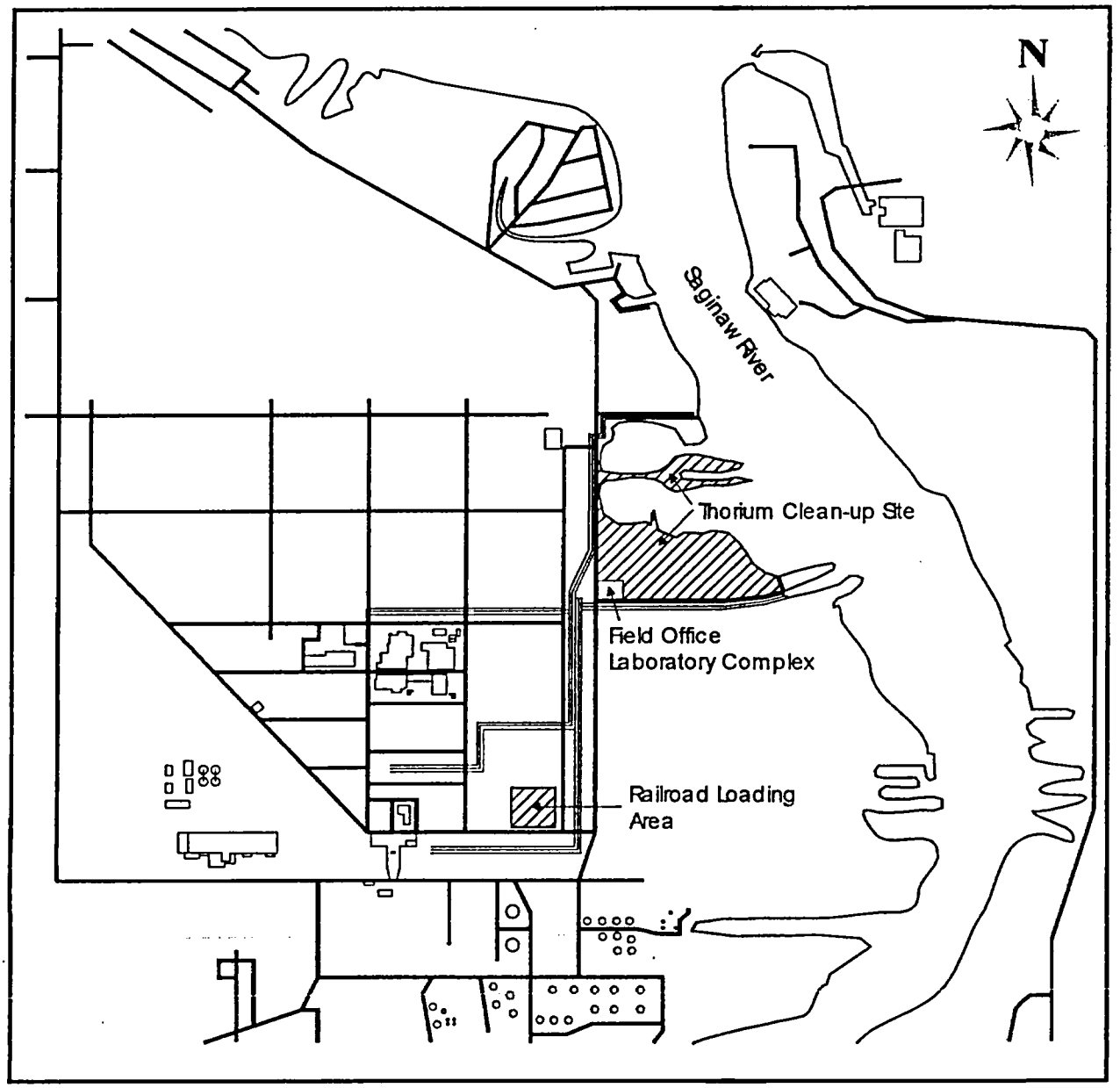


Figure 2-2

Bay City Thorium Disposal Site - Remaining 9.1 Acres

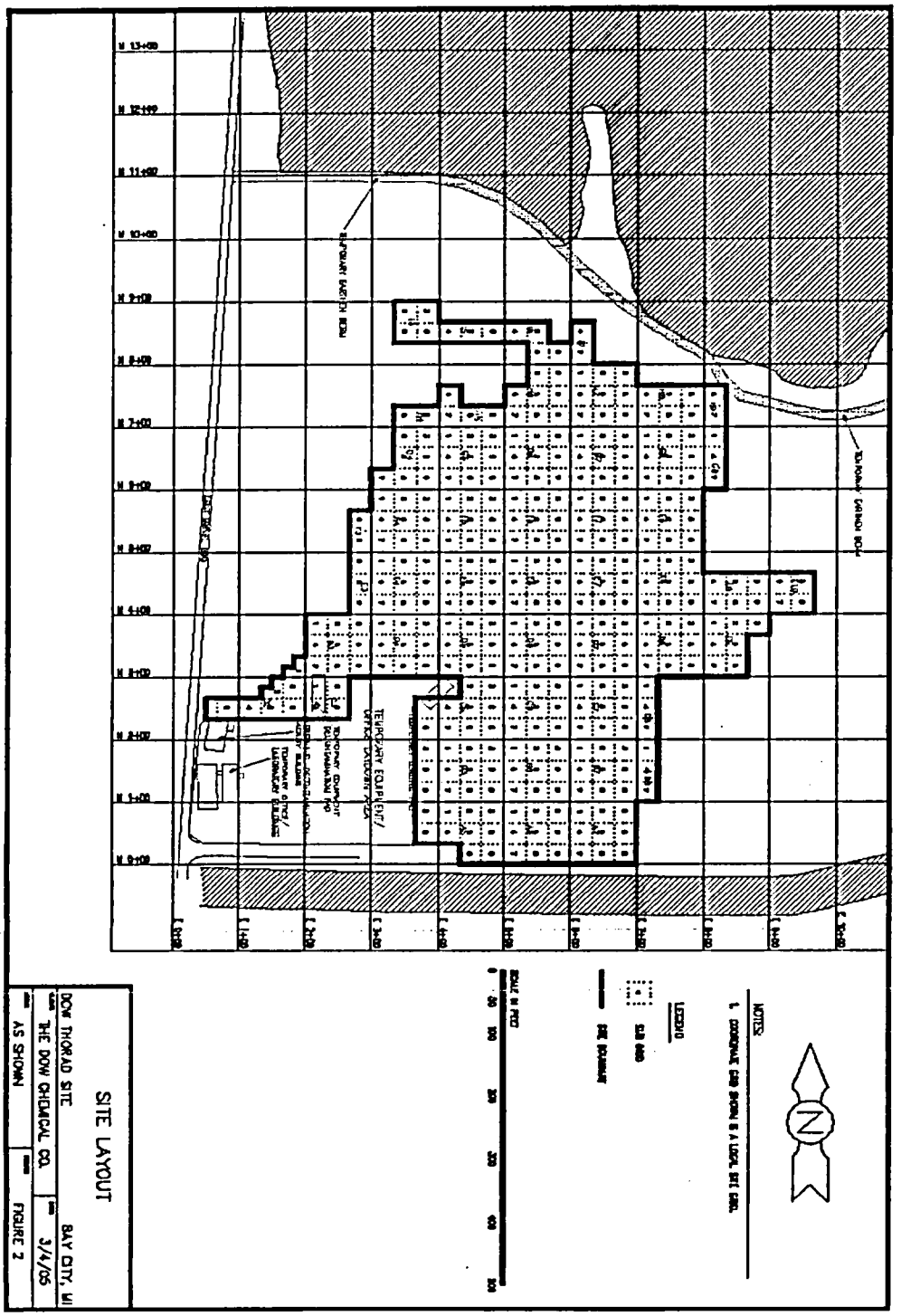
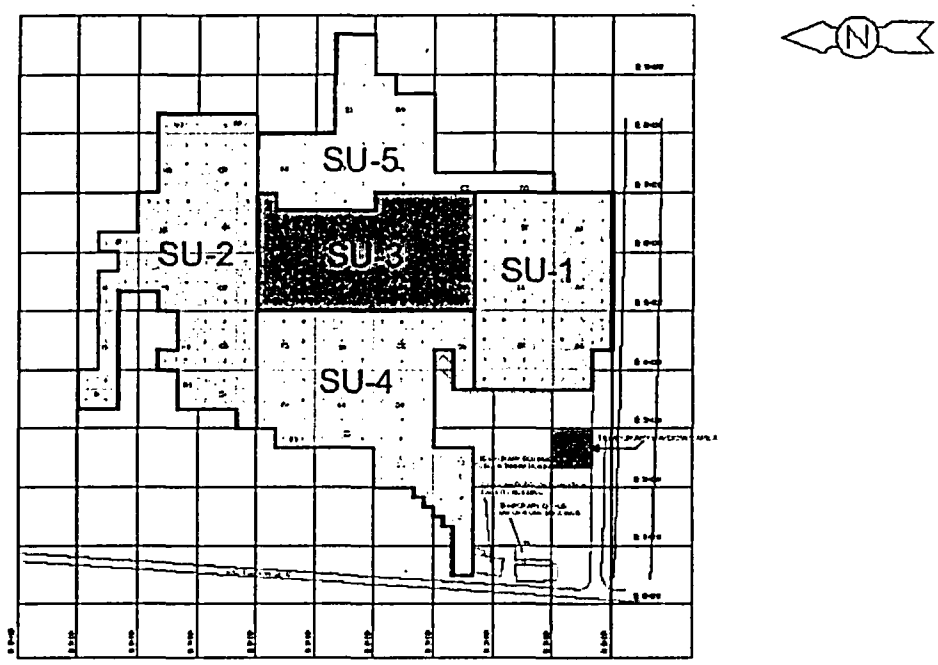


Figure 2-3

Survey Unit Breakdown for Remaining 9.1 Acres



The criteria were calculated using the approach described in Section 3.1 ("Release Criteria") of the December, 1995 Supplement to the Decommissioning Work Plan and response No. 8 of the Response to Comments (on the Work Plan) of March, 1996, in conjunction with the methodology in Appendix A of NUREG/CR 5849.

The total thorium unrestricted use criterion was determined as follows:

$$\text{Total Thorium Criteria} = \frac{1}{\left(\frac{0.2}{10}+\frac{0.2}{10}+\frac{0.6}{21}\right)}$$

Where: The fractions of Th-232, Th-230, and Th-228 are 0.2, 0.6, and 0.2, respectively, and the unrestricted use criteria is 10 pCi/g for Th-232 and Th-228 and 21 pCi/g for Th-230 (see March, 1996 Response to Comments).

The Supplement described data analysis methods for the unsaturated zone and the Thorad site-specific criteria of 3.2 pCi/g Th-232 (2.9 pCi/g plus 0.3 pCi/g background). The resulting analysis guidelines are listed below:

- Maximum individual sample - < 14.8 pCi/g Th-232
- Average of any two samples in a given 100m^2 subgrid from 0-1 meter depth - < 6.1 pCi/g Th-232
- Average of the four samples from the 0-1 m depth in a given 100 m^2 subgrid - < 3.2 pCi/g Th-232.
- Average of the eight samples from the 0-2 m depth in a given 100 m^2 subgrid - < 3.2 pCi/g Th-232 (if applicable).
- Average of the two samples from 0-2 meters in the same borehole - < 4.3 pCi/g Th-232 (if applicable).

For the saturated zone, the Supplement states that no individual sample may exceed 30 pCi/g.

2.2.2 Exposure Rate

The exposure rate criterion is 10 uR/hr, above background at 1 meter, averaged over each 100 m^2 subgrid. Consistent with NUREG/CR-5849, the maximum individual exposure rate will not exceed 2 times the criteria, (i.e., 20 uR/hr).

3.0 FINAL STATUS SURVEY OVERVIEW

3.1 FSS AND REMEDIATION METHODS

3.1.1 Saturated Zone

The FSS of the saturated zone was performed by collecting composite borehole samples collected from the top of the saturated zone to the underlying clay layer. Two samples were collected from each 100 m^2 subgrid.

The affected area around any location with a borehole sample exceeding 30 pCi/g Th-232 was excavated. The affected area was defined *apriori* by borehole samples collected in a square or circular pattern around the elevated location before excavation begins. The linear distance between samples varied depending on the size of the affected area but in no case exceeded 5m. The boundary defined by the square or circular pattern was projected downward to the clay layer. The entire resulting projected volume of saturated zone material was then remediated to the underlying clay layer. No additional samples were collected after excavation since the contaminated volume was well defined by the *apriori* boreholes.

The average Th-232 concentration in the *apriori* borehole samples replaced the original (i.e., pre-remediation) elevated value in the saturated zone FSS database which was then used in the 95% confidence compliance demonstration.

3.1.2 Unsaturated Zone

3.1.2.1 Borehole Samples

One borehole sample was collected from the unsaturated zone in each 25 m^2 quadrant. The borehole sample was collected either before or after the exposure rate criterion was demonstrated depending on the conditions encountered in a given area. If the unsaturated zone was more than 1.5 m from the surface in samples collected in 2005, the Supplement required the sample to be split. However, no 2005 unsaturated zone samples exceeded 1.5 m. Subsequently, the unsaturated zone borehole samples collected in 2005 were a minimum 1.4 ft deep consistent with the Supplement.

Excavation of unsaturated zone areas that exceeded the criteria continued until the saturated zone was encountered or a minimum of 1.4 ft was excavated. The Supplement discussed sampling requirements for excavation floors in the event the excavation did not reach the saturated zone. However, since all excavations were down to the saturated zone, no floor samples were applicable.

After excavation, a borehole sample of the excavation sidewall was collected at the location of the highest scan result, as documented by the cpm reading of a NaI detector in contact with the sidewall surface. The borehole sample was collected as close as possible to the sidewall given structural limitations and safety considerations. The FSS excavation sample result replaced the original (i.e., pre-remediation) elevated value in the unsaturated zone FSS database which was then used in the 95% confidence compliance demonstration.

3.1.2.2 Exposure Rate Measurements

Four FSS exposure rate measurements were collected in each 25 m^2 quadrant. This exceeds the one measurement per 25 m^2 frequency recommended in NUREG/CR-5849. Additional emphasis is placed on exposure rate measurements because 1) the vast majority of projected dose is from direct gamma, 2) exposure rate measurements best augment the 1m composite borehole samples, and 3) the SDMP Action plan limit for thorium is fundamentally based on a 10 uR/hr exposure rate as described in the 1981 Branch Technical Position "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operation." All FSS exposure rate measurements were conducted after backfill in areas where excavation was required.

3.1.2.3 Scan Survey

All land areas (post-backfill if excavation required) were 100% scan surveyed as a part of FSS. Based on the scan results, additional samples and analyses were conducted as described below.

- An additional exposure rate measurement was collected in each 100 m^2 sub-grid at the location of the highest FSS surface scan result (as documented by the cpm reading from a NaI detector in contact with the ground surface).
- A composite borehole sample was collected in each 100 m^2 sub-grid at the location of the highest FSS scan result (as documented by the cpm reading from a NaI detector in contact with the ground surface).
- If the borehole sample and exposure rate both meet the limit using the assessment methods described above, then the FSS was considered complete.

- If the exposure rate measurement caused a subgrid to fail, then an investigation was conducted and remediation completed as necessary. To demonstrate compliance, the biased exposure rate measurement was added to the existing 16 measurement FSS data set and the average of the 17 was required to be less than 10 uR/hr. The 20 uR/hr maximum also applied.
- If the borehole sample caused a subgrid to fail, then an investigation was conducted and remediation completed as necessary. To demonstrate compliance, the borehole sample was added to the existing four sample FSS borehole data set in a given sub-grid and the average of the five was required to be less than 3.2 pCi/g Th-232. The 14.8 pCi/g maximum also applied.

3.2 DATA ANALYSIS

Data analysis of the systematic and bias borehole results and exposure rate results were conducted using an Excel database. The database entries were reviewed by the RSO at the time of initial entry. In addition, radiological engineers compared all database entries to the corresponding hard copy gamma spec reports and exposure rate survey forms during the preparation of the final FSS data packages to ensure high quality and accuracy.

3.2.1 Saturated Zone

For the saturated zone, each individual borehole sample result was checked to ensure that no sample exceeded 30 pCi/g Th-232. The average concentration was calculated for each survey unit and compliance with the 3.2 pCi/g Th-232 criteria demonstrated at the 95% confidence level.

3.2.2 Unsaturated Zone

For the unsaturated zone, the borehole sample results were reviewed to ensure that each of the analysis guidelines listed in Section 2.2 were satisfied. Individual sample results were checked to ensure that no sample exceeded 14.8 pCi/g Th-232. The highest two sample average was calculated for each sub-grid to ensure that the average was less than 6.1 pCi/g Th-232. The average of the four samples in each sub-grid was calculated to demonstrate that the average was less than 3.2 pCi/g Th-232. No unsaturated zone sample exceeded 1.5 m in depth. Therefore, the analysis guidelines pertaining to the 0-2 m depth were not applicable. Finally, the average concentration in each survey unit was calculated to demonstrate that the average was less than 3.2 pCi/g at the 95% confidence level.

There were three additional calculations performed as a part of the unsaturated data analysis. First, in accordance with the Supplement, when remediation was performed due to borehole results, compliance with the 3.2 pCi/g 100 m^2 averaging criteria was demonstrated using the weighted average of the excavated area and the remaining area in a given subgrid. The weighted average calculation is best described by the following example (this example was also provided in the Supplement). Assume a 16 m^2 area is excavated down to the saturated zone (no floor sample required) and the bias sidewall sample was 5.7 pCi/g Th-232. Also assume that the average of the remaining 3 borehole sample results in the given 100 m^2 grid is 2.4 pCi/g. The weighted average would be 2.9 pCi/g (ie. [(16/100)(5.7) + (84/100)(2.4) = 2.9)]) and the 100 m^2 subgrid would be meet the 3.2 pCi/g compliance criteria (and the 14.8 pCi/g maximum criteria). This calculation was performed when applicable in the database.

Second, a calculation was performed after "bounding" samples were collected to further evaluate the area around an individual sample location that caused a sub-grid to fail one of the analysis guidelines. Four bounding samples were collected at a distance of one meter from the initial unsaturated zone borehole sample. If the average of the five samples met the analysis guideline, the average result replaced the initial result in the database. This was considered a realistic approach since the average over a larger area provided a more accurate representation of the 25 m^2 quadrant.

Note that this calculation was only performed if the sample was less than the maximum guideline. If the maximum was exceeded, remediation was performed in all cases, regardless of the bounding sample results.

Third, the average of all five borehole samples collected in each sub-grid was calculated. As described above, the five samples included the four systematic samples, one from each 25 m^2 quadrant, and the borehole result from the biased sample collected at the highest scan survey location. The five sample average was used in the compliance calculation.

3.2.3 Exposure Rate

Individual net exposure rate results were checked to ensure that each was below the 20 μR/hr maximum criteria. The average of the 17 measurements collected in each sub-grid, the initial 16 and the bias sample, was calculated to ensure that the average in each sub-grid was below the 10 μR/hr criteria.

3.3 FSS DOCUMENTATION

All soil samples, original survey data records, and log-books have been archived at the Dow Bay City facility and will be retained until after license termination.

Final Survey "Packages" were compiled for each sub-grid. The survey packages contain the records and information necessary to support the final reported FSS result. The results provided in this report can be independently calculated from the data included in each package. The packages are stored at the Bay City Facility and contain the following information:

- Sub-Grid Closure Summary Sheet: This cover sheet summarizes all of the FSS data for the sub-grid and provides a pass/fail indication for each of the criteria and analysis guidelines.

- Gamma Spectroscopy Reports: Copies of all of the analyses used to support the remediation and FSS are compiled in the package. Samples were collected and analyzed for several reasons including initial sampling, bounding samples, remediation samples, and bias samples.
- Remediation Records: Maps are provided for each remediated area to illustrate the location, area, and depth of excavation.
- Exposure Rate Records: All FSS exposure rate survey forms and results are included.

3.4 SAMPLE ANALYSIS

Final survey borehole samples were analyzed for Th-232 using the onsite NaI gamma spectroscopy system. Five percent of the FSS samples were analyzed by an independent laboratory to satisfy QA requirements. All QA data were acceptable in accordance the criteria provided in NRC Inspection Procedure IP 84526. The performance of onsite laboratory was determined to be acceptable by NRC as documented in Inspection Report 040-00017/05-001.

3.5 INSTRUMENTATION

Table 3-1 lists the field radiological monitoring instrumentation used during remediation and FSS. Each instrument was initially calibrated to NIST-traceable standards prior to use on the project, and then checked for radiation response and efficiency prior to daily use.

Table 3-1

Field Radiological Monitoring Instrumentation

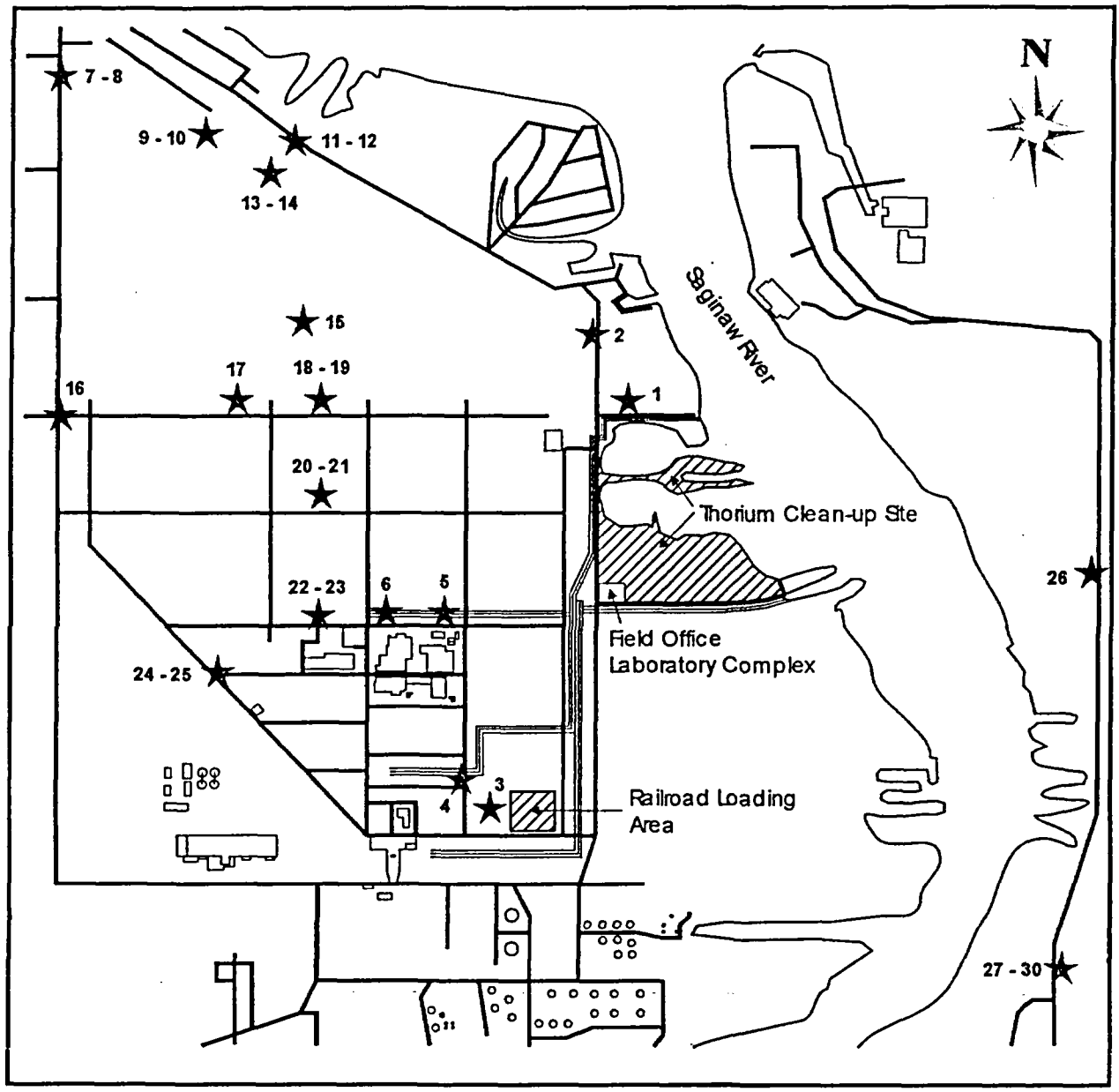
Instrument	Measures	Detector Efficiency*	LLD/MDA
Ludlum Model 43-5 w/ Ludlum Model 12	Alpha Surface	15%	22 dpm
Ludlum Model 43-90 w/ Ludlum Model 2221	Alpha Surface	22%	12 dpm
Ludlum Model 44-9 w/ Ludlum Model 12	Alpha, Beta, Gamma	12% alpha 15% beta 1% gamma	
Ludlum Model 43-10 w/ Ludlum 1000	Alpha (air filters, smears)	43%	0.04 dpm
Ludlum Model 19	Exposure Rate		1 microR/h
Air Particulate			
Eberline RAS-1 Air Pump	Flow Rate = 40-100 lpm		
MSA Escort Lapel Sampler	Flow Rate = 2-3 lpm		
General Metal Works-2000 High Vol Sampler	Flow Rate = 30-60 cfm		
Test/Calibration Equipment			
Ludlum Model 500 Pulser	NIST Traceable		
AFC-85L Air Flow Calibrator	NIST Traceable		
GMW-Calibrator Orifice for High Vol Sampler	NIST Traceable		
MSA Optiflow 660 Air Flow Calibrator	NIST Traceable		
Field Laboratory Equipment			
Canberra Gamma Spectrometer	Soil Th-232 Concentration		0.8 pCi/g

* Detector efficiencies are approximate and appropriate for Th-230, Tc-99, and Co-60

3.6 BACKGROUND LEVEL DETERMINATION

Background soil samples were collected from 30 locations in the unaffected area (Figure 3-4), and 29 samples analyzed for Th-230, Th-232, and Th-228 concentrations in the Freeport Laboratory (sample No.14 was lost in transit). Sample numbers 1 through 25 were collected from locations on Dow property that were not impacted by site operations. Sample numbers 26 through 30 were collected from locations east of the Dow property, across the Saginaw River. Background exposure rates were measured at the same locations as the soil samples. Statistical procedures described in NUREG/CR-5849 (see Table A7) were used to ensure that the average thorium concentrations determined were representative of true average background levels.

Figure 3-4, Background Sample Locations



4.0 SURVEY FINDINGS AND RESULTS

4.1 BACKGROUND LEVELS

Background soil concentrations (Table A2) averaged 0.30 pCi/g for Th-232, 0.49 pCi/g for Th-230, and 0.31 pCi/g for Th-228. Background exposure rate averaged 4 μR/h (Table A3). The number of background samples and exposure rate measurements collected were sufficient to satisfy NUREG/CR-5849 guidance that the variability of the mean distribution should be within ± 20% of the mean value at the 95% confidence level.

4.2 FINAL STATUS SURVEY RESULTS FOR SU-1 AND SU-2

The summary results are provided in Figure 4-1. The average and 95% confidence level for the unsaturated and saturated zones of both SU-1 and SU-2 are well below the criteria of 3.2 pCi/g Th-232. The mean concentrations range from 1.0 pCi/g to 1.8 pCi/g Th-232.

Table 4-1

Summary of FSS Results in SU-1 and SU-2

Survey Unit	Unsaturated Zone pCi/g Th-232			Saturated Zone pCi/g Th-232			Exposure Rates μR/hr	
	Average	95% CL	Max Value	Average	95% CL	Max Value	Average	Max Value
1	1.4	1.5	11.2	1.0	1.3	18.3	7	16
2	1.6	1.7	9.8	1.8	2.2	22.6	6	13

5.0 REFERENCES

5.1 Dow Decommissioning Work Plan, October 1993

5.2 Supplement to the Decommissioning Work Plan, December 1995

5.3 Letter from Dow to NRC, Response to Comments, March 1996

5.4 NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination (Draft for Comment), December 1993

5.5 NRC Inspection Report No. 040-00017/05-001 (DNMS), December 2, 2005

5.6 Letter from NRC to Dow, Review of Final Status Survey Reports for the Previously Remediated Areas VA-I through VA-VI, Dow Chemical Company's Bay City, MI, SDMP Site (TAC# L60463), August 16, 2002

5.7 Dow "Background Radiological Survey", October 11-13, 1989

5.8 Dow Central Research Index Report, CRI-TSP-92-076, "Radiological Analysis of Soil Samples from the Madison, Illinois Storage Facility Utilizing a Revised Alpha Spectroscopic Method"

Appendix A

Final Status Survey

Verification Measurements / Analyses

Table A1

BACKGROUND SOIL CONCENTRATIONS							
Bay City							
Sample Name	^{232}Th (pCi/G)	Error (2σ)	MDA (pCi/G)	^{230}Th (pCi/G)	Error (2σ)	^{228}Th (pCi/G)	Error (2σ)
BCBKG01	0.39	0.08	0.13	1.04	0.84	0.48	0.44
BCBKG02	0.36	0.07	0.14	0.46	0.34	0.41	0.31
BCBKG03	0.28	0.08	0.11	0.38	0.31	0.35	0.29
BCBKG04	0.44	0.10	0.13	0.80	0.91	0.62	0.74
BCBKG05	0.43	0.10	0.15	0.70	0.51	0.52	0.40
BCBKG06	0.51	0.18	0.13	0.68	0.47	0.48	0.35
BCBKG07	0.38	0.19	0.13	2.30	3.69	0.77	1.38
BCBKG08	0.16	0.08	0.11	0.37	0.48	0.12	0.20
BCBKG09	0.13	0.07	0.10	0.21	0.25	0.09	0.12
BCBKG10	0.26	0.09	0.13	0.38	0.39	0.23	0.26
BCBKG11	0.19	0.07	0.11	0.04	0.04	0.14	0.10
BCBKG12	0.18	0.08	0.14	0.18	0.14	0.11	0.09
BCBKG13	0.18	0.08	0.14	0.21	0.12	0.19	0.11
BCBKG15	0.23	0.07	0.11	0.12	0.15	0.32	0.31
BCBKG16	0.56	0.12	0.16	0.76	0.51	0.66	0.46
BCBKG17	0.41	0.10	0.16	0.30	0.47	0.30	0.47
BCBKG18	0.10	0.08	0.12	0.18	0.21	0.16	0.19
BCBKG19	0.12	0.06	0.10	0.15	0.14	0.06	0.07
BCBKG20	0.14	0.07	0.11	0.29	0.25	0.09	0.09
BCBKG21	0.19	0.07	0.15	0.23	0.17	0.13	0.11
BCBKG22	0.20	0.07	0.10	0.36	0.39	0.13	0.18
BCBKG23	0.15	0.06	0.11	0.24	0.24	0.30	0.29
BCBKG24	0.12	0.08	0.11	0.13	0.16	0.05	0.08
BCBKG25	0.22	0.07	0.08	0.93	0.89	0.72	0.70
BCBKG26	0.32	0.09	0.13	0.27	0.23	0.16	0.15
BCBKG27	0.56	0.20	0.20	0.93	0.69	0.90	0.67
BCBKG28	0.68	0.24	0.20	0.41	0.45	0.07	0.14
BCBKG29	0.43	0.19	0.21	0.65	1.22	0.43	0.89
BCBKG30	0.34	0.08	0.15	0.44	0.45	0.10	0.16
AVERAGE	0.30			0.49		0.31	
St. Dev.	0.16			0.44		0.24	

Table A2

Background Exposure Rates – Bay City

Location	µR/hr
1	4
2	3
3	3
4	4
5	5
6	4
7	3
8	4
9	4
10	6
11	8
12	3
13	4
14	5

See Survey Record # S05-0194 for background exposure rate locations.

Number of measurements: 14
Average: 4 µR/hr

TABLE A3
FSS BOREHOLE SAMPLE
RESULTS FOR SU-1

Sub-grid	Survey Unit	Unsaturated Zone									Saturated Zone			
		Quadrant Sample Results (pCi/g)				Max Sample Conc.	2 Sample Max. Avg.	4 Sample Avg.	Final Sample	Final Average	Quadrant Sample Results (pCi/g)			
		A	B	C	D						A	B	C	D
A4-3	1	0.4	1.8	0.4	0.4	1.8	1.1	0.8	0.6	0.7	0.4			1.1
A4-6	1	0.7	0.4	0.5	0.4	0.7	0.6	0.5	0.3	0.5		0.4	0.5	
A5-1	1	0.3	0.7	1.1	0.3	1.1	0.9	0.6	0.4	0.6	0.5			0.3
A5-2	1	0.7	1.4	0.5	3.5	3.5	2.5	1.5	2.8	1.8	0.3			0.3
A5-3	1	1.5	1.8	0.6	0.5	1.8	1.6	1.1	2.7	1.4		0.4	0.3	
A5-4	1	0.5	0.3	0.4	1.1	1.1	0.8	0.6	0.4	0.6	0.3			1.1
A5-5	1	0.4	2.8	0.3	0.5	2.8	1.6	1.0	5.0	1.8	0.5			0.5
A5-6	1	0.4	0.6	1.0	2.4	2.4	1.7	1.1	1.0	1.1		0.4	0.4	
A5-8	1	0.7	0.6	2.0	0.3	2.0	1.3	0.9	1.0	0.9	0.6			0.4
A5-9	1	0.7	0.3	0.3	0.3	0.7	0.5	0.4	0.3	0.4	0.3	0.7		
A6-1	1	3.5	0.7	0.4	0.4	3.5	2.1	1.3	1.3	1.3	0.5			0.4
A6-2	1	0.3	0.3	0.3	0.9	0.9	0.6	0.5	5.0	1.4		0.4	0.6	
A6-3	1	0.5	2.8	1.6	0.6	2.8	2.2	1.4	3.4	1.8		1.2	0.5	
A6-4	1	0.6	0.5	0.5	0.3	0.6	0.6	0.5	1.3	0.6	0.4			0.3
A6-5	1	3.4	1.0	0.4	0.4	3.4	2.2	1.3	1.9	1.4	0.6			0.5
A6-6	1	0.6	1.6	1.2	0.6	1.6	1.4	1.0	11.2	3.0		0.7	1.4	
A6-7	1	0.3	0.7	0.3	0.4	0.7	0.5	0.4	0.8	0.5	0.3	0.3		
A6-8	1	0.4	0.8	0.4	0.4	0.8	0.6	0.5	1.7	0.7	0.6	0.4		
A6-9	1	0.5	0.6	0.3	0.5	0.6	0.6	0.5	0.5	0.5	0.4	0.3		
A7-1	1	2.7	3.0	3.1	3.4	3.4	3.3	2.9	3.7	3.1	2.3			0.7
A7-2	1	2.0	3.7	0.5	3.8	3.8	3.8	2.2	1.3	2.1		2.9	0.4	
A7-3	1	6.0	0.5	0.5	0.4	6.0	3.3	0.6	4.5	1.4		0.3	0.4	
A7-4	1	0.4	2.6	1.0	1.0	2.6	1.8	1.2	4.7	1.9	0.4			0.8
A7-5	1	2.4	0.6	4.3	1.1	4.3	3.4	2.1	7.3	3.2	0.6			0.9
A7-6	1	0.4	0.5	0.5	1.6	1.6	1.1	0.8	0.6	0.7	0.7			0.5
A7-7	1	0.4	0.7	0.4	0.4	0.7	0.5	0.5	0.4	0.5	0.5	0.6		
A7-8	1	0.8	0.9	0.4	0.3	0.9	0.8	0.6	0.8	0.6	0.4	0.4		
A7-9	1	1.1	3.4	0.5	0.3	3.4	2.3	1.3	1.1	1.3	0.4	0.5		
B4-3	1	0.3	0.4	0.6	0.6	0.6	0.6	0.5	0.4	0.5	0.3	0.3		0.3
B4-6	1	0.5	0.3	0.6	0.3	0.6	0.6	0.4	0.4	0.4	0.3			0.3
B4-9	1	0.3	0.3	0.4	0.9	0.9	0.6	0.5	0.1	0.4		0.5	0.4	
B5-1	1	0.4	0.5	0.3	0.6	0.6	0.6	0.5	0.8	0.5		0.5	0.3	
B5-2	1	0.4	0.7	0.5	0.9	0.9	0.8	0.6	2.2	0.9	0.4			0.9
B5-3	1	0.7	0.3	0.3	2.4	2.4	1.5	0.9	0.6	0.9		0.3	0.4	
B5-4	1	0.7	0.7	1.2	0.5	1.2	1.0	0.8	0.4	0.7		0.3	0.4	
B5-5	1	0.4	0.7	0.8	2.1	2.1	1.4	1.0	3.5	1.5	0.8			0.3
B5-6	1	0.7	2.1	0.5	4.4	4.4	3.2	1.9	1.8	1.9		0.4	0.4	0.5
B5-7	1	0.4	0.5	0.9	0.3	0.9	0.7	0.6	0.4	0.5		0.5	0.3	
B5-8	1	0.5	2.6	0.3	0.3	2.6	1.6	0.9	2.9	1.3		0.8	0.4	
B5-9	1	0.4	1.0	4.4	4.6	4.6	4.5	2.6	2.1	2.5	0.4			0.9
B6-1	1	0.5	2.8	0.7	0.5	2.8	1.7	1.1	1.8	1.2	2.0			0.3
B6-2	1	1.6	0.7	0.5	0.5	1.6	1.2	0.8	7.7	2.2	1.4			0.3
B6-3	1	1.2	0.5	0.6	0.6	1.2	0.9	0.7	8.8	2.3		0.7	0.4	
B6-4	1	2.0	1.8	1.2	0.3	2.0	1.9	1.3	3.0	1.7	0.5			0.7
B6-5	1	0.9	1.5	0.4	2.4	2.4	1.9	1.3	0.3	1.1		3.4	0.3	
B6-6	1	0.9	0.7	0.4	7.5	7.5	4.2	2.4	3.2	2.5	0.4			0.5
B6-7	1	2.8	1.6	1.6	0.5	2.8	2.2	1.6	2.5	1.8	0.7			0.3
B6-8	1	0.4	0.9	2.3	1.1	2.3	1.7	1.2	1.9	1.3	0.4			0.3
B6-9	1	3.1	1.2	2.2	0.7	3.1	2.7	1.8	1.8	1.8	0.5			0.4
B7-1	1	0.7	0.5	1.3	0.4	1.3	1.0	0.7	4.1	1.4	0.5			0.5
B7-2	1	0.5	0.6	1.7	2.7	2.7	2.2	1.4	2.1	1.5		0.9	0.4	
B7-3	1	0.7	2.8	0.6	1.8	2.8	2.3	1.0	7.6	2.3	4.2			9.0
B7-4	1	0.5	0.5	0.6	5.1	5.1	2.8	1.7	1.6	1.7	0.5			3.1
B7-5	1	0.6	3.0	0.6	5.1	5.1	4.1	2.1	2.0	2.1	0.5			13.1
B7-6	1	1.3	2.1	1.2	1.4	2.1	1.8	1.4	5.0	2.1	2.5			1.0
B7-7	1	3.0	5.5	0.8	0.7	5.5	4.3	2.5	5.6	3.1		1.7	0.4	
B7-8	1	2.7	0.6	3.9	0.8	3.9	3.3	2.0	3.4	2.3		1.1	3.0	

TABLE A3
FSS BOREHOLE SAMPLE RESULTS FOR SU-1

Sub-grid	Survey Unit	Unsaturated Zone									Saturated Zone			
		Quadrant Sample Results (pCi/g)				Max Sample Conc.	2 Sample Max. Avg.	4 Sample Avg.	Final Sample	Final Average	Quadrant Sample Results (pCi/g)			
		A	B	C	D						A	B	C	D
B7-9	1	1.5	1.0	3.4	2.9	3.4	3.2	2.6	4.9	3.1	0.4			18.3
C4-9	1	2.3	0.7	0.8	0.3	2.3	1.5	1.0	0.5	0.9	0.5			0.7
C5-7	1	0.4	0.3	0.3	0.3	0.4	0.4	0.3	0.4	0.3		0.6	0.3	
C5-8	1	0.4	1.0	0.3	0.4	1.0	0.7	0.5	3.3	1.1	0.8			0.5
C5-9	1	0.9	0.7	0.3	0.5	0.9	0.8	0.6	0.5	0.6	0.4			0.3
C6-7	1	0.8	1.7	0.3	0.4	1.7	1.2	0.8	5.6	1.8		0.3	0.8	
C6-8	1	0.7	1.1	1.2	0.5	1.2	1.1	0.9	0.9	0.9		0.5	0.3	
C6-9	1	0.3	1.1	0.4	0.9	1.1	1.0	0.7	1.2	0.8	1.1			0.3
C7-7	1	1.4	2.7	0.4	1.0	2.7	2.0	1.4	1.1	1.3		0.3	0.7	
C7-8	1	5.3	0.7	0.4	1.3	5.3	3.3	2.1	0.6	1.8	0.5			0.5
C7-9	1	0.8	0.8	1.1	3.6	3.6	2.3	1.7	1.7	1.7		8.1	2.2	

TABLE A4
FSS BOREHOLE SAMPLE
RESULTS FOR SU-2

Sub-grid	Survey Unit	Unsaturated Zone									Saturated Zone			
		Quadrant Sample Results (pCi/g)				Max Sample Conc.	2 Sample Max. Avg.	4 Sample Avg.	Final Sample	Final Average	Quadrant Sample Results (pCi/g)			
		A	B	C	D						A	B	C	D
G4-2	2	1.4	1.0	0.9	0.4	1.4	1.2	0.9	3.2	1.4	0.6			0.9
G4-3	2	1.4	2.2	3.9	1.4	3.9	3.0	2.2	7.0	3.2		2.9	1.7	
G4-5	2	1.1	1.5	4.8	2.7	4.8	3.8	2.5	1.6	2.3		0.4	0.3	
G4-6	2	1.1	2.8	3.6	1.6	3.6	3.2	2.1	1.0	1.9	0.8			0.6
G4-7	2	1.3	0.5	2.2	0.8	2.2	1.7	1.2	4.3	1.8		0.6	1.1	
G4-8	2	2.4	2.6	1.7	4.1	4.1	3.3	2.3	2.4	2.3	0.4	0.7		
G4-9	2	4.0	1.7	3.5	1.2	4.0	3.7	2.6	2.0	2.5		0.7	0.8	
G5-1	2	1.9	6.0	0.5	2.9	6.0	4.5	2.8	2.1	2.7	2.5			6.4
G5-2	2	0.9	1.7	3.9	0.7	3.9	2.8	1.8	1.1	1.7		1.2	19.1	
G5-3	2	0.8	0.5	0.8	1.3	1.3	1.1	0.8	2.9	1.3	2.2			1.0
G5-4	2	3.2	3.2	2.1	0.8	3.2	3.2	2.3	1.7	2.2		0.3	4.3	
G5-5	2	3.4	3.0	3.8	1.7	3.8	3.6	3.0	3.1	3.0	5.7			2.3
G5-6	2	3.6	1.3	3.6	2.8	3.6	3.6	2.9	3.6	3.0		3.6	0.3	
G5-7	2	1.9	1.5	2.6	2.9	2.9	2.8	2.2	0.8	1.9		0.3	0.5	
G5-8	2	1.9	3.1	0.6	5.0	5.0	4.0	2.7	2.7	2.7	2.7			1.0
G5-9	2	4.1	1.2	3.1	1.8	4.1	3.6	2.6	0.8	2.2		3.9	0.8	
G6-1	2	2.2	1.4	1.7	1.5	2.2	1.9	1.7	5.4	2.4	1.8			1.1
G6-2	2	1.0	0.6	1.0	0.8	1.0	1.0	0.8	0.4	0.8		1.0	0.4	
G6-3	2	1.5	3.4	0.4	0.2	3.4	2.5	1.4	0.5	1.2	1.2			0.9
G6-4	2	1.3	0.9	0.8	2.4	2.4	1.9	1.4	1.3	1.4	0.8	1.1	0.9	
G6-5	2	1.2	1.0	1.7	1.0	1.7	1.5	1.2	1.3	1.3	1.9			1.8
G6-6	2	1.8	0.8	0.4	1.1	1.8	1.5	1.0	1.4	1.1		0.5	2.0	
G6-7	2	1.5	2.3	3.2	1.7	3.2	2.8	2.2	2.9	2.3	0.6			0.5
G6-8	2	0.7	0.6	0.6	3.2	3.2	2.0	1.3	1.0	1.2		0.3	1.1	
G6-9	2	0.9	1.5	0.4	1.8	1.8	1.6	1.1	1.4	1.2	0.4			0.9
G7-1	2	0.7	0.8	9.3	0.8	9.3	5.1	2.9	0.7	2.4	0.9	0.6	0.6	
G7-2	2	0.4	0.9	1.2	1.3	1.3	1.3	1.0	1.3	1.1		0.9	0.4	
G7-3	2	0.6	2.9	0.9	1.1	2.9	2.0	1.4	8.2	2.7	1.0			1.2
G7-4	2	0.4	5.3	0.4	2.6	5.3	4.0	2.2	1.0	1.9	0.6			1.4
G7-5	2	1.8	1.2	0.4	1.3	1.8	1.6	1.2	1.6	1.3	0.8			1.2
G7-6	2	1.1	1.3	0.8	2.1	2.1	1.7	1.3	1.5	1.3		1.6	1.0	
G7-7	2	3.7	0.4	1.3	5.3	5.3	4.5	2.7	0.8	2.3		0.8	1.2	
G7-8	2	1.6	1.0	1.3	1.5	1.6	1.5	1.3	1.1	1.3		0.7	0.6	
G7-9	2	4.0	0.7	0.7	0.6	4.0	2.4	1.5	7.5	2.7	5.0			22.6
G8-1	2	0.4	0.4	0.7	0.5	0.7	0.6	0.5	2.1	0.8	0.6			0.4
G8-2	2	0.5	1.9	3.6	0.5	3.6	2.7	1.6	1.5	1.6		1.3	0.5	
G8-3	2	2.2	3.2	0.3	1.3	3.2	2.7	1.8	5.4	2.5	0.7			0.6
G8-4	2	1.3	0.9	1.1	1.0	1.3	1.2	1.1	1.0	1.1	1.1			1.0
G8-5	2	1.2	1.0	0.4	0.9	1.2	1.1	0.9	0.7	0.9		1.4	0.8	
G8-6	2	1.4	2.0	0.4	0.3	2.0	1.7	1.0	1.0	1.0	0.6			0.5
G8-7	2	0.8	0.7	1.8	0.5	1.8	1.3	1.0	2.1	1.2	0.8			0.8
G8-8	2	0.6	0.4	1.0	0.3	1.0	0.8	0.6	1.3	0.7		0.8	0.9	
G8-9	2	0.4	2.5	1.1	5.8	5.8	4.1	2.4	1.8	2.3		2.4	1.3	
G9-1	2	1.5	1.7	0.3	1.6	1.7	1.7	1.3	6.1	2.2	6.3	2.9		0.7
G9-4	2	0.3	1.0	0.7	0.8	1.0	0.9	0.7	6.0	1.8		0.9	1.0	
G9-7	2	0.8	0.6	0.8	0.4	0.8	0.8	0.6	0.4	0.6	2.1			0.5
H4-8	2	0.4	0.5	0.5	2.1	2.1	1.3	0.9	1.0	0.9	0.6			0.6
H4-9	2	1.1	0.7	0.6	0.8	1.1	1.0	0.8	1.2	0.9	1.2			0.3
H5-4	2	0.9	2.7	6.9	1.9	6.9	4.8	3.1	1.7	2.8		16.8	2.8	
H5-7	2	9.8	0.6	1.1	0.9	9.8	5.4	3.1	0.8	2.6	17.8			2.6
H5-8	2	2.7	1.4	6.1	0.6	6.1	4.4	2.7	4.6	3.1		1.3	1.7	
H5-9	2	0.8	1.9	0.4	1.4	1.9	1.7	1.1	5.4	2.0		0.9	1.1	
H6-2	2	0.6	1.3	1.1	2.7	2.7	2.0	1.4	1.8	1.5	1.8			5.5
H6-3	2	1.2	0.5	2.4	0.5	2.4	1.8	1.2	1.3	1.2	1.3			0.5
H6-4	2	2.4	0.6	0.4	0.5	2.4	1.5	1.0	0.9	1.0	0.9			1.1
H6-5	2	1.0	1.4	0.4	0.4	1.4	1.2	0.8	0.3	0.7		1.5	0.6	
H6-6	2	8.8	0.7	0.7	0.5	8.8	4.7	2.7	0.9	2.3	5.5			1.1

TABLE A4
FSS BOREHOLE SAMPLE
RESULTS FOR SU-2

Sub-grid	Survey Unit	Unsaturated Zone									Saturated Zone			
		Quadrant Sample Results (pCi/g)				Max Sample Conc.	2 Sample Max. Avg.	4 Sample Avg.	Final Sample	Final Average	Quadrant Sample Results (pCi/g)			
		A	B	C	D						A	B	C	D
H6-7	2	1.0	1.4	1.1	1.8	1.8	1.6	1.3	0.6	1.2	1.0			0.9
H6-8	2	0.6	0.5	1.2	0.7	1.2	1.0	0.7	0.9	0.8	1.1			1.7
H6-9	2	0.4	0.6	1.3	0.7	1.3	1.0	0.8	2.7	1.1		1.0	0.4	
H7-1	2	3.2	1.9	2.6	1.2	3.2	2.9	2.2	1.6	2.1		1.6	0.5	
H7-2	2	1.9	0.6	1.0	0.5	1.9	1.4	1.0	0.7	0.9		1.2	0.6	
H7-3	2	0.4	0.4	0.8	1.3	1.3	1.1	0.7	1.3	0.9		0.7	1.0	
H7-4	2	0.7	1.2	0.4	0.4	1.2	0.9	0.7	1.0	0.7	1.2			0.5
H7-5	2	0.5	0.4	0.9	0.5	0.9	0.7	0.6	1.1	0.7		1.1	1.9	
H7-6	2	1.2	1.2	1.6	0.2	1.6	1.4	1.0	1.6	1.2		0.4	0.4	
H7-7	2	0.4	0.4	1.1	0.4	1.1	0.8	0.6	5.1	1.5		0.7	0.8	
H7-8	2	0.8	0.5	0.7	1.0	1.0	0.9	0.8	0.7	0.7	0.4			1.0
H7-9	2	1.1	7.2	0.7	1.3	7.2	4.2	2.6	1.1	2.3		2.1	0.9	
H8-4	2	0.4	1.4	1.6	0.7	1.6	1.5	1.0	0.7	0.9			2.8	0.7
H8-5	2	0.6	3.4	1.1	2.3	3.4	2.8	1.8	0.6	1.6	1.2			0.4
H8-6	2	0.9	2.5	1.0	1.7	2.5	2.1	1.5	1.7	1.6	0.5			0.4
H8-7	2	0.5	1.0	0.9	0.4	1.0	1.0	0.7	0.8	0.7		0.8	0.4	
H8-8	2	0.6	1.3	1.6	1.2	1.6	1.5	1.2	0.7	1.1		0.8		1.6
H8-9	2	1.3	0.7	1.1	2.2	2.2	1.7	1.3	0.8	1.2	0.5			1.1
H9-4	2	1.1	0.7	1.0	1.0	1.1	1.1	1.0	1.0	1.0	0.8			1.3
H9-7	2	1.3	0.5	1.2	1.0	1.3	1.2	1.0	1.3	1.1		0.4	1.2	
I4-2	2	0.4	1.4	1.4	1.5	1.5	1.4	1.2	0.7	1.1	0.4			1.0
I4-3	2	2.4	1.0	2.2	4.2	4.2	3.3	2.5	0.8	2.1		0.9	1.2	
I4-5	2	0.4	3.9	1.0	2.2	3.9	3.0	1.8	5.5	2.5	3.2			4.7
I4-6	2	1.0	4.7	3.1	3.0	4.7	3.9	3.0	2.5	2.9		3.2	3.9	
I5-4	2	1.2	0.9	2.3	0.7	2.3	1.7	1.3	4.4	1.9	3.2			12.5
I5-5	2	3.5	0.7	0.6	0.9	3.5	2.2	1.0	3.5	1.5		0.8	1.0	
I5-6	2	0.4	0.5	1.1	0.6	1.1	0.9	0.7	1.8	0.9	0.8			10.7
I6-4	2	1.8	0.6	0.9	0.5	1.8	1.4	1.0	2.4	1.2		1.2	4.5	
I6-5	2	1.0	1.0	0.4	0.8	1.0	1.0	0.8	0.6	0.8	2.5			0.4
I6-8	2	0.8	2.9	1.5	1.2	2.9	2.2	1.8	1.0	1.7		1.5	1.0	
I6-9	2	1.3	0.5	0.9	1.3	1.3	1.3	1.0	0.7	1.0	3.3			1.0
I7-4	2	2.1	0.4	0.8	0.4	2.1	1.5	0.9	1.0	0.9		1.2	1.6	
I7-7	2	2.5	0.4	0.5	1.7	2.5	2.1	1.3	2.6	1.5		0.6	0.9	

TABLE A5
FSS EXPOSURE RATE
RESULTS FOR SU-1

Sub-grid	Survey Unit	Scan				Quadrant Exposure Rates - µR/hr (corrected for background)																Average (corrected for BKG)
		CPM Range		Highest Scan Location		Quadrant A				Quadrant B				Quadrant C				Quadrant D				
		Low	High	Max. CPM	Exposure Rate (µR/hr)	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
A4-3	1	6,037	9,787	10,026	7	4	10	4	10	7	7	8	12	4	10	4	4	6	6	7	6	6.82
A4-6	1	5,041	6,254	6,254	3	4	4	3	3	3	3	3	3	3	3	2	2	3	4	3	3	3.06
A5-1	1	7,020	10,950	19,761	11	6	7	6	7	8	10	8	10	6	7	5	5	9	11	10	13	8.18
A5-2	1	7,957	28,588	67,288	12	10	10	9	11	7	9	8	8	7	8	8	10	6	7	8	8	8.59
A5-3	1	8,442	29,733	31,508	9	7	7	7	6	7	7	6	6	7	7	8	7	7	7	7	6	6.94
A5-4	1	7,245	9,038	11,062	5	5	4	4	4	5	6	7	6	4	5	3	4	6	5	5	4	4.82
A5-5	1	8,922	14,124	37,051	8	6	6	5	5	5	5	6	7	5	6	5	5	6	6	6	6	5.76
A5-6	1	8,430	27,691	73,874	13	7	7	7	7	7	7	8	8	7	7	8	8	8	9	9	10	8.06
A5-8	1	9,153	11,271	15,695	8	6	7	5	5	7	7	5	5	4	4	3	4	4	4	3	4	5.00
A5-9	1	11,730	13,449	35,470	11	6	7	5	5	7	7	5	5	4	4	5	5	3	3	5	5	5.41
A6-1	1	8,150	11,806	13,785	6	6	6	7	7	6	6	7	7	6	6	8	7	6	7	7	7	6.59
A6-2	1	6,818	21,060	28,272	7	7	6	7	7	7	6	6	6	6	6	6	6	6	5	6	5	6.18
A6-3	1	6,505	30,251	61,000	8	6	8	6	8	11	10	10	10	6	7	5	6	9	9	7	8	7.88
A6-4	1	8,219	17,445	28,288	7	7	7	7	7	6	7	7	7	6	6	6	6	6	7	7	7	6.65
A6-5	1	7,781	43,811	54,974	11	6	6	8	10	7	7	10	8	10	8	7	6	7	6	6	6	7.59
A6-6	1	8,386	19,857	51,514	8	5	9	6	7	10	11	7	6	6	6	5	4	6	5	5	4	6.47
A6-7	1	9,640	13,324	19,824	11	6	7	5	5	7	7	5	5	4	3	3	3	3	3	3	3	4.88
A6-8	1	9,507	23,132	35,074	8	6	7	5	4	7	7	4	5	3	3	3	2	2	3	2	3	4.35
A6-9	1	8,130	12,410	13,029	6	6	6	6	5	6	5	5	4	3	3	3	3	5	3	3	3	4.41
A7-1	1	8,092	25,268	37,666	9	9	8	8	9	9	10	10	11	8	7	9	9	9	9	10	10	9.06
A7-2	1	7,880	30,678	75,025	7	5	7	7	7	7	6	7	6	6	6	6	6	7	6	6	7	6.41
A7-3	1	6,713	24,247	38,037	10	6	7	7	7	10	7	7	5	8	8	6	5	7	5	10	5	7.06
A7-4	1	6,191	15,380	23,082	9	7	8	7	7	7	7	7	6	5	5	5	5	7	6	4	4	6.24
A7-5	1	7,648	22,398	26,248	6	6	7	7	5	6	5	5	7	6	7	7	6	6	6	6	6	6.12
A7-6	1	9,470	10,478	15,350	12	12	8	6	8	8	6	6	6	6	8	8	8	4	6	6	6	7.29
A7-7	1	9,036	10,868	12,361	7	7	6	5	5	7	7	5	5	3	3	3	3	3	3	3	3	4.59
A7-8	1	8,109	11,232	12,683	6	6	7	4	4	6	6	3	4	3	2	2	2	2	3	2	2	3.76
A7-9	1	9,127	10,860	11,539	6	5	5	5	5	5	5	5	4	3	3	2	2	3	3	2	2	3.82
B4-3	1	9,582	9,916	10,059	8	5	8	6	7	8	7	7	8	5	5	5	5	6	8	6	7	6.53
B4-6	1	8,852	10,270	26,092	8	6	7	7	8	6	7	7	7	7	7	7	6	8	7	6	7	6.94
B4-9	1	6,053	10,300	13,373	10	8	7	6	7	7	9	8	7	7	8	9	7	8	8	8	10	7.88
B5-1	1	9,512	11,725	15,458	11	7	8	8	7	9	10	9	8	7	7	8	7	7	7	8	9	8.06
B5-2	1	9,791	12,824	21,312	9	8	8	7	7	8	9	8	10	8	8	8	7	8	9	7	7	8.00
B5-3	1	8,916	13,858	18,226	8	8	8	7	8	8	8	8	8	7	8	6	8	6	7	8	8	7.59
B5-4	1	9,494	12,340	24,262	9	6	6	6	7	7	8	10	9	6	5	6	7	9	8	8	7	7.29
B5-5	1	9,872	17,109	34,053	11	9	8	9	8	8	7	7	7	8	7	7	7	7	7	7	6	7.65
B5-6	1	8,400	22,558	28,462	12	8	12	8	8	9	10	8	9	7	7	6	6	7	6	6	6	7.94

TABLE A5
FSS EXPOSURE RATE
RESULTS FOR SU-1

Sub-grid	Survey Unit	Scan				Quadrant Exposure Rates - µR/hr (corrected for background)																Average (corrected for BKG)
		CPM Range		Highest Scan Location		Quadrant A				Quadrant B				Quadrant C				Quadrant D				
		Low	High	Max. CPM	Exposure Rate (µR/hr)	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
B5-7	1	9,546	11,279	14,880	7	7	7	6	7	7	6	8	8	6	6	6	6	7	8	8	8	6.94
B5-8	1	10,616	17,679	85,603	12	7	8	9	7	9	7	7	8	10	6	8	6	7	7	7	7	7.76
B5-9	1	8,439	24,627	26,343	11	7	7	7	7	7	7	7	8	9	10	8	10	10	9	6	5	7.94
B6-1	1	8,975	26,508	26,977	12	10	9	12	9	9	11	7	10	8	7	6	7	8	9	8	8	8.82
B6-2	1	9,851	19,804	26,219	10	10	9	9	8	8	8	8	9	10	8	8	8	8	9	7	9	8.59
B6-3	1	9,395	12,890	18,913	10	8	6	8	6	8	10	10	8	10	6	14	8	8	6	8	6	8.24
B6-4	1	7,705	23,233	25,212	8	6	6	7	7	7	7	7	7	7	6	7	6	5	5	7	6	6.53
B6-5	1	7,959	14,408	24,307	9	7	7	7	7	7	7	7	7	7	7	7	6	7	7	6	6	6.94
B6-6	1	7,601	13,844	27,190	9	7	6	7	7	6	6	8	7	7	7	7	8	7	7	8	8	7.18
B6-7	1	11,804	13,556	21,954	8	6	6	5	6	7	8	7	7	6	6	7	7	7	5	6	5	6.41
B6-8	1	7,110	24,266	30,217	9	8	7	8	8	7	7	7	7	8	8	9	9	6	6	7	6	7.47
B6-9	1	8,026	15,838	28,131	10	7	7	6	6	7	8	7	7	7	7	7	7	7	7	7	7	7.12
B7-1	1	11,070	37,621	49,487	16	8	6	9	8	10	12	10	8	6	6	8	6	12	8	8	6	8.65
B7-2	1	8,692	20,009	23,464	8	6	7	7	7	7	8	8	8	7	7	7	7	7	7	9	9	7.41
B7-3	1	8,150	11,829	14,397	6	6	6	6	6	7	6	6	6	6	6	6	6	6	6	6	6	6.06
B7-4	1	7,578	9,288	11,275	5	3	5	5	5	5	5	5	5	5	6	6	6	6	6	6	7	5.35
B7-5	1	7,939	26,492	38,437	7	6	6	5	6	9	10	8	10	6	7	5	8	7	11	7	12	7.65
B7-6	1	7,449	11,287	13,592	9	7	6	7	5	6	5	5	5	8	6	7	7	6	6	5	6	6.24
B7-7	1	8,265	36,226	47,371	12	10	9	10	8	9	7	6	8	8	8	6	7	8	8	8	9	8.29
B7-8	1	8,692	15,592	19,123	10	9	8	8	8	8	8	10	8	7	7	7	7	8	8	7	7	7.94
B7-9	1	10,827	18,237	33,298	10	10	9	10	8	6	6	7	5	7	6	6	7	7	9	8	8	7.59
C4-9	1	9,089	10,440	10,463	8	6	7	6	5	8	8	7	7	7	5	4	6	7	6	7	7	6.53
C5-7	1	9,317	12,369	28,155	9	7	8	9	9	10	11	12	11	7	9	8	9	10	9	9	11	9.29
C5-8	1	10,413	18,477	38,018	13	10	11	9	10	11	10	10	10	8	8	7	8	10	9	8	8	9.41
C5-9	1	11,983	15,944	16,749	10	9	9	9	9	9	9	10	9	8	10	9	9	10	8	9	8	9.06
C6-7	1	10,128	36,603	39,578	15	10	10	10	10	11	11	10	10	10	10	8	9	9	9	8	8	9.88
C6-8	1	10,254	15,392	21,476	13	11	13	9	9	12	10	10	9	9	9	9	9	8	8	8	8	9.65
C6-9	1	11,442	18,390	29,968	9	9	8	9	8	9	9	8	8	8	8	6	6	9	9	7	7	8.06
C7-7	1	10,257	28,448	81,023	9	13	11	11	10	10	7	9	7	8	9	8	8	8	7	7	7	8.76
C7-8	1	10,130	15,939	19,133	9	8	7	8	7	8	8	7	6	8	7	7	6	7	6	6	6	7.12
C7-9	1	8,458	25,594	28,692	11	8	8	7	6	8	8	6	7	7	7	7	7	7	7	7	7	7.35

TABLE A6
FSS EXPOSURE RATE
RESULTS FOR SU-2

Sub-grid	Survey Unit	Scan				Quadrant Exposure Rates - µR/hr (corrected for background)																Average (corrected for BKG)
		CPM Range		Highest Scan Location		Quadrant A				Quadrant B				Quadrant C				Quadrant D				
		Low	High	Max. CPM	Exposure Rate (µR/hr)	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
G4-2	2	9,235	23,822	32,443	13	7	7	6	6	7	7	6	7	7	7	8	8	7	8	11	12	7.88
G4-3	2	7,955	10,826	13,989	6	6	6	6	6	6	6	6	7	6	6	6	6	6	6	6	6	6.06
G4-5	2	8,224	13,528	17,752	8	7	7	7	6	8	6	7	6	6	6	6	7	7	6	7	5	6.59
G4-6	2	8,503	13,114	16,084	7	6	6	6	6	7	7	6	6	6	6	6	7	6	6	6	6	6.24
G4-7	2	9,129	13,106	22,113	9	5	5	6	6	7	8	7	9	7	7	9	7	7	9	7	9	7.29
G4-8	2	8,402	16,311	19,099	9	6	6	7	6	5	6	5	6	6	6	6	6	6	6	7	6	6.18
G4-9	2	8,978	13,506	18,108	11	8	8	8	8	7	7	7	8	7	8	8	8	7	8	8	8	7.88
G5-1	2	8,438	12,009	18,828	9	7	6	7	6	8	6	9	5	5	6	6	7	8	5	7	5	6.59
G5-2	2	8,770	16,516	17,408	12	7	7	8	7	6	6	7	6	9	7	10	8	7	7	7	7	7.53
G5-3	2	8,782	20,832	26,255	9	6	7	7	7	7	8	8	8	8	7	8	8	7	7	7	7	7.41
G5-4	2	7,667	9,667	10,459	5	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	4.53
G5-5	2	8,001	15,905	17,008	8	6	6	7	6	7	6	7	6	6	6	6	6	7	6	6	5	6.29
G5-6	2	8,805	16,924	18,451	9	7	9	6	8	7	7	7	7	6	8	6	6	6	7	7	7	7.06
G5-7	2	8,109	9,935	10,589	11	7	7	7	7	7	8	7	8	7	8	7	8	8	8	8	9	7.76
G5-8	2	8,148	10,566	12,537	7	8	5	8	5	6	6	7	6	7	6	8	7	7	6	7	7	6.65
G5-9	2	7,759	9,993	11,380	7	5	6	5	6	6	6	6	6	5	7	4	7	6	6	6	7	5.94
G6-1	2	8,693	12,378	50,572	9	7	7	7	7	7	6	7	7	7	7	7	7	7	7	7	7	7.06
G6-2	2	9,947	12,359	25,290	7	7	7	9	9	7	6	7	6	7	7	8	7	7	6	7	6	7.06
G6-3	2	7,810	22,551	30,381	6	5	5	5	5	5	6	5	6	6	6	6	6	6	6	6	6	5.65
G6-4	2	10,853	15,921	32,082	11	6	5	6	5	5	5	5	5	7	6	6	6	5	5	5	5	5.76
G6-5	2	9,654	11,167	12,367	9	8	8	8	8	8	8	8	9	9	8	9	9	9	8	9	8	8.41
G6-6	2	8,848	30,726	49,192	11	8	8	6	6	7	8	6	6	5	5	5	5	5	6	5	5	6.29
G6-7	2	8,855	18,502	37,980	6	7	6	6	6	7	6	7	7	6	6	6	6	6	6	6	6	6.24
G6-8	2	7,883	12,599	21,318	7	7	7	7	7	7	6	7	7	7	7	7	6	7	7	6	6	6.76
G6-9	2	8,517	12,358	13,656	7	4	5	5	5	6	5	5	5	5	5	5	5	5	4	5	5	5.06
G7-1	2	7,996	11,059	13,171	6	6	6	6	6	6	6	7	6	6	6	6	6	7	6	7	7	6.24
G7-2	2	9,030	11,639	15,367	6	7	6	6	6	5	6	6	4	7	7	7	7	7	5	6	7	6.18
G7-3	2	7,068	8,846	10,054	7	5	6	5	6	6	5	5	5	6	6	6	6	5	6	5	6	5.65
G7-4	2	7,061	10,528	11,062	4	2	2	3	3	2	3	3	3	3	3	3	4	3	3	4	3	3.00
G7-5	2	7,626	9,422	12,072	6	5	4	4	5	4	4	4	4	4	4	4	4	4	3	4	4	4.18
G7-6	2	8,199	9,633	10,293	7	6	6	5	7	6	6	6	7	7	7	7	7	6	7	7	7	6.53
G7-7	2	7,982	11,737	12,930	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4.00
G7-8	2	7,401	15,340	20,342	5	4	4	4	4	4	5	5	6	4	3	4	4	4	5	5	4	4.35
G7-9	2	7,573	14,538	17,776	6	3	3	5	6	5	6	6	6	5	5	5	6	5	6	6	6	5.29
G8-1	2	8,109	10,284	10,284	6	6	5	6	5	5	5	5	5	6	6	6	6	5	5	6	6	5.53
G8-2	2	7,505	9,417	10,534	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6.00
G8-3	2	7,175	8,488	9,177	6	5	5	5	5	6	6	5	6	6	5	5	5	5	6	5	6	5.41

TABLE A6
FSS EXPOSURE RATE
RESULTS FOR SU-2

Sub-grid	Survey Unit	Scan				Quadrant Exposure Rates - µR/hr (corrected for background)																Average (corrected for BKG)
		CPM Range		Highest Scan Location		Quadrant A				Quadrant B				Quadrant C				Quadrant D				
		Low	High	Max. CPM	Exposure Rate (µR/hr)	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
G8-4	2	8,775	10,083	11,823	7	7	7	7	7	7	7	6	7	6	7	7	8	6	6	8	8	6.94
G8-5	2	7,075	10,830	11,782	7	5	6	6	6	5	5	6	5	7	7	7	7	6	5	6	5	5.94
G8-6	2	7,144	10,648	11,028	7	5	5	6	5	5	5	5	6	6	5	5	5	6	6	6	6	5.53
G8-7	2	9,130	20,185	24,510	6	6	7	7	7	7	7	8	7	8	8	7	7	8	7	7	7	7.12
G8-8	2	7,955	9,848	11,590	8	6	6	6	6	6	6	6	6	6	7	6	7	7	6	6	6	6.29
G8-9	2	7,179	10,436	12,038	7	6	7	7	5	5	6	6	6	6	5	5	5	6	5	7	6	5.88
G9-1	2	7,210	13,878	34,238	11	6	6	8	8	6	6	7	7	7	7	6	6	6	7	7	7	6.94
G9-4	2	7,756	11,679	14,595	7	5	5	6	6	6	6	7	6	6	6	6	6	6	6	7	6	6.06
G9-7	2	8,256	10,396	18,378	7	5	6	6	6	6	6	6	6	6	5	7	5	6	6	5	5	5.82
H4-8	2	7,488	9,702	10,234	7	6	5	6	6	5	5	7	6	6	7	7	7	7	6	7	7	6.29
H4-9	2	8,695	12,552	18,862	7	6	6	7	7	6	6	7	7	7	7	7	7	7	7	7	6	6.71
H5-4	2	8,503	15,651	16,499	9	5	6	6	6	6	5	6	5	6	6	6	7	6	6	7	7	6.18
H5-7	2	7,836	12,096	12,915	5	5	5	5	5	5	5	6	6	5	5	5	5	5	5	5	5	5.12
H5-8	2	8,488	13,585	22,989	9	6	6	6	7	7	7	7	7	6	6	7	7	7	8	7	9	7.00
H5-9	2	9,117	15,273	20,759	8	8	7	7	8	7	7	7	7	7	7	9	8	7	7	8	7	7.41
H6-2	2	7,768	22,115	51,928	8	6	6	6	6	7	6	6	7	6	7	6	6	7	8	6	6	6.47
H6-3	2	10,114	19,486	26,106	9	6	6	6	6	6	7	6	7	8	7	8	8	6	6	7	6	6.76
H6-4	2	8,892	12,605	16,483	7	5	6	6	6	6	6	6	6	6	6	7	6	6	7	6	6	6.12
H6-5	2	8,964	13,561	17,053	8	7	6	6	7	7	6	7	8	7	7	7	7	7	7	6	7	6.88
H6-6	2	8,196	18,643	32,224	6	7	9	6	6	6	6	5	6	6	6	7	7	6	7	7	7	6.47
H6-7	2	9,219	12,373	14,391	8	7	7	7	7	7	7	7	6	8	7	8	7	7	6	7	6	7.00
H6-8	2	7,318	11,249	22,535	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5.00
H6-9	2	8,532	10,151	22,192	5	5	4	4	5	6	5	5	5	4	5	4	6	5	5	5	5	4.88
H7-1	2	7,045	8,264	15,201	7	5	5	5	5	5	5	5	5	6	6	5	6	5	5	6	5	5.35
H7-2	2	8,114	10,192	20,679	6	5	5	6	5	5	6	5	5	7	4	6	5	5	5	5	5	5.29
H7-3	2	8,661	10,216	11,663	7	5	5	5	5	5	6	6	7	5	6	4	6	6	6	5	6	5.59
H7-4	2	6,827	11,826	16,374	8	5	5	5	6	5	5	7	6	5	6	6	7	7	8	6	7	6.12
H7-5	2	9,023	10,739	12,451	7	7	6	6	6	6	6	6	6	6	8	7	7	6	5	5	5	6.18
H7-6	2	8,078	10,615	18,208	7	6	6	7	7	6	6	6	6	6	6	6	6	6	6	6	5	6.12
H7-7	2	8,677	10,551	26,546	7	6	6	5	7	6	6	6	6	6	7	7	6	7	7	6	7	6.35
H7-8	2	8,203	10,288	13,420	7	7	7	7	7	6	7	6	5	6	6	7	6	6	6	6	6	6.35
H7-9	2	7,494	9,767	10,563	6	6	6	6	6	5	5	5	5	6	6	6	6	5	5	6	5	5.59
H8-4	2	7,837	9,589	10,822	6	6	6	6	6	6	6	6	6	6	5	6	5	5	5	6	5	5.71
H8-5	2	7,739	10,133	10,482	6	6	6	5	5	6	6	5	5	5	5	5	5	5	5	5	5	5.29
H8-6	2	7,870	8,944	9,147	5	5	6	5	6	5	5	6	6	5	5	6	6	5	5	6	5	5.41
H8-7	2	7,436	9,128	10,345	6	5	5	5	5	6	5	5	5	5	6	5	6	6	6	6	5	5.41
H8-8	2	7,143	9,946	10,490	6	5	5	4	5	5	5	5	5	5	5	5	5	5	5	6	6	5.12

TABLE A6
FSS EXPOSURE RATE
RESULTS FOR SU-2

Sub-grid	Survey Unit	Scan				Quadrant Exposure Rates - µR/hr (corrected for background)																Average (corrected for BKG)
		CPM Range		Highest Scan Location		Quadrant A				Quadrant B				Quadrant C				Quadrant D				
		Low	High	Max. CPM	Exposure Rate (µR/hr)	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
H8-9	2	7,511	9,960	11,518	6	5	5	5	6	6	6	5	5	5	5	6	6	5	5	6	5	5.41
H9-4	2	7,148	7,843	7,843	5	5	5	5	6	5	5	5	5	5	6	5	5	5	5	5	5	5.12
H9-7	2	7,903	11,981	13,098	7	6	5	6	6	5	5	5	6	5	6	5	6	7	7	6	6	5.82
I4-2	2	5,883	17,498	28,349	5	4	4	4	4	4	4	5	5	5	5	5	4	5	5	6	6	4.71
I4-3	2	7,697	10,421	14,546	5	5	6	5	5	5	5	5	5	5	6	6	5	5	4	5	5	5.12
I4-5	2	7,039	12,933	15,416	8	5	5	5	5	6	7	4	5	4	4	5	5	5	5	5	5	5.18
I4-6	2	8,953	17,354	25,043	6	6	6	6	5	5	5	5	6	5	7	5	5	6	6	5	5	5.53
I5-4	2	8,173	10,166	11,072	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6.00
I5-5	2	7,857	14,260	22,654	6	6	6	6	7	6	6	6	6	5	5	5	5	5	5	5	5	5.59
I5-6	2	7,766	9,555	10,665	6	5	6	5	6	5	5	5	5	5	6	5	5	5	6	5	5	5.29
I6-4	2	7,736	11,564	12,286	7	5	6	6	6	5	6	6	5	5	6	5	5	5	6	5	5	5.53
I6-5	2	8,298	12,823	15,894	7	6	6	6	5	7	7	6	7	5	5	6	5	6	7	6	7	6.12
I6-8	2	8,397	15,006	15,752	6	7	7	7	7	8	8	7	7	6	6	6	6	7	6	6	6	6.65
I6-9	2	7,969	16,712	33,482	8	8	8	8	5	8	7	7	6	7	5	6	5	6	6	6	6	6.59
I7-4	2	8,459	1,011	19,487	6	6	5	5	5	5	6	5	5	5	5	6	5	5	5	5	5	5.24
I7-7	2	7,389	27,929	31,436	6	6	5	4	5	5	5	5	6	5	5	6	5	5	5	5	5	5.18

Table A7

Final Status Survey Statistical Equations

The following statistical equations/formulas were used to assess FSS data:

Survey Data Average ($\bar{x}$):

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

Standard Deviation (S_x):

$$S_x = \sqrt{\frac{\sum_{i=1}^{n}(\bar{x}-x_i)^2}{n-1}}$$

Determination of Number of Background data points (n_B):

$$n_B = \left[\frac{t_{95.5\%,df} S_x}{0.2 \bullet \bar{x}_B}\right]^2$$

Comparison of statistical mean ($\mu\alpha$) with guideline values:

$$\mu_\alpha \approx \bar{x} + t_{1-\alpha,df}\frac{S_x}{\sqrt{n}}$$

Note: See chapter 8.0 of NUREG/CR-5849 for detailed discussion of above-listed statistical analyses.

Where:

X_i = measurement (analysis) at point i
n = number of measurements (analyses)
t_i - α, df = 95% confidence level from Table B-1 of Appendix B of NUREG/CR-5849 (large sample size t statistic of 1.67 used for Bay City FSS 95% CL calculation)

C_G = Guideline Value