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FOURTH QUARTER 1991
QUARTERLY GROUND-WATER
MONITORING REPORT
SIEMENS NUCLEAR POWER CORPORATION
RICHLAND, WASHINGTON

PROJECT NO. WA183.03

Volume 1

March 23, 1992

Prepared for

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QUARTERLY GROUND-WATER MONITORING REPORT
SIEMENS NUCLEAR POWER CORPORATION
RICHLAND, WASHINGTON

March 23, 1992

Geraghty & Miller, Inc. is submitting this report to Siemens Nuclear Power Corporation for work performed at their Richland, Washington facility. The report was prepared in conformance with Geraghty & Miller's strict quality assurance/quality control procedures to ensure that the report meets the highest standards in terms of the methods used and the information presented. If you have any questions or comments concerning this report, please contact one of the individuals listed below.

Respectfully submitted,

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INTRODUCTION

This report documents the fourth quarter 1991 ground-water sampling effort conducted in accordance with the Phase I Ground-Water Study Work Plan (Work Plan) (Geraghty & Miller 1991a) for the Siemens Nuclear Power Corporation (SNP) fuels fabrication facility in Richland, Washington (Figure 1). The fourth quarter 1991 sampling effort was conducted in November 1991 and is the first quarterly sampling event for the Phase I Ground-Water Study. The following discusses the methods and results.

METHODS

Water-level measurements and ground-water quality samples were collected from SNP Wells GM-1 through GM-12 (Figure 2) between November 11 and 13, 1992 by Geraghty & Miller personnel. A set of duplicate ground-water samples were collected from Department of Energy (DOE) Well MW-12 with DOE sampling personnel. The ground-water sampling methodology employed was that outlined in the Phase I Ground-Water Study Sampling and Analysis Plan (SAP) (Geraghty & Miller 1991b). Analytical data were validated in accordance with the Quality Assurance Project Plan (Geraghty & Miller 1991b) and the U.S. Environmental Protection Agency Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses (USEPA 1988a) and Inorganic Analyses (USEPA 1988b) as applicable.

Water-levels were measured on November 11 and 12, 1991 within a 24-hour period prior to sampling activities and are listed in Table 1. The static water level in each well was measured with an electric sounder (Slope Indicator Company water level

indicator, model 51453). In addition, the total depth of the well was measured using a weighted stainless-steel tape. The measuring point was a notch in or the top of the well casing which has been surveyed relative to mean sea level (msl). All water-level and total depth measurements were made by Geraghty & Miller personnel.

From the water-level and total depth measurements, the volume of water in the well was calculated. Then a minimum of three well volumes of water were evacuated from the well using a nondedicated submersible pump. The pH, specific conductance, and temperature of the discharged water was measured during the purging after each well volume was removed. The pH was considered stable when two consecutive measurements agreed within 0.2 standard units. Temperature was considered stable when two consecutive measurements agreed within 0.2 degrees centigrade. Specific conductance readings were considered stable when two consecutive readings were within 10 percent of each other. If the pH, specific conductivity, and temperature did not stabilize within the designated purging volume, then purging continued until the readings stabilized or until the field supervisor indicated that further purging was unnecessary. The purge water was pumped into 55-gallon drums and were held on site.

Samples were collected for the analyses listed in Table 2 using a Teflon™ bailer. The bailor was lowered on a clean nylon cord and was emptied into the appropriate sample bottles with preservatives using a bottom-emptying Teflon™ spigot. For samples collected for analyses of dissolved constituents, the sample was emptied from the bailor into a clean glass beaker. Then the sample was drawn through clean silicon tubing and a 0.45-micron filter using a motorized peristaltic pump and a sample bottle containing nitric acid as a preservative.

Immediately after collection, all samples were recorded on chain-of-custody forms and stored in a cooler with wet ice and frozen reusable ice packs. Coolers of filled sample containers were either relinquished to an overnight-delivery courier for delivery or taken the next day by sampling personnel to the laboratory for analysis. Appropriate

chain-of-custody procedures were followed each time samples were relinquished to either the courier or the laboratory.

Field parameters (pH, specific conductivity, and temperature) measured and recorded on the Water Sampling Logs. The color, odor, appearance, and other observations about the sample are also noted on the Water Sampling Log. Water Sampling Logs are provided in Appendix A.

All nondedicated sampling equipment, including the equipment used to measure field parameters, was decontaminated according to the SAP (Geraghty & Miller 1991b) prior to use and after sampling each well to avoid chemical cross-contamination of field samples.

For the 13 wells sampled, one duplicate and one rinsate sample was collected at the end of each sampling day. The deionized water used for the rinsate samples was obtained from the SNP Deionized Water Building. In addition, a trip blank was analyzed for each set of samples delivered to the analytical laboratory.

Pacific Northwest Environmental Laboratory, Inc. of Redmond, Washington was contracted to analyze the ground-water samples. The samples were analyzed for the constituents listed in Table 2, with the exception of temperature, specific conductivity, and pH, which were analyzed in the field by sampling personnel.

After the data were validated according to the method cited above, the areal distributions of constituent concentrations were plotted on site maps. These maps are described in the following section.

RESULTS

WATER LEVEL MEASUREMENTS

Figure 3 shows the November 1991 water-level elevations and general water-table surface contours. Ground-water flow was generally to the northeast. The horizontal gradient was approximately 0.0006.

LABORATORY ANALYSES

Analytes, analytical methods, and Data Quality Objectives (DQO) are listed in Table 2. Laboratory analytical results for organic and inorganic analytes are listed in Table 3 and selected constituents are discussed below. The laboratory reports are provided in Appendix B.

Organic Analytes

Trichloroethene and 1,1,1-Trichloroethane

The distribution of trichloroethene (TCE) and 1,1,1-trichloroethane (TCA) based on analytical results from the November 1991 sampling are shown in Figure 4. TCE was detected in ground-water samples from all the wells, except upgradient Wells GM-1 and GM-2. The highest concentration of TCE was 35 micrograms per liter (μg/L) in the sample from Well GM-12, located near the South Pit. TCE concentrations in samples from Wells GM-3 through GM-11 ranged from 2 μg/L to 23 μg/L. TCA concentrations ranged from nondetectable to 5 μg/L. TCA was not detected in samples from Wells GM-7, GM-8, GM-10, GM-11, GM-12, or from upgradient Wells GM-1 and GM-2. The sample from DOE Well MW-12 had a TCE concentration of 64 μg/L and a TCA concentration of 2 μg/L.

1,1,2,2-Tetrachloroethane

1,1,2,2-tetrachloroethane was detected only in the sample from Well GM-4 at a concentration of 5 μg/L. Well GM-4 is just north of the UO_2 Building. The sample from DOE Well MW-12 had a 1,1,2,2-tetrachloroethane concentration of 6 μg/L.

Other Organic Analytes

Acetone was detected in the sample from Well GM-5 at a concentration 3 μg/L and chloroform was detected in the sample from Well GM-4 at a concentration of 2 μg/L.

Inorganic Analytes

Nitrate and Ammonia

The distributions of nitrate and ammonia based on November 1991 analytical results are shown in Figure 5. Nitrate concentrations ranged from 5.46 mg/L to 45.7 mg/L (expressed as nitrogen, NO_3-N) in Wells GM-3 through GM-12. Samples from upgradient Wells GM-1 and GM-2 contained 4.26 mg/L and 3.87 mg/L, respectively. Ammonia concentrations based on the November 1991 sampling ranged from 0.030 mg/L to 45.0 mg/L (expressed as nitrogen, NH_3-N) in Wells GM-3 through GM-12. Samples from upgradient Wells GM-1 and GM-2 contained 0.041 mg/L and 0.035 mg/L, respectively. The sample from DOE Well MW-12 had a nitrate concentration of 54.1 mg/L and an ammonia concentration of 0.028 mg/L.

Fluoride

The distribution of fluoride based on November 1991 analytical results is shown in Figure 6. Fluoride concentrations ranged from 0.254 mg/l to 7.10 mg/L in Wells GM-3 through GM-12. Samples from upgradient Wells GM-1 and GM-2 contained 0.300 mg/L and 0.335 mg/L, respectively. The sample from DOE Well MW-12 had a fluoride concentration of 0.359 mg/L.

Radionuclides

The distributions of gross-alpha and gross-beta concentrations based on the November 1991 analytical results are shown in Figure 7. Gross-alpha concentrations ranged from 5.3 ± 2.8 picocuries per liter (pCi/L) to 87 ± 20 pCi/L in Wells GM-3 through GM-12. Samples from upgradient Wells GM-1 and GM-2 contained 10 ± 6 pCi/L and 19 ± 8 pCi/L, respectively. Gross-beta concentrations ranged from 10 ± 2 picocuries per liter (pCi/L) to 90 ± 11 pCi/L in Wells GM-3 through GM-12. Samples from upgradient Wells GM-1 and GM-2 contained 15 ± 3 pCi/L and 22 ± 4 pCi/L, respectively. The sample from DOE Well MW-12 had a gross alpha concentrations of 9.8 ± 5.4 and a gross beta concentration of 59 ± 5.

DATA VALIDATION

The data validation report is provided in Appendix C. The results of data validation are summarized in Table 4. The following section discusses the data validation for specific analytes.

Organic analyses

Trichloroethene

TCE was detected in one of the laboratory method blanks associated with the samples analyzed. This did not compromise the validity of the data, but they are flagged with a "B" to note this occurrence.

Other organic analytes

Acetone was detected at a concentration of 4 μg/L in one of the trip blanks and one of the laboratory method blanks associated with the samples analyzed. It was also detected in the ground-water sample from Well GM-5 and the November 12, 1991 rinsate sample at concentrations of 3 μg/L and 4μg/L, respectively. These results are flagged with a "B" to note the presence of the analyte in an associated blank. Acetone is a common laboratory contaminant (USEPA 1988a) and may have been introduced to the samples at the laboratory.

Chloroform was detected in the ground-water sample from GM-4 at a concentration of 2 μg/L. In addition, the November 12 and 13, 1991 rinsate samples had chloroform concentrations of 22 μg/L and 16 μg/L, respectively.

Bromodichloromethane was detected in both rinsate samples and Dibromochloromethane was detected in the November 12, 1991 rinsate sample. In addition, methylene chloride was detected in one of the trip blanks. However, none of these analytes were detected in the ground-water samples.

Inorganic Analyses

Ammonia

The ammonia value for the ground-water sample from GM-4 is flagged with a "J" denoting that they are estimated because the associated matrix spike recovery is outside QC limits.

Metals

All iron results are flagged with a "J" denoting that they are estimated because the associated laboratory duplicates are outside QC limits. Metals results flagged with a "B" denote that the result is above the Instrument Detection Limit, but is below the Contract Required Detection Limit.

REFERENCES

Geraghty & Miller, Inc. 1991a. Work Plan, Phase I Ground-Water Study, Siemens Nuclear Power Corporation, Richland, Washington, September 1991.

_____. 1991b. Sampling and Analysis Plan, Phase I Ground-Water Study, Siemens Nuclear Power Corporation, Richland, Washington, September 1991.

U.S. Environmental Protection Agency (EPA). 1988a. Laboratory Data Validation Functional Guidelines for Organic Analyses, February 1988.

_____. 1988b. Laboratory Data Validation Functional Guidelines for Inorganic Analyses, July 1988.

TABLE 1. MONITORING WELL SURVEY DATA AND NOVEMBER 1991 WATER-LEVEL DATA
SIEMENS NUCLEAR POWER CORPORATION FACILITY, RICHLAND, WASHINGTON
PROJECT NO. WA183.03

Well Number	Date of Water-Level Measurement	Top of Casing Elevation (ft msl)	Concrete Pad Elevation (ft msl)	North Coordinate (ft)*	East Coordinate (ft)*	Depth to Water (ft btopc)	Water-Table Elevation (ft msl)
GM-1	11-Nov-91	375.44	374.04	371,320	2,303,233	20.44	355.00
GM-2	11-Nov-91	370.11	368.49	371,746	2,302,437	15.03	355.08
GM-3	11-Nov-91	370.88	371.15	372,300	2,302,894	15.94	354.94
GM-4	11-Nov-91	369.67	368.36	372,753	2,303,001	14.94	354.73
GM-5	12-Nov-91	367.39	365.80	372,865	2,303,321	12.74	354.65
GM-6	12-Nov-91	380.87	379.47	372,776	2,303,864	26.21	354.66
GM-7	12-Nov-91	380.89	379.61	373,030	2,303,807	26.34	354.55
GM-8	12-Nov-91	372.48	370.92	373,145	2,303,534	17.98	354.50
GM-9	12-Nov-91	371.04	369.34	373,432	2,303,337	16.62	354.42
GM-10	12-Nov-91	376.33	374.82	373,435	2,303,651	21.96	354.37
GM-11	11-Nov-91	381.84	380.19	373,454	2,303,942	27.70	354.14
GM-12	11-Nov-91	388.78	387.23	373,442	2,304,243	35.00	353.78
TW-1	11-Nov-91	367.00	NA	372,769	2,303,158	12.22	354.78
TW-2	11-Nov-91	370.00	NA	372,769	2,303,443	15.23	354.77
TW-3	11-Nov-91	369.52	NA	372,527	2,303,443	14.67	354.85
TW-4	11-Nov-91	371.04	NA	372,385	2,303,443	16.17	354.87
TW-5	11-Nov-91	371.13	NA	372,255	2,303,443	16.24	354.89
TW-6	11-Nov-91	366.15	NA	372,141	2,303,443	11.22	354.93
TW-7	11-Nov-91	367.15	NA	371,967	2,303,443	12.17	354.98
TW-8	11-Nov-91	372.44	NA	372,623	2,302,676	17.51	354.93
TW-9	12-Nov-91	367.84	NA	372,941	2,303,289	13.10	354.74
TW-11	11-Nov-91	373.12	NA	371,981	2,303,182	18.16	354.96
TW-12	11-Nov-91	374.15	NA	371,986	2,303,307	19.18	354.97
TW-13	11-Nov-91	375.07	NA	371,714	2,303,307	20.04	355.03
TW-14	12-Nov-91	370.25	NA	373,448	2,303,389	15.64	354.61
TW-15	12-Nov-91	370.65	NA	373,444	2,303,529	16.06	354.59
TW-16	12-Nov-91	376.77	NA	373,447	2,303,693	22.19	354.58
TW-17	12-Nov-91	379.5	NA	373,309	2,303,809	24.96	354.5
TW-18	12-Nov-91	377.3	NA	373,431	2,303,680	22.89	354.4
TW-19	11-Nov-91	381.15	NA	372,774	2,303,767	26.34	354.81
TW-20	11-Nov-91	381.43	NA	372,581	2,303,767	26.57	354.86
TW-21	11-Nov-91	380.47	NA	372,372	2,303,768	25.54	354.93
TW-22	11-Nov-91	374.95	NA	371,586	2,303,410	20.04	354.91
TW-23	11-Nov-91	373.25	NA	371,555	2,302,499	18.12	355.13
TW-24	12-Nov-91	373.36	NA	372,117	2,302,282	18.31	355.05
TW-25	12-Nov-91	371.92	NA	372,620	2,302,041	16.76	355.16
TW-26	11-Nov-91	367.70	NA	372,884	2,303,262	12.93	354.77

*	North American Datum 1927 (NAD 27)
ft	Feet
ft msl	Feet above mean sea level
NA	Not available/not applicable
topc	Top of PVC casing
btopc	Below top of casing

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TABLE 2. SUMMARY OF ANALYTES, METHODS, AND DATA QUALITY OBJECTIVES FOR GROUND-WATER MONITORING
SIEMENS NUCLEAR POWER CORPORATION FACILITY, RICHLAND, WASHINGTON
PROJECT NO. WA183.03

Analyte	Method	CRQL (1)	G&M QA Level (2)	Precision Criteria (3)	Accuracy Criteria (3)
Volatile Organics	624-CLP-M (4)	2 ug/L	IV	25	75-125
Ammonia as Nitrogen	350.3 (5)	50 ug/L	III	20	75-125
Barium	200.7 (5)	200 ug/L	IV	20	75-125
Calcium	200.7 (6)	5000 ug/L	IV	20	75-125
Iron	200.7 (6)	100 ug/L	IV	20	75-125
Magnesium	200.7 (6)	5000 ug/L	IV	20	75-125
Manganese	200.7 (6)	15 ug/L	IV	20	75-125
Potassium	200.7 (6)	5000 ug/L	IV	20	75-125
Sodium	200.7 (6)	5000 ug/L	IV	20	75-125
Chloride	300.0 (7)	10000 ug/L	III	20	75-125
Fluoride	340.2 (8)	100 ug/L	III	20	75-125
Nitrate as Nitrogen	300.0 (7)	100 ug/L	III	20	75-125
Phosphate	300.0 (7)	500 ug/L	III	20	75-125
Sulfate	300.0 (7)	2000 ug/L	III	20	75-125
Alkalinity	310.1 (5)	10000 ug/L	III	20	75-125
Acidity	305.1 (5)	10000 ug/L	III	20	75-125
Gross alpha	900.0 (9)	7.5 pCi/L	III	20	75-125
Gross beta	900.0 (9)	25 pCi/L	III	20	75-125
Temperature	(10)	NA	NA	NA	NA
pH	(10)	NA	NA	NA	NA
Specific conductance	(10)	NA	NA	NA	NA

(1) CRQL is the contract-required quantitation limit; values are to be considered requirements in the absence of known or suspected analytical interferences.

(2) Level IV reporting includes a full laboratory report as required by the USEPA Contract Laboratory Program (CLP). Level III reporting includes a full CLP data package except for raw spectra and laboratory bench data sheets used to prepare quality assurance documents.

(3) Precision is expressed as a relative percent difference between results of duplicate or replicate analyses; accuracy is expressed as percent recovery of an analyte. These limits apply to sample results greater than five times the CRQL and are to be considered requirements in the absence of known or suspected analytical interferences.

(4) Method described in 40 CFR 136, Appendix A.

(5) Method described in Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, 1979.

(6) Method described in 40 CFR 136, Appendix C.

(7) Method described in Determination of Inorganic Anions in Aqueous and Solid Samples of Ion Chromatography, EPA-600/4-84-017, 1984.

(8) Method described in Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, 1979, Revised 1983.

(9) Method described in Prescribed Procedures for Measurement of Radioactivity in Drinking Water, EPA-600/4-80-032, 1980.

(10) Measured in the field according to instrument manufacturer's instructions.

ug/L Micrograms per liter
pCi/L Picocuries per liter
NA Not applicable

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TABLE 3a. VOLATILE ORGANIC ANALYTES
ANALYTICAL RESULTS FOR NOVEMBER 1991 GROUND-WATER SAMPLES
SIEMENS NUCLEAR POWER CORPORATION FACILITY, RICHLAND, WASHINGTON
PROJECT NO. WA183.03

Well Number	Date Sampled	TCE (µg/L)		TCA (µg/L)		1,1,2,2-Tetrachloroethane (µg/L)		Acetone (µg/L)		Chloroform (µg/L)	
GM-1	11-12-91	1	U	1	U	1	U	2	U	1	U
GM-2	11-12-91	1	U	1	U	1	U	2	U	1	U
GM-3	11-12-91	22	B	5		1	U	2	U	1	U
GM-4	11-12-91	2	B	3		5		2	U	2	
GM-5	11-13-91	22	B	2		1	U	3	B	1	U
GM-6	11-13-91	12	B	3		1	U	2	U	1	U
GM-7	11-13-91	13	B	1	U	1	U	2	U	1	U
GM-8	11-13-91	13	B	1	U	1	U	2	U	1	U
GM-9	11-13-91	10	B	3		1	U	2	U	1	U
GM-10	11-13-91	21	B	1	U	1	U	2	U	1	U
GM-11	11-13-91	23	B	1	U	1	U	2	U	1	U
GM-12	11-13-91	35	B	1	U	1	U	2	U	1	U
GM-13*	11-13-91	21	B	2		1	U	2	U	1	U
MW-12	11-12-91	64	B	2		6		2	U	1	U
RINSATE	11-12-91	1	U	1	U	1	U	4	B	22	
RINSATE	11-13-91	1	U	1	U	1	U	2	U	16	
TRIP BLANK	11-12-91	1	U	1	U	1	U	4	B	1	U
TRIP BLANK	11-13-91	1	U	1	U	1	U	2	U	1	U

* Duplicate sample from Well GM-5
µg/L Micrograms per liter
TCE Trichloroethene
TCA 1,1,1-Trichloroethane
U Not detected above given detection limit
B Compound found in associated blank as well as in sample

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TABLE 3b. DISSOLVED METALS
ANALYTICAL RESULTS FOR NOVEMBER 1991 GROUND-WATER SAMPLES
SIEMENS NUCLEAR POWER CORPORATION FACILITY, RICHLAND, WASHINGTON
PROJECT NO. WA183.03

Well Number	Date Sampled	Barium (µg/L)		Calcium (µg/L)		Iron (µg/L)		Magnesium (µg/L)		Manganese (µg/L)		Potassium (µg/L)		Sodium (µg/L)	
GM-1	11-12-91	30.3	B	37,500		25.0	UJ	9,290		5.7	B	4,400	B	15,700	
GM-2	11-12-91	36.9	B	38,300		25.0	UJ	9,320		5.0	U	4,350	B	19,100	
GM-3	11-12-91	70.6	B	59,800		25.0	UJ	12,600		11.4	B	9,630		22,400	
GM-4	11-12-91	55.8	B	53,300		25.0	UJ	14,100		7.4	B	4,880	B	18,300	
GM-5	11-13-91	72.9	B	34,700		25.0	UJ	14,100		29.6		7,930		23,800	
GM-6	11-13-91	44.7	B	47,500		29.9	BJ	11,300		13.4	B	5,980		19,600	
GM-7	11-13-91	37.2	B	44,000		46.3	BJ	10,600		5.0	U	5,090		18,300	
GM-8	11-13-91	58.4	B	37,900		25.0	UJ	11,200		36.3		6,440		20,100	
GM-9	11-13-91	99.5	B	59,000		56.4	BJ	15,400		13.6	B	12,900		47,400	
GM-10	11-13-91	67.0	B	38,800		27.1	BJ	10,600		71.2		7,600		20,600	
GM-11	11-13-91	37.2	B	55,500		25.0	UJ	12,600		5.0	U	6,150		21,400	
GM-12	11-13-91	80.1	B	61,200		28.4	BJ	13,000		22.0		10,600		20,800	
GM-13*	11-13-91	70.8	B	35,900		25.0	UJ	14,400		29.6		8,610		23,500	
MW-12	11-12-91	108	B	112,000		37.7	BJ	23,200		6.4	B	9,070		30,600	
RINSATE	11-12-91	15.0	U	40.0	U	25.0	UJ	40.0	U	5.0	U	400	U	406	B
RINSATE	11-13-91	15.0	U	40.0	U	25.0	UJ	40.0	U	5.0	U	400	U	119	B

* Duplicate sample from Well GM-5.
U Not detected above given detection limit.
J Estimated value.
B Result above the Instrument Detection Limit, but is below the Contract Required Detection Limit.
µg/L Micrograms per liter.

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TABLE 3c. ANIONS, AMMONIA, AND RADIONUCLIDES
ANALYTICAL RESULTS FOR NOVEMBER 1991 GROUND-WATER SAMPLES
SIEMENS NUCLEAR POWER CORPORATION FACILITY, RICHLAND, WASHINGTON
PROJECT NO. WA183.03

Well Number	Date Sampled	Chloride (mg/L)	Fluoride (mg/L)	Nitrate as N (mg/L)	Ortho-Phosphate (mg/L)	Sulfate (mg/L)	Ammonia as N (mg/L)	Gross Alpha (pCi/L)	Gross Beta (pCi/L)
GM-1	11-12-91	10.1	0.300	4.26	0.100 U	28.0	0.041	10 ± 6	15 ± 6
GM-2	11-12-91	8.26	0.335	3.87	0.100 U	21.2	0.035	19 ± 8	22 ± 4
GM-3	11-12-91	38.0	1.31	11.4	0.235	17.9	0.042	35 ± 14	47 ± 7
GM-4	11-12-91	10.5	0.910	19.0	0.100 U	11.5	0.037 J	80 ± 21	66 ± 9
GM-5	11-13-91	8.92	7.10	26.0	0.100 U	60.7	45.0	75 ± 7	82 ± 4
GM-6	11-13-91	11.4	0.333	6.43	0.100 U	30.5	0.030	59 ± 16	58 ± 10
GM-7	11-13-91	12.8	0.254	5.46	0.100 U	29.9	0.030	46 ± 14	38 ± 9
GM-8	11-13-91	10.4	2.10	15.5	0.108	33.4	5.23	60 ± 15	65 ± 8
GM-9	11-13-91	18.5	7.05	45.7	0.100 U	52.7	10.08	54 ± 12	62 ± 6
GM-10	11-13-91	9.98	3.62	21.4	0.121	40.2	12.39	39 ± 9	66 ± 5
GM-11	11-13-91	12.5	0.571	9.56	0.100 U	36.2	0.044	5.3 ± 2.8	10 ± 2
GM-12	11-13-91	10.5	2.74	8.22	0.100 U	37.2	5.44	87 ± 20	90 ± 11
GM-13*	11-13-91	8.64	7.20	9.96	0.100 U	58.6	46.9	78 ± 8	74 ± 4
MW-12	11-12-91	17.8	0.359	54.1	0.100 U	66.2	0.028	9.8 ± 5.4	59 ± 5
RINSATE	11-12-91	0.179	0.100 U	0.155	0.100 U	0.100	0.015	0.6 ± 1.0	1.8 ± 1.6
RINSATE	11-13-91	0.100 U	0.100 U	0.100 U	0.100 U	0.100	0.030	0.0 ± 1.0	1.6 ± 1.6

* Duplicate sample from Well GM-5.
U Not detected above given detection limit.
J Estimated value.
N Nitrogen.
mg/L Milligrams per liter.

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TABLE 3d. FIELD PARAMETERS, ALKALINITY, AND ACIDITY
ANALYTICAL RESULTS FOR NOVEMBER 1991 GROUND-WATER SAMPLES
SIEMENS NUCLEAR POWER CORPORATION FACILITY, RICHLAND, WASHINGTON
PROJECT NO. WA183.03

Well Number	Date Sampled	Temperature† (degrees C)	pH† (standard units)	Specific Conductance† (µmhos/cm)	Alkalinity (mg/L)		Acidity (mg/L)	
GM-1	11-12-91	17.5	7.7	385	111		10.0	U
GM-2	11-12-91	18.5	7.7	363	135		10.0	U
GM-3	11-12-91	20.2	7.6	483	155		10.0	U
GM-4	11-12-91	19.3	7.4	557	121		10.0	U
GM-5	11-13-91	17.0	7.4	749	169		10.0	U
GM-6	11-13-91	13.7	7.6	463	155		10.0	U
GM-7	11-13-91	13.2	7.8	418	151		10.0	U
GM-8	11-13-91	13.6	7.3	552	105		10.0	U
GM-9	11-13-91	14.2	7.4	832	116		10.0	U
GM-10	11-13-91	15.1	6.9	537	104		10.0	U
GM-11	11-13-91	15.2	7.3	503	154		10.0	U
GM-12	11-13-91	15.5	7.4	607	150		10.0	U
GM-13*	11-13-91	NA	NA	NA	168		10.0	U
MW-12	11-12-91	15.1	7.3	936	169		10.0	U
RINSATE	11-12-91	NA	NA	NA	1.00	U	10.0	U
RINSATE	11-13-91	NA	NA	NA	1.00	U	10.0	U

* Duplicate sample from Well GM-5.
† Parameter measured in the field.
U Not detected above given detection limit.
mg/L Milligrams per liter.
µmhos/cm Micromhos per centimeter.
C Centigrade.
NA Not available/not applicable.

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TABLE 4. SUMMARY OF DATA VALIDATION RESULTS FOR NOVEMBER 1991 CHEMICAL ANALYSES
SIEMENS NUCLEAR POWER CORPORATION FACILITY, RICHLAND, WASHINGTON
PROJECT NO. WA183.03

Sampling Event	Qualifier Code	Analyte	Samples Flagged
Nov-91	B (1)	TCE	GM-3, GM-4,GM-5, GM-6, GM-7, GM-8, GM-9, GM-10, GM-11 GM-12
Nov-91	B (1)	Acetone	GM-5, RINSATE 11/12/91 TRIP BLANK 11/12/91
Nov-91	J (2)	Ammonia	GM-4
Nov-91	B (4)	Barium	GM-1, GM-2, GM-3, GM-6, GM-7, GM-8, GM-9, GM-10, GM-11, GM-12, GM-13*, MW-12
Nov-91	B (4)	Iron	GM-6, GM-7, GM-9, GM-10, GM-12, MW-12
Nov-91	J (3)	Iron	GM-1, GM-2, GM-3, GM-6, GM-7, GM-8, GM-9, GM-10, GM-11, GM-12, GM-13*, MW-12, RINSATE 11/12/91, RINSATE 11/13/91
Nov-91	B (4)	Manganese	GM-1, GM-3, GM-4, GM-6, GM-9, MW-12
Nov-91	B (4)	Potassium	GM-1, GM-2, GM-4
Nov-91	B (4)	Sodium	RINSATE 11/12/91, RINSATE 11/13/91

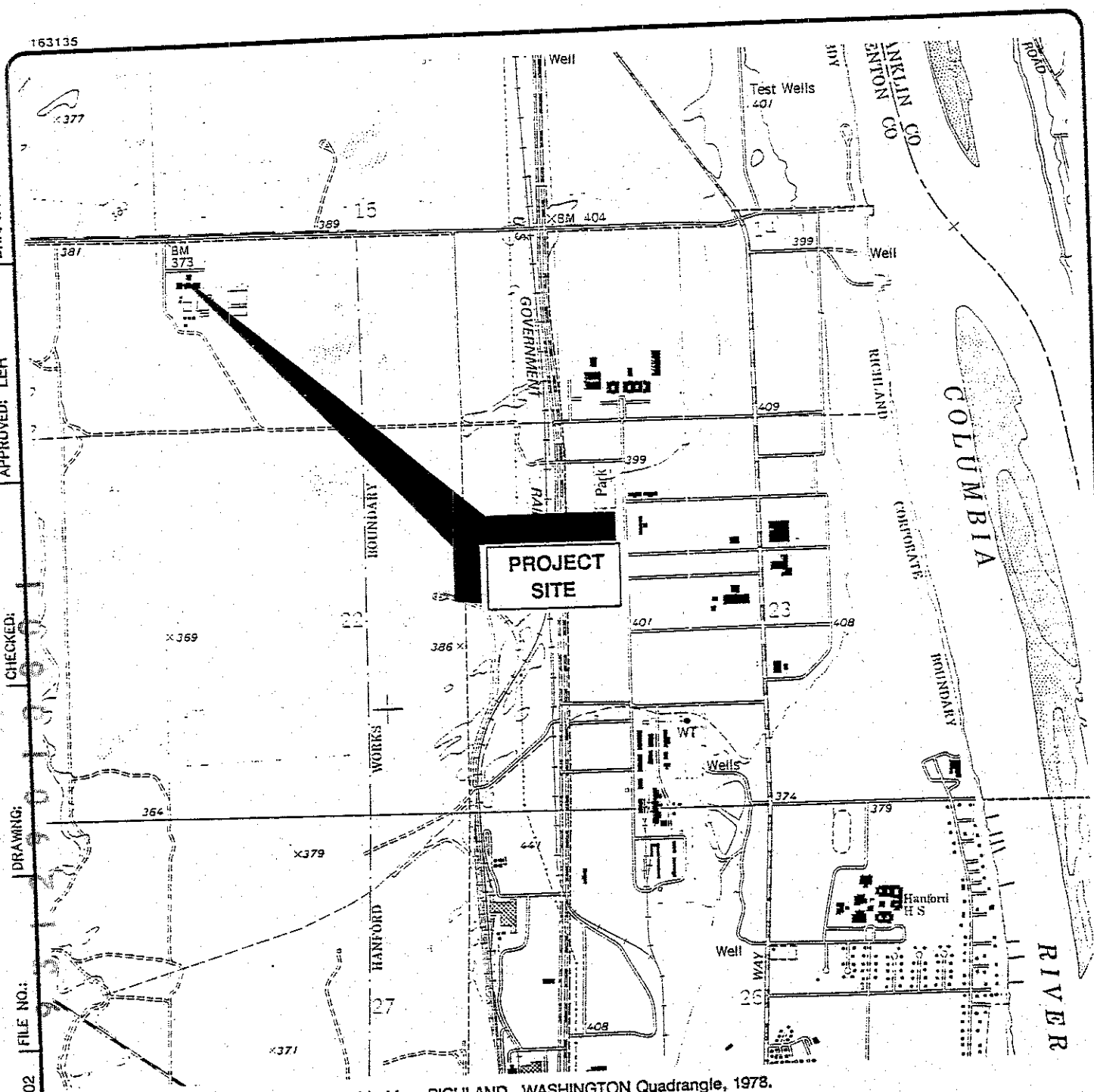
* Duplicate of GM-5
J Estimated value
B Analyte detected in laboratory blank, except with explanation (4)
TCE Trichloroethene

(1) Compound found in associated blank as well as in sample.
(2) Matrix spike recovery outside quality control limits.
(3) Laboratory duplicate relative percent difference outside quality control limits.
(4) Result above the Instrument Detection Limit, but below the Contract Required Detection Limit.

I:\SNPC\WA18303\DATAVAL.WQ2

FIGURES

163135



SOURCE: USGS 7.5 Minute Topographic Map, RICHLAND, WASHINGTON Quadrangle, 1978.

0 1 MILE

0 1000 2000 3000 4000 5000 6000 7000 FEET

N

WASHINGTON

QUADRANGLE LOCATION

GERAGHTY & MILLER, INC.
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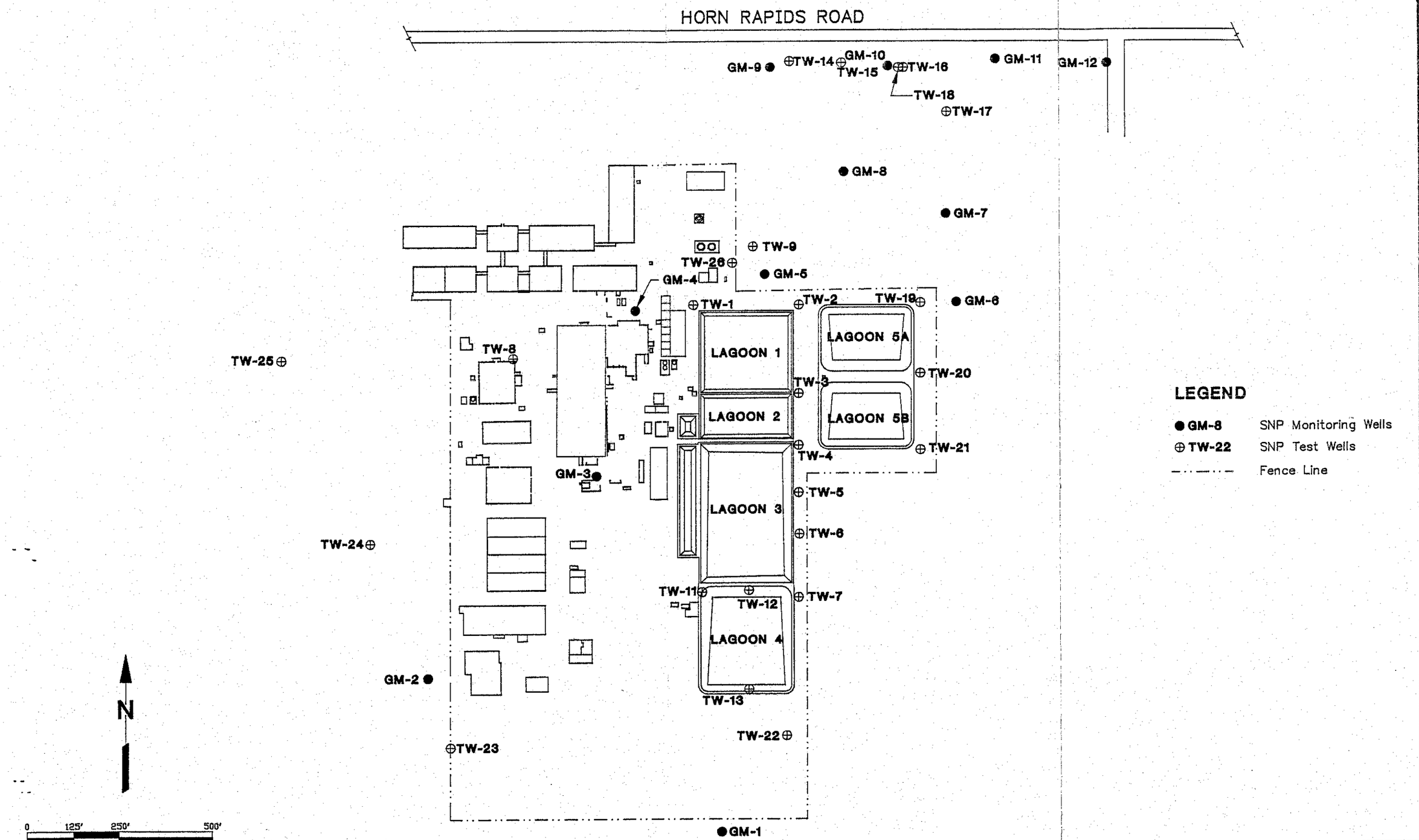
SITE LOCATION MAP

Siemens Nuclear Power Corporation
Richland, Washington

FIGURE 1

DRAFTER: SAC
APPROVED: LER
CHECKED:
DRAWING:
FILE NO.:
PRJCT NO.: WA183.02
DWG DATE: JULY 1991



GERAGHTY & MILLER, INC.
Environmental Services

JOB #WA183.03

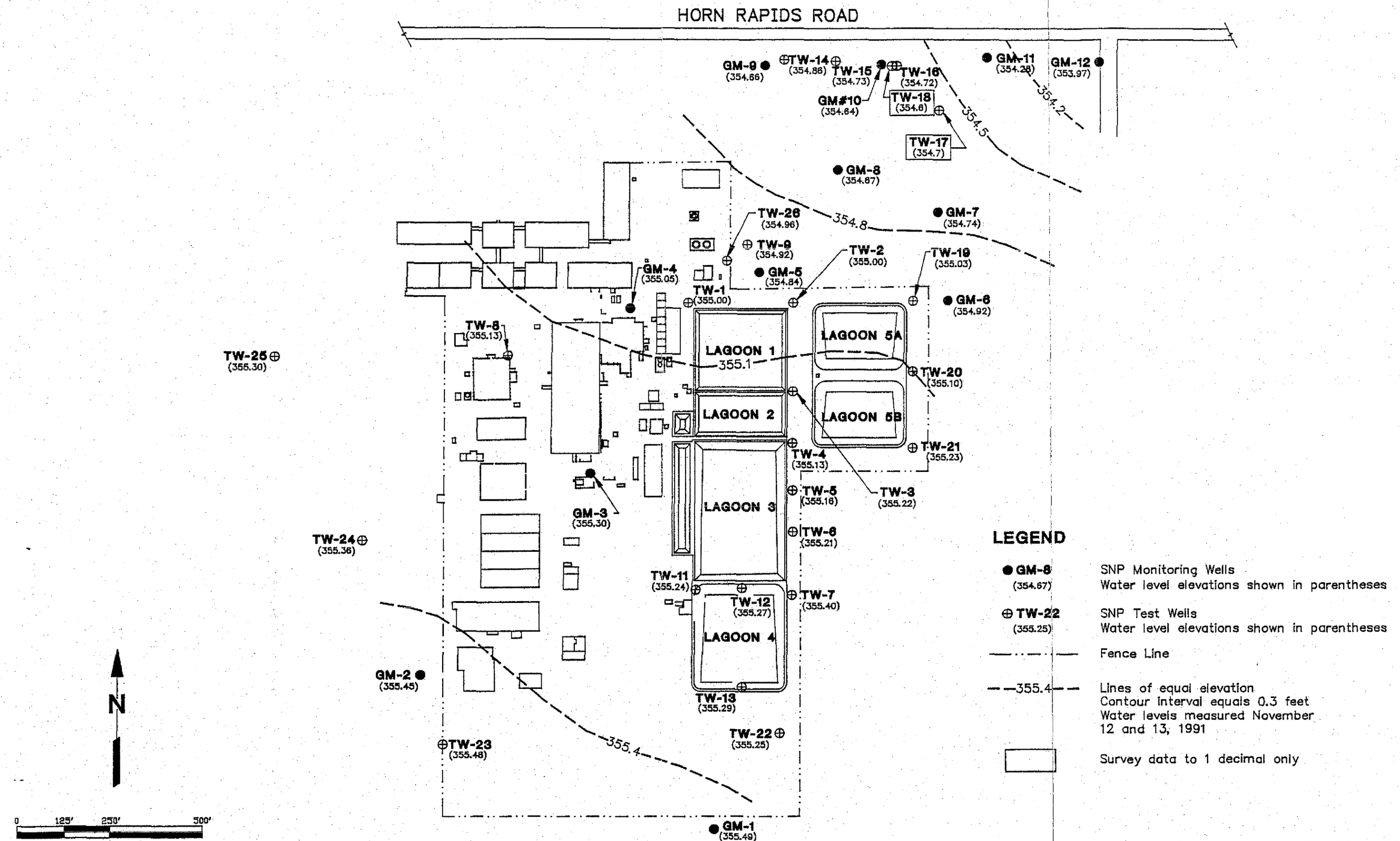
SITE PLAN

Siemens Nuclear Power Corporation
2101 Horn Rapids Road
Richland, Washington 99352

FIGURE 2

DWG DATE: 02-17-92 | PRJCT NO.: WA183.03 | FILE NO.: WA183.03 | DRAWING: X | CHECKED: JB | APPROVED: LER | DRAFTER: CH

9 3 1 2 9 0 1 0 8 0 2



GERAGHTY & MILLER, INC.
Environmental Services

JOB #WA183.03

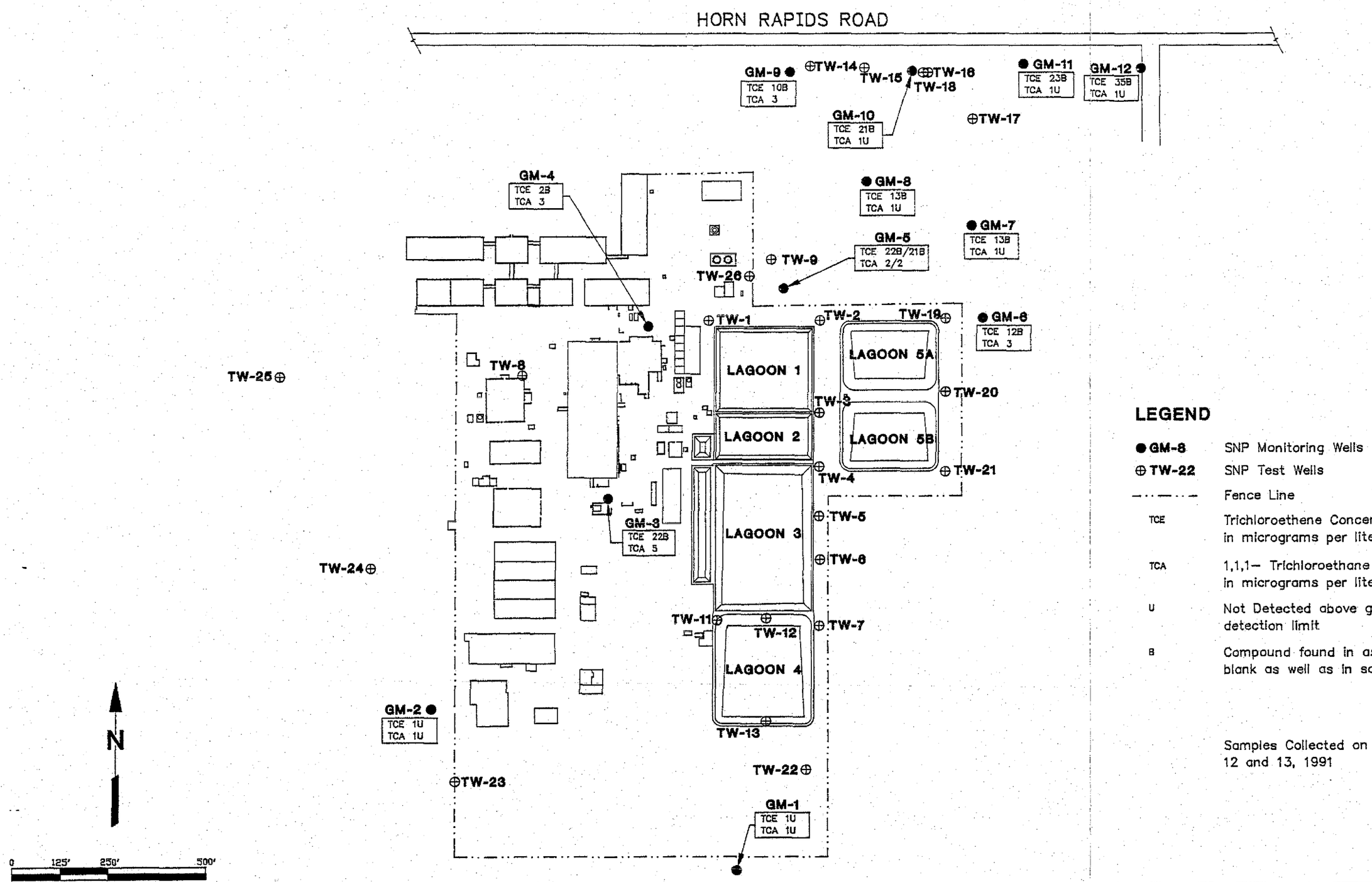
WATER TABLE SURFACE MAP

Siemens Nuclear Power Corporation
2101 Horn Rapids Road
Richland, Washington 99352

FIGURE 3

DWG DATE: 02-17-92 | PRJCT NO.: WA183.03 | FILE NO.: WA183.03 | DRAWING: X | CHECKED: JB | APPROVED: LER | DRAFTER: CH

9 3 1 2 9 0 1 0 8 0 3



GERAGHTY & MILLER, INC.
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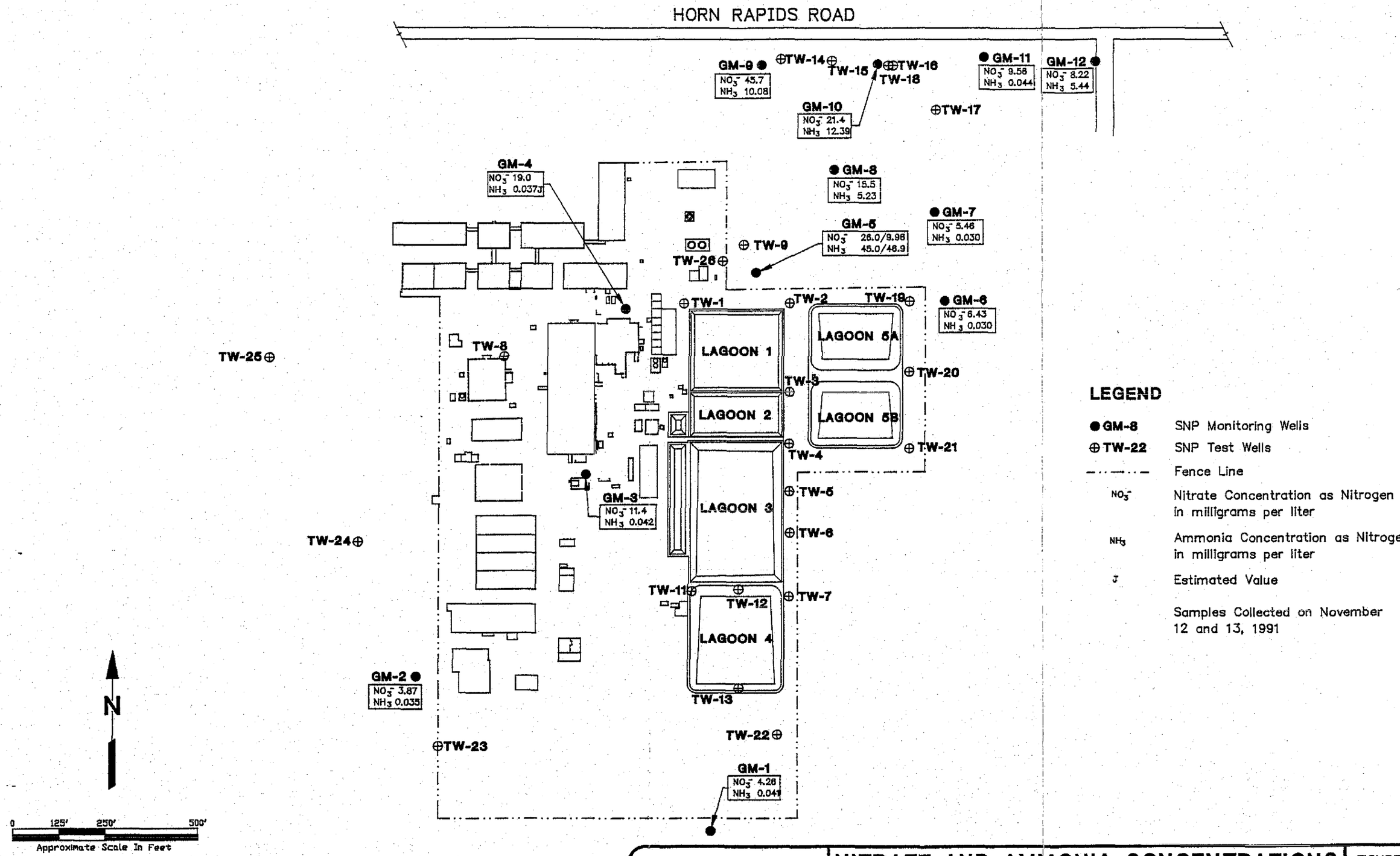
JOB #WA183.03

TCE AND TCA CONCENTRATIONS IN THE GROUND WATER NOVEMBER 1991

Siemens Nuclear Power Corporation
2101 Horn Rapids Road
Richland, Washington 99352

FIGURE **4**

DRAFTER: CH | APPROVED: LER | CHECKED: JB | DRAWING: 931290 | FILE NO.: WA183.03 | PRJCT NO.: WA183.03 | DWG DATE: 02-28-92



GERAGHTY & MILLER, INC.
Environmental Services

JOB #WA183.03

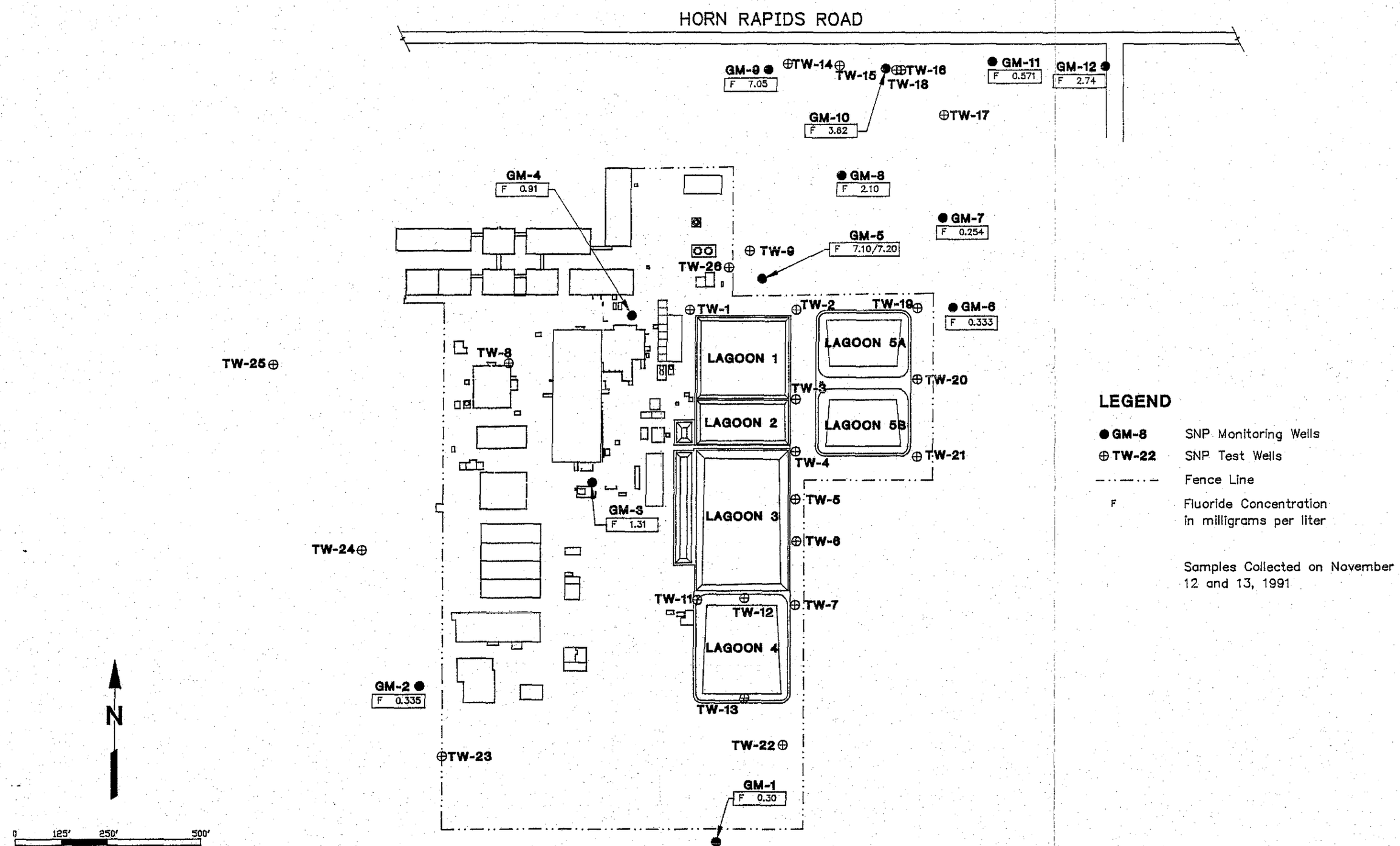
NITRATE AND AMMONIA CONCENTRATIONS IN THE GROUND WATER NOVEMBER 1991

Siemens Nuclear Power Corporation
2101 Horn Rapids Road
Richland, Washington 99352

FIGURE 5

DRAFTER: CH | APPROVED: LER | CHECKED: JB | DRAWING: X | FILE NO.: WA183.03 | PRJCT NO.: WA183.03 | DWG DATE: 03-16-92

9 3 1 2 9 0 1 0 8 0 5



GERAGHTY & MILLER, INC.
Environmental Services

JOB #WA183.03

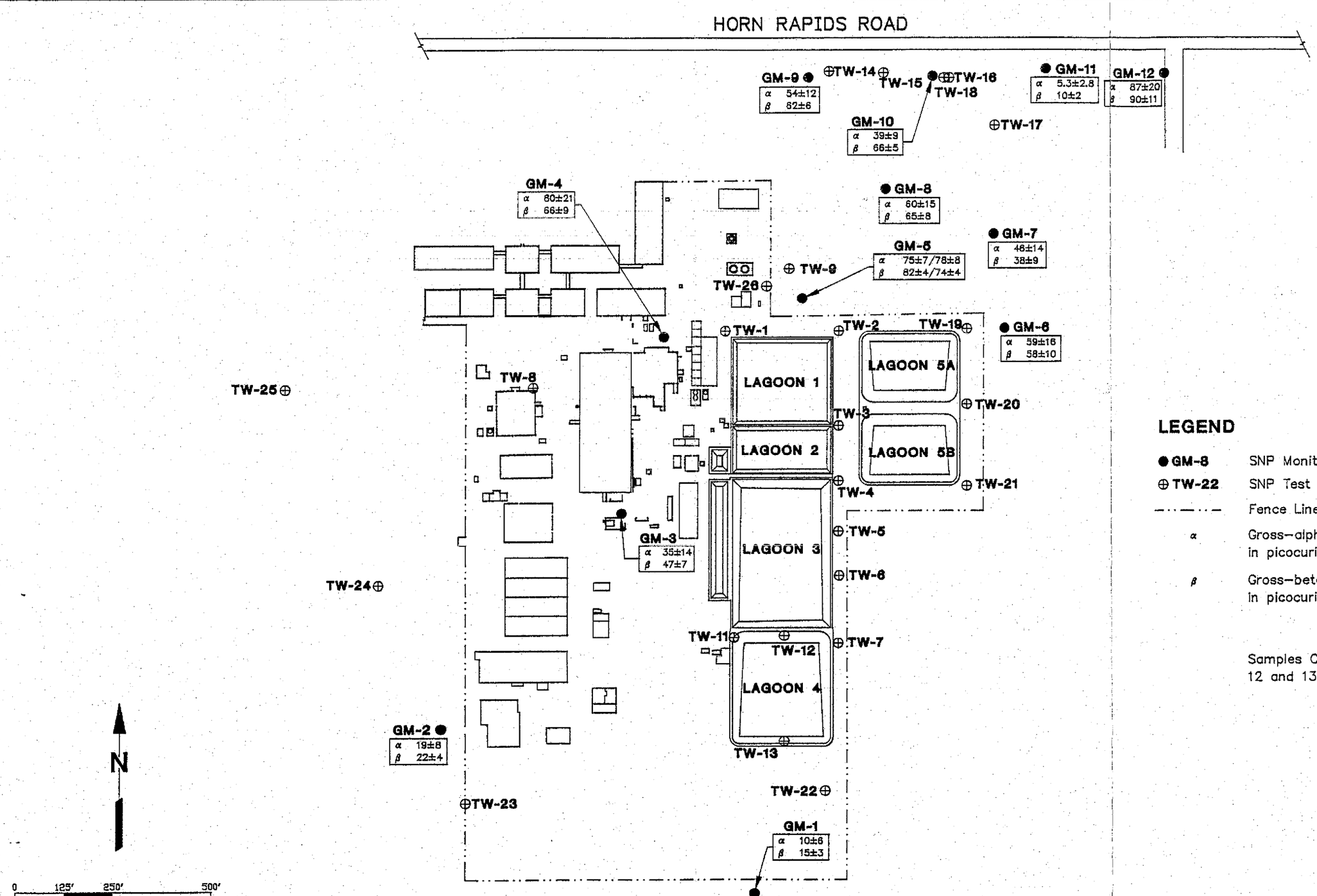
FLUORIDE CONCENTRATIONS IN THE GROUND WATER NOVEMBER 1991

Siemens Nuclear Power Corporation
2101 Horn Rapids Road
Richland, Washington 99352

FIGURE 6

DRAFTER: CH | APPROVED: LER | CHECKED: JB | DRAWING: X | FILE NO.: WA183.03 | PRJCT NO.: WA183.03 | DWG DATE: 02-17-92

9 3 1 2 9 0 1 0 8 0 6



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JOB #WA183.03

RADIONUCLIDE CONCENTRATIONS IN THE GROUND WATER NOVEMBER 1991

Siemens Nuclear Power Corporation
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Richland, Washington 99352

FIGURE 7

DWG DATE: 02-17-92 | PRJCT NO.: WA183.03 | FILE NO.: WA183.03 | DRAWING: X | CHECKED: JB | APPROVED: LER | DRAFTER: CH

9 3 1 2 9 0 1 0 8 0 7