INSTRUCTION SHEET

To update your copy of the Marble Hill Nuclear Generating Station - Units 1 and 2 Environmental Report - Operating License Stage, please remove the indicated pages and replace them with the attached Supplement 2 pages.

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* Correction of typographical error.

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TABE 2.1-3 (Cont'd)

CITY	STATE	1980 POPULATION[a]	PROJECTED 2030 POPULATION[b]	DISTANCE AND DIRECTION (in miles)
Taylorville	KY	801	1,167	39.5 S
Jonesville	IN	213	276	39.6 NW
Rising Sun	IN	2,478	3,607	39.8 NE
Crandall	IN	176	320	39.9 WSW
Milan	IN	1,556	2,348	39.9 NNE
Moores Hill	IN	566	918	40.1 NNE
Westport	IN	1,450	2,078	40.2 N
Valley Station (U)	KY	24,474	39,320	40.7 SSW
Fredericksburg	IN	233	346	41.4 WSW
Elizabethtown	IN	603	942	41.9 NNW
Napoleon	IN	246	335	41.9 N
Frankfort	KY	25,973	52,421	42.1 SW
Milhousen	IN	214	273	42.1 N
Aurora	IN	3,816	4,703	42.6 NE
Medora	IN	853	1,134	42.8 WNW
Elizabeth	IN	178	263	43.6 SW
Campbellsburg	IN	695	886	44.1 W
New Middletown	IN	115	171	44.3 SW
Shepherdsville	KY	4,454	11,244	44.5 SSW
Livonia	IN	120	162	45.0 W
Corydon	IN	2,724	4,115	45.3 SW
Hardinsburg	IN	298	443	45.7 WSW
Dry Ridge	KY	1,250	2,720	46.0 E
Saltillo	IN	134	171	46.0 W
Fairfield	KY	169	358	46.4 S
Lawrenceburg	IN	4,403	5,615	46.5 NE
Crittenden	KY	597	1,299	46.8 ENE
Stamping Ground	KY	562	1,136	47.1 ESE
Greendale	IN	3,795	4,839	47.2 NE
Williamstown	KY	2,502	5,444	47.4 E
Sunman	IN	924	1,396	47.6 NNE
Bloomfield	KY	954	1,495	47.9 S
Corinth	KY	258	561	48.0 E
Hartsville	IN	379	621	48.0 NNW
Walton	KY	1,651	3,811	48.3 ENE
Milltown	IN	1,006	1,566	48.4 WSW
Columbus	IN	30,292	40,493	48.8 NNW
Newpoint	IN	296	341	49.2 N
Lawrenceburg	KY	5,167	11,868	49.3 SE
Batesville	IN	4,152	5,528	49.4 NNE

Source: a. U.S. Department of Commerce (1981a, Tables 1 and 2; U.S. Department of Commerce 1981b, Tables 1 and 2).
b. Sargent & Lundy DEMOG Program.

inclusion in the National register of Historic Places by both the Indiana SHPO and the Keeper of the National Register (see Appendix 2.6A). The mitigation plan for this site, which includes moving the tower and avoiding the archaeological finding, has been approved by the Indiana SHPO and the USNRC (see Appendix 2.6A).

2.6.2.4 Marble Hill to Jefferson Transmission Line Corridor

The Marble Hill to Jefferson Transmission Line is described in detail in ER-OL Section 3.9. Archaeological reconnaissance of the corridor will begin in 1983. Results of this survey will be available following completion of the study.

2.6.2.5 Elizabethtown to Gwynneville Transmission Line Corridor

The Elizabethtown to Gwynneville Transmission Line and associated substations are described in detail in ER-OL Section 3.9. Archaeological reconnaissance of the corridor will begin in 1984; results will be available following completion of the survey. Results of archaeological reconnaissance of the substations are presented in the following subsections.

2.6.2.5.1 Elizabethtown Substation

A Phase I archaeological reconnaissance of the proposed 765 kV Elizabethtown Substation was completed in August 1980.

The Phase I reconnaissance, which included inspection of exposed ground areas and shovel probes, was conducted throughout an 80-acre tract of land in which the 10-acre substation will be located. Two prehistoric sites (12 B 428 and 12 B 198) were recommended for evaluation. Subsequent Phase II test excavations at 12 B 428 indicated that no cultural deposits have been preserved below the existing disturbed plowzone; no additional investigations were recommended. Undisturbed prehistoric cultural deposits were encountered in portions of 12 B 198. However, the material found was limited to lithic debris (chert flakes and thermally cracked stone) of unspecific cultural affiliation, and additional studies were not recommended. It was determined that neither site meets the criteria of eligibility for nomination to the National Register of Historic Places. 2

In conclusion, construction and operation of the Elizabethtown Substation will not affect significant archaeological resources.

2.6.2.5.2 Gwynneville Substation

A Phase I archaeological reconnaissance of the proposed Gwynneville 765 kV Substation was completed in March 1983.

The Phase I reconnaissance was conducted throughout a 106-acre tract of land in which the 16-acre substation will be located.

Three prehistoric sites (12 Sh 142, 12 Sh 143, and 12 Sh 147) and one historic site (12 Sh 148) were recommended for Phase II evaluation. The Phase II test excavations indicated that sites 12 Sh 142, 12 Sh 143, 12 Sh 147, and 12 Sh 148 do not meet the criteria for nomination to the National Register of Historic Places. No sub-plowzone artifacts, features, or cultural stratigraphy were located. The deep plowing that has been conducted on these sites has disturbed any artifact patterns associated with the prehistoric and historic phases of the si s. Because of this disturbance, the sites were not recommended potentially significant. 2

In conclusion, construction and operation of the Gwynnevil Substation will not affect any significant archaeological resources.

2.6.3 Natural Landmarks

The information for this subsection is p ed in Subsection 2.3.3 of the ER-CP except for the fo ng additions. The cemetery on the Marble Hill site property has been enclosed with a fence to prevent disturbance du g construction. Controlled access to the cemetery will be m ained throughout operation of Marble Hill 1&2. Natural areas t are located in the vicinity of the transmission line corridors are listed in ER-OL Table 3.9-1.

CONTENTS (Cont'd)

between 1977 and 1981 has been toward increasing Corbicula density.

Corbicula density in the vicinity of the Marble Hill site is considered to be oscillating above the optimum carrying capacity of the ecosystem of the Ohio River; it is expected to reach an equilibrium density sometime in future. Due to the relatively small volume of heated water that will be discharged from Marble Hill 1&2 to the Ohio River, no significant impact upon the benthic community, including Corbicula, is anticipated.

5.1.3.2 Thermal Effects on Fish

The preoperational ecological monitoring data collected from 1977 through 1981 confirm the results of the baseline studies conducted in 1974. In general, the predominant species of adult fish in the Ohio River in the vicinity of the Marble Hill site are gizzard shad, emerald shiner, and channel catfish, followed by sauger, longnose gar, and freshwater drum. As shown in ER-CP Table 5.1-6, gizzard shad, channel catfish, and longnose gar have been found in the Wabash River at temperatures of up to approximately 94° F; freshwater drum, although slightly less tolerant of high temperatures, has been found at temperatures in excess of 90° F.

Oak Ridge National Laboratory (1981, pp. 4-2, 4-3, 4-4, and 4-8) reports the following upper lethal temperatures for the predominant fish found in the Ohio River in the vicinity of the Marble Hill site:

Gizzard shad	31.7° C (89.0° F)
Emerald shiner	37.7° C (99.9° F)
Channel catfish	38.0° C (100.4° F)
Sauger	30.4° C (86.7° F)
Freshwater drum	34.0° F (93.2° F)

These values, with the exception of the value for sauger, represent the critical thermal maximum, generally considered to be the point at which locomotory activity becomes disorganized and the fish loses its ability to escape from adverse conditions (Oak Ridge National Laboratory 1981, p. 1-3). The value for sauger represents the temperature at which 50% of a group of test fish were alive after exposure for 96 hours. No information on the upper lethal temperature for longnose gar is readily available. However, this species is generally considered to be tolerant of relatively high temperature (see ER-CP Table 5.1-6). Inasmuch as the maximum predicted temperature of the blowdown from Marble Hill 1&2 is approximately 89° F under extreme conditions (see ER-OL Table 5.1-1), it is unlikely that upper lethal temperatures will be exceeded for any of the predominant

towers. Occurrence of downwash is determined from wind speed and direction relative to the towers and from the effluent velocity of the cooling tower discharge. Downwash criteria incorporated in the model are based upon laboratory and field studies of cooling tower aerodynamics. The model does not indicate the frequency of fog, but only of downwash that may lead to fog.

The new model computations for November 1978 through October 1979 indicate downwash conditions on 1422 hours, or 16% of the time. This frequency is significantly lower than the annual frequency of 25% given for ground-level fog in ER-CP Subsection 5.1.7.2.1. The new results suggest that the fog frequency estimates in the ER-CP are highly conservative.

On the basis of the original model results, the most recent computations, and surveys of observed cooling tower fogging effects (Carson 1980, p. 300; Hanna 1978, p. 13), it is concluded that the fog estimates presented in ER-CP Table 5.1-13 and Figure 5.1-12 are overestimates. Carson (1980, p. 300) and Hanna (1978, p. 13) state that ground fog from mechanical draft cooling towers does not extend beyond 200 to 500 meters from the towers. The estimates in the ER-CP indicate rare fog occurrences out to 1000 meters, with most occurrences within 400 meters.

Cooling tower fog usually occurs when winds have a substantial component normal to the long axis of the mechanical draft cooling towers. The maximum ground fog frequency at Marble Hill 1&2 will be east and northeast of the cooling towers, as shown in ER-CP Figure 5.1-12, in accord with the tower orientation and prevailing wind directions.

ER-CP Subsection 5.1.7.2.2 discusses the possibility of ground fog at great distances (50 km or farther) from the cooling towers. There have been no confirmed observations of such fog, and it appears highly unlikely that cooling tower-induced fog will ever occur at such distances from Marble Hill 1&2. Most authorities now believe that cooling towers do not cause ground fog in any circumstance other than downwash near mechanical draft towers (Carson 1980, p. 300; Hanna 1978, p. 13).

5.1.4.3 Effects of Drift

An analysis of the magnitude and impacts of cooling tower drift
was presented in ER-CP Subsection 5.1.7.3. That analysis was
based upon an assumed drift rate of 0.02% of the combined
circulating water and nonessential service water flow, or
approximately 120 gpm per unit. Manufacturers' specifications 2
for the circulating water cooling towers at Marble Hill 1&2 now
indicate that the actual drift rate will be no greater than
0.008% of the revised water flow, or approximately 52 gpm per 2
unit. This value represents a decrease by a factor of
approximately 2.3 in the quantity of drift from that assumed for
the ER-CP analysis. The ER-CP analysis was also 2

based on an expected total dissolved solids (TDS) concentration in the circulating water of 1500 mg/liter; more recent calculations indicate an average TDS concentration of 1635 mg/liter. 2

ER-OL Tables 5.1-6 through 5.1-9 and Figure 5.1-2 update the data presented in ER-CP Tables 5.1-14 through 5.1-18 and Figure 5.1-13 to take into account the lower drift rate, the higher TDS concentration, and the 1978-1979 meteorological data. All modeling results from the ER-CP have been scaled in accordance with these changes in cooling tower parameters and meteorological frequencies. 2 It is assumed that the original drift droplet size distribution (see ER-CP Table 5.1-14) is applicable to the new drift rate. The distribution was originally derived as typical for modern mechanical draft cooling towers (see response to Question 102, Supplement 1 to the ER-CP). It is believed that the drift deposition data presented in ER-OL Tables 5.1-6 through 5.1-9 and Figure 5.1-2 are conservative, since the modeling assumed a 100% capacity factor and all drift emissions from a point source at the center of the cooling tower area.

5.1.4.4 Other Effects

The Marble Hill 1&2 circulating water cooling towers will discharge large quantities of heat and moisture to the atmosphere. It has been suggested that such inputs of energy and water could lead to detectable changes in local weather phenomena, such as increased cloudiness or precipitation. Present knowledge of atmospheric processes is inadequate to define a firm limit of energy input above which significant meteorological responses may occur. However, many sources of magnitude similar to or greater than the Marble Hill 1&2 cooling towers have operated for long periods without measureable effects. As stated in NUREG-0097, the Final Environmental Statement for Marble Hill 1&2 (USNRC 1976, p. 5-5), "there is no evidence that...(cooling towers)... cause significant changes in local weather conditions."

The visible plumes from the Marble Hill 1&2 circulating water cooling towers will often resemble small natural clouds. The modeling that has been performed indicates that in 19% of the visible plume occurrences the cooling tower plumes will rise into the base of an existing overcast cloud layer. In a few cases, especially in summer, the plumes may evaporate, to reappear as small cumulus clouds at a higher altitude where natural clouds already exist.

Thus, the cooling towers will occasionally cause the formation of small clouds. In cold weather they may cause the formation of a long, narrow layer of stratus-type clouds at altitudes far above the ground. As discussed in Subsection 5.1.4.1.2 of this report, the frequency and size of these tower-induced clouds are too small to cause a significant increase in cloudiness or decrease

in sunlight. Most long visible plumes and tower-induced clouds will occur in winter and during naturally cloudy weather, so that the impact is further minimized.

A number of studies have been performed to determine whether cooling towers can cause changes in precipitation. Snowfall from cooling towers has been observed on a few occasions of very cold

5.1.4.5.1 Combination of Cooling Tower Plumes

The plumes from the cooling towers at Marble Hill 1&2 and those at the Trimble County Generating Station will occasionally combine and mix. This is likely to occur only when winds are directed along the line joining the two plants, i.e., from the northwest or southeast. For other wind directions, the plumes will not merge until they are far downwind of both sources, by which time both are likely to have dispersed and evaporated.

Northwest and southeast winds had a combined frequency of occurrence of approximately 8% according to the 1978-1979 meteorological data from the Marble Hill site; this represents the maximum occurrence of direct plume combination for this period. Whether or not the plumes actually mix when winds are from the northeast or southeast will depend on their relative altitudes.

Combination of the cooling tower plumes from the two stations will have little effect except for an increase in the size and length of the combined plumes when both are visible. The modeling analysis done for this report indicates that the Marble Hill circulating water cooling tower plumes will be visible over the Trimble County Generating Station approximately 50 hours per year. According to data in the Trimble County Draft Environmental Impact Statement (EIS) (USEPA 1978a, p. TA-129), plumes from that station will be visible over Marble Hill 1&2 approximately 35 hours per year. Thus, it is estimated that there will be approximately 85 hours per year when merger or close approach of the two sets of cooling tower plumes results in a larger visible plume than would result from either station individually. These occasions of plume merger will usually be on cloudy or rainy days, and there will be no significant reduction in sunlight due to the combination.

In other situations the visible part of the cooling tower plumes from both power stations will have disappeared before the plumes merge. There will then be no observable effect of merger. It was concluded in the Trimble County Final EIS (USEPA 1978b, p. 2-4) that the worst-case humidity increase due to the cooling towers at each station will be 3% or less, and that the "interaction potential of cooling tower plumes is remote."

There will be some overlapping of the drift deposition patterns from the two stations' cooling towers. Both sets of towers will have their maximum solids deposition to the north and northeast, but the respective peak deposition areas will be on opposite sides of the Ohio River. Based on the estimated deposition pattern for Marble Hill 1&2 from this report and that for Trimble County from its Draft EIS (USEPA 1978a, p. TA-133), the point of maximum combined drift deposition will be approximately 2.5 km north of the Trimble County plant on the Kentucky side of the Ohio River. The annual average solids deposition rate there will be approximately 50 kg/hectare-year. This is less than rates | 2

shown to have adverse effects on vegetation (Mulchi and Armbruster 1974, p. 385).

The drift deposition rate at Marble Hill 1&2 due to operation of the Trimble County Generating Station is indicated to be 1.2 kg/hectare-year (Figure 6.3.1-2A, Trimble County Draft EIS), while that at Trimble County Station due to operation of Marble Hill will be approximately 10 kg/hectare-year (see ER-OL Figure 5.1-2). The Trimble County Station deposition rates are generally smaller than Marble Hill's because of the higher altitude of emission from Trimble County's natural draft cooling towers; drift particles are thus usually dispersed over a larger area before they are deposited on the ground. The difference may be less than indicated in the above comparison, however, because of the different terrain elevations at the Marble Hill and Trimble County Station sites. 2

5.1.4.5.2 Combination of Cooling Tower and Stack Plumes

Units 1 and 2 of the Trimble County Generating Station will emit approximately 2000 g/sec of sulfur dioxide (SO_2) from the plant stacks. These emissions will be at an altitude of 372 meters above mean sea level (MSL). The Marble Hill 1&2 cooling towers have an emission altitude of 255 meters MSL.

Combination of the Marble Hill cooling tower plume and the Trimble County stack effluent plume may occur during the 3% to 6% of the time that winds are from the northwest. (When winds are from the southeast the stack plume will normally pass over the Marble Hill site well above the Marble Hill cooling tower plume.) The combination of the cooling tower and stack plumes will have no significant effect on plume chemistry or pollutant concentrations. It is believed that moisture accelerates the formation of sulfates in a power plant stack effluent plume, though the detailed chemistry of SO_2 transformation into sulfates in the atmosphere is not fully understood. There have been reports of increased acidity where cooling tower plumes mix with stack plumes (Hanna 1978, p. 18). However, the moisture that could be added to the Trimble County stack plume by the Marble Hill cooling towers will not be significant in magnitude or frequency of occurrence compared to other sources. Large quantities of water vapor are naturally present in the atmosphere much of the time, the Trimble County stack plume is expected to mix with its own cooling tower plume more frequently than with Marble Hill's, and abundant moisture will already be present in the scrubbed stack plume at emission.

Interactions of the cooling tower plumes and stack plume from Marble Hill 1&2 and the Trimble County Generating Station were considered in the Trimble County Final EIS (USEPA 1978b, p. 2-4). In that document, the U.S. Environmental Protection Agency stated that there are no standards or regulations concerning sulfates, and that any potential radiological interactions would have "relatively minor" impacts.

TABLE 5.1-6

EXPECTED RATE OF DEPOSITION OF DRIFT SOLIDS

DIRECTION FROM COOLING TOWERS	DISTANCE FROM CENTER OF COOLING TOWER AREA (meters) 100	200	300	500	1,000	5,000	10,000	
N	197	503	218	152	113	11	4	
NNE	260	724	312	219	163	17	6	
NE	210	539	239	178	131	12	5	
ENE	133	341	171	168	122	8	2	
E	95	247	139	174	122	7	1	
ESE	65	174	103	131	98	6	2	
SE	49	125	67	76	56	4	1	
SSE	39	106	71	103	74	4	1	
S	68	174	86	83	62	5	1	2
SSW	81	207	98	82	62	6	1	
SW	105	269	133	126	93	6	1	
WSW	109	278	120	86	67	7	1	
W	128	332	142	96	73	7	4	
WNW	105	265	107	57	42	5	1	
NW	121	307	119	55	40	6	2	
NNW	105	270	114	78	46	5	2	

Note: Deposition values are in kg/hectare-year; to convert to pounds/acre-month, multiply values by 0.074.

TABLE 5.1-7

AREA AFFECTED BY VARIOUS MAGNITUDES OF DRIFT RESIDUE DEPOSITION

RANGE OF SOLIDS DEPOSITION (kg/hectare-year)[a]	TOTAL AREA (hectares)[b]	
≥ 500	1.0	
250 - 499	9.0	
200 - 249	11.5	
150 - 199	33.5	
100 - 149	165	2
50 - 99	580	
10 - 49	5000	
5 - 9.9	7600	
2 - 4.9	25,000	
<2	>30,000	

[a]To convert deposition values to pounds/acre-month, multiply by 0.074.

[b]To convert area to acres, multiply by 2.47.

TABLE 5.1-8

GROUND-LEVEL CONCENTRATION OF DRIFT MINERALS

IN AMBIENT AIR FOR MARBLE HILL 1 & 2 COOLING TOWERS

DISTANCE (meters)	MAXIMUM 24-HOUR AVERAGE ($\mu g/m^3$)	ANNUAL AVERAGE ($\mu g/m^3$)
100	<0.2	<0.05
200	1.9	0.19
300	15.5	1.8
500	34.5	4.2
1,000	16.6	2.0
2,000	7.1	0.7
5,000	1.0	0.1
10,000	0.14	0.019

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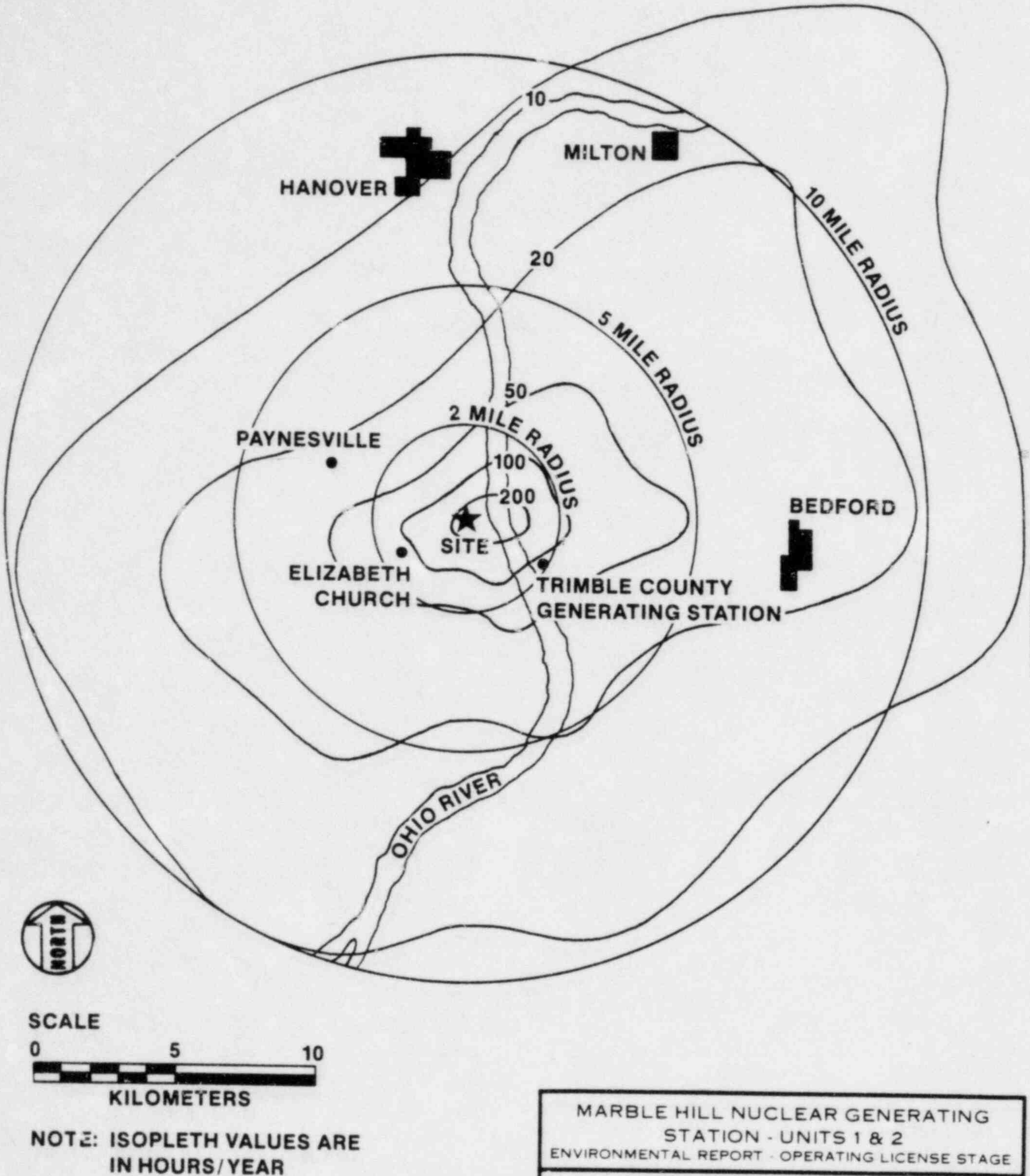
TABLE 5.1-9

COMPARISONS OF GROUND-LEVEL CONCENTRATIONS OF DRIFT MINERALS WITH AIR QUALITY STANDARDS

AVERAGING TIME	MAXIMUM DRIFT MINERALS CONCENTRATIONS ($\mu g/m^3$)	INDIANA AIR QUALITY STANDARDS FOR SUSPENDED PARTICULATE		COMPLIANCE WITH STANDARD
		PRIMARY ($\mu g/m^3$)	SECONDARY ($\mu g/m^3$)	
24-hour	34.5	260	150	Yes
Annual	4.2	75	60[a]	Yes

[a]National Ambient Air Quality Standard.

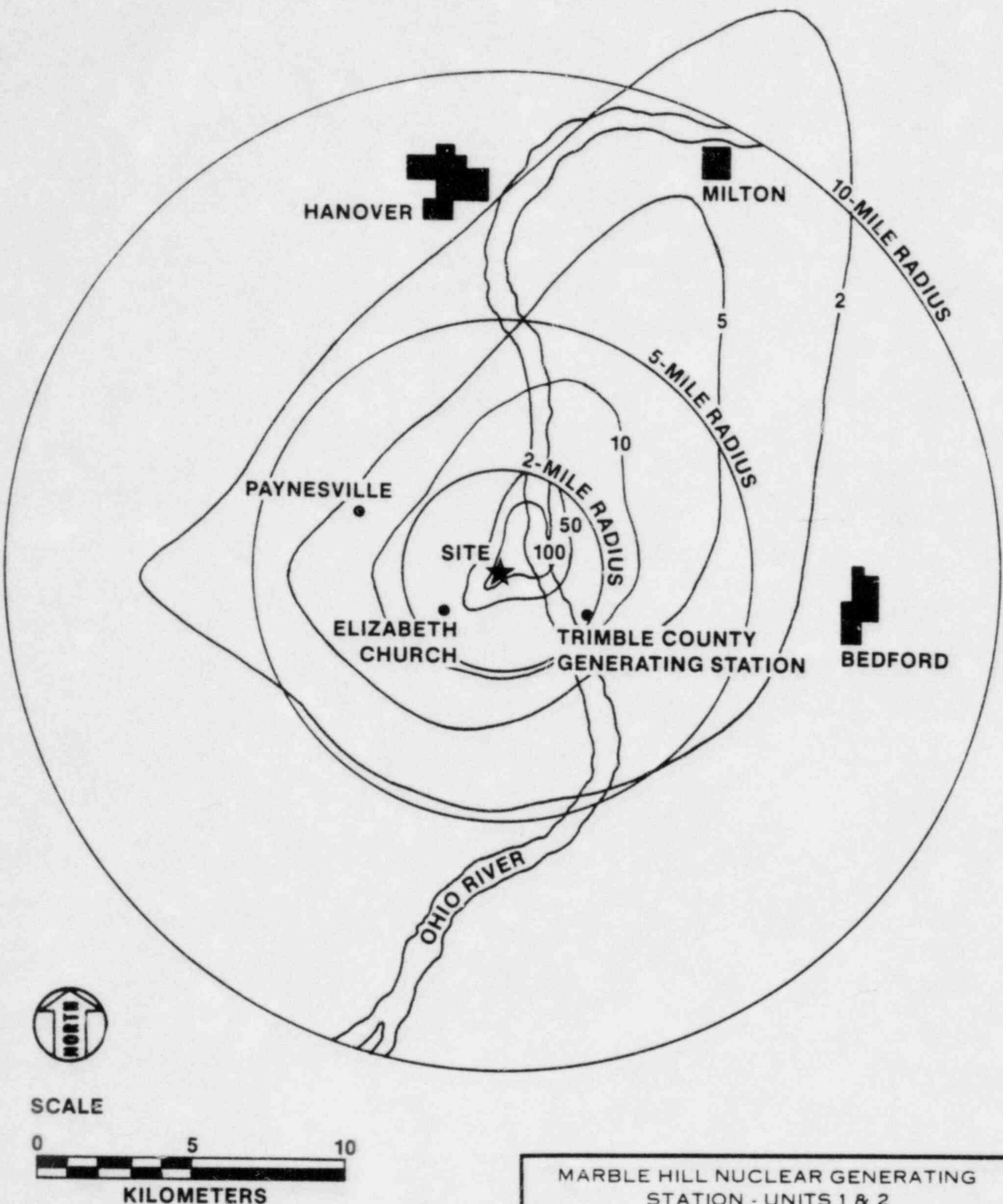


2

MARBLE HILL NUCLEAR GENERATING STATION - UNITS 1 & 2
ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE

FIGURE 5.1-1

FREQUENCY OF VISIBLE COOLING TOWER PLUMES FOR THE PERIOD NOV. 1978 TO OCTOBER 1979



NOTE: ISOPLETH VALUES ARE IN Kg/HECTARE-YEAR

MARBLE HILL NUCLEAR GENERATING STATION - UNITS 1 & 2
ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE

FIGURE 5.1-2

ANNUAL AVERAGE DEPOSITION RATE OF DRIFT SOLIDS

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CHAPTER 6.0 - EFFLUENT AND ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS

LIST OF FIGURES

regulatory guide and the USNRC's Branch Technical Position on "An Acceptable Radiological Environmental Monitoring Program" (1979).

The PERMP is scheduled to begin in January 1983, approximately 3.5 years before fuel arrives at the site. The objectives of the PERMP include the following:

a. to identify probable critical pathways for radiation that should be monitored after the station begins operation;

b. to measure background radiation levels and their variations along anticipated critical pathways in the area surrounding the station;

c. to train personnel in the use of monitoring equipment and procedures; and

d. to evaluate monitoring equipment and procedures for use in the operational environmental radiological monitoring program.

The Environmental Report - Construction Permit Stage (ER-CP) for Marble Hill 1&2 stated that a detailed description of the PERMP would be presented in the ER-OL. Details of the PERMP are presented in the following subsections.

6.1.5.1 Sampling Media, Locations, and Frequency

ER-OL Table 6.1-8 summarizes the samples and analyses planned for the Marble Hill 1&2 PERMP. The media to be sampled include the most important radiation dose pathways. ER-OL Table 6.1-9 summarizes the code used to identify samples and the approximate direction and distance from the station of each of the sampling locations. The locations of the onsite airborne radioactivity monitoring stations and onsite direct radiation monitoring stations are shown in ER-OL Figures 6.1-5 and 6.1-6. Onsite groundwater, surface water, fish, invertebrate, and shoreline sediment monitoring locations are shown in ER-OL Figure 6.1-7. The locations of offsite airborne radioactivity and direct radiation monitoring stations are shown in ER-OL Figures 6.1-8 and 6.1-9. Offsite milk, peach, and tobacco monitoring locations are shown in ER-OL Figure 6.1-10. ER-OL Figure 6.1-11 shows the locations of all control radiation monitoring stations (air, water, and terrestrial) in this program. 2

6.1.5.2 Data Analysis, Analytical Sensitivity, and Data Presentation

The samples will be analyzed by radiochemical methods that are similar to or better than those outlined in the U.S. Atomic Energy Commission Health and Safety Laboratory's "Procedures

Manual" (USAEC 1972). The analytical procedures will result in detection capabilities equal to or better than those outlined in the USNRC's Branch Technical Position (1979, Table 2). These detection capabilities are shown in ER-OL Table 6.1-10. ER-OL

TABLE 6.1-9

SAMPLING LOCATIONS FOR THE RADIOLOGICAL MONITORING PROGRAM

EXPOSURE PATHWAYS	SAMPLE CODE[a]	DIRECTION[b]	DISTANCE[b] (miles)	REMARKS
Air Monitoring a. Airborne Particulates/ Airborne Iodine	020301/ 030301	NE	0.2	Northwest corner of cemetery east of Unit 1 cooling tower.
	021202/ 031202	WSW	1.3	Meteorological station 1 - near Elizabeth Church.
	020801/ 030801	SSE	0.5	Behind (east) guardhouse at Gate 1.
	020101/ 030101	N	0.7	Located behind guardhouse at north gate to site (near Little Saluda Creek).
	020508/ 030508	E	7.3	Bedford, Kentucky substation. 0.7 mile east of KY 421 on Cuts V Lane.
	021206/ 031206	WSW	5.7	New Washington substation pole No. 717-[illegible]98. The substation is across the street from Disciples of Christ Church.
	020111/ 030111	N	11.0	North Madison (PSI) service center on Clifty Drive.
	021029/ 031029	SSW	29.0	LG&E Power Station at 3rd Street and River Road, Louisville.
Direct Radiation Monitoring (TLD)	010101	N	0.7	Behind guard shack at the north gate to the Marble Hill site (attached to utility pole).
	010201	NNE	0.6	Floodplain; attached to cement based pole located between the two cement block well buildings north of the pumping station.
	010300	NE	0.2	Northwest corner of cemetery, east of cooling tower No. 1. TLD attached to chain link fence.
	010301	NE	0.4	Floodplain; on meteorological tower No. 2 fence.
	010401	ENE	0.4	Located on second cement-based pole north of the pumping station (first cement-based pole east of the floodplain road).
	010501	E	0.4	South of pumping station on utility pole immediately west of small yellow building (first pole south of discharge structure).
	010601	ESE	0.6	Located on a maple tree at the east edge of a clearing approximately 0.4 mile south of pumping station.

See footnotes on last page of table.

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TABLE 6.1-9 (CONT'D)

EXPOSURE PATHWAYS	SAMPLE CODE[a]	DIRECTION[b]	DISTANCE[b] (miles)	REMARKS
Direct Radiation Monitoring (TLD) (Cont'd)	010701	SE	0.6	Located on fifth fence post east of Marble Hill Road along the fence bordering the site east of gate 1.
	010801	SSE	0.5	Attached to fence post behind (east) guardhouse at gate 1.
	010901	S	0.5	Attached to thirtieth fence post west of gate 1.
	011001	SSW	0.5	Located on fence post west of Marble Hill Inn along Marble Hill Road (north side of road).
	011101	SW	0.6	Attached to second pole east of the guard shack at the gate 3 entrance to the site.
	011202	WSW	1.3	Meteorological tower near Elizabeth Church.
	011301	W	0.6	Located on the first pole west of the small drainage ditch running under the fence north of the Ceco Lord Warehouses (southwest of materials building).
	011401	WNW	0.6	Attached to the chainlink fence directly in front of the large wooden utility pole that is northwest of the Materials Building in the Newberg Laydown area.
	011501	NW	0.5	Located northwest of cooling tower [illegible]. The TLD is attached to the small tulip tree on the west edge of the access road (approximately 300 feet from the gate behind the spoil area).
	011601	NNW	0.8	Located on the chain link fence bordering the Newburg area northwest of materials building.
	010105	N	4.6	Located on PSI pole no. 714-971, which is located at the "T" formed where 400 West meets 500 South.
	010205	NNE	4.3	Located on South Central Bell pole no. 53 4.0 miles south on KY 625.
	010209	NNE	8.4	Attached to a pole behind (east) the Milton Substation, which is located at the junction of KY 625 and KY 1255.
	010304	NE	3.4	Located on South Central Bell pole no. 23, which is approximately 7.0 miles south of KY 421 on KY 625.
	010404	ENE	3.7	Attached to pole no. [illegible]. This pole is located on KY 625 near Mount Pleasant.

See footnotes on last page of table.

2

TABLE 6.1-9 (CONT'D)

EXPOSURE PATHWAYS	SAMPLE CODE[a]	DIRECTION[b]	DISTANCE[b] (miles)	REMARKS
Direct Radiation Monitoring (TLD) (Cont'd)	010505	E	4.6	Attached to pole no. 38. This is the third pole past the black-top road on the south side of KY 625 east of Poplar Ridge Church.
	010508	E	7.3	Located at Bedford Substation 0.7 mile east of KY 421 on Cuts V Lane.
	010605	ESE	4.2	Attached to pole no. 32, which is located approximately 2.5 miles west of KY 42 on KY 754.
	010705	SE	4.2	Attached to pole no. 23189, which is located approximately 3.6 miles west of KY 42 on the road immediately south of the large Bray Orchards building.
	010805	SSE	4.4	TLD is located on a utility pole containing a large green box and platform. This pole is located on the southwest side of Bethlehem along Bethlehem Road.
	010909	S	8.6	Attached to pole no. 206 located along a gravel lane just west of the Oldham Co. Water District building on the east edge of Westport, Ky.
	010905	S	4.4	Attached to PSI pole no. 790-348 located approximately 0.5 mile west of Bethlehem on Bethlehem Road.
	011005	SSW	4.6	Located on a pole along Flint Ridge Road 2.6 miles south of Bethel Church.
	011105	SW	4.4	Attached to PSI pole no. 720-134 at the Otto Substation. Otto Substation is located 0.5 mile south of Bethlehem Road on Boyer Road.
	011205	WSW	4.2	Attached to the seventh pole east of Taflinger Road on the north side of Carroll Road (Taflinger Road is 1 mile east of New Washington on Bethlehem Road).
	011206	WSW	5.7	Attached to pole no. 717-998 immediately west of the New Washington Substation.
	011305	W	4.3	Attached to pole no. 6½ located south, just off Marble Hill Road, along the 1st road east of Rt. 62.
	011405	WNW	4.3	Attached to a poplar tree approximately 80 feet east of Rt. 62 along the south side of the railroad tracks leading to Marble Hill.

See footnotes on last page of table.

2

TABLE 6.1-9 (CONT'D)

EXPOSURE PATHWAYS	SAMPLE CODE[a]	DIRECTION[b]	DISTANCE[b] (miles)	REMARKS
Direct Radiation Monitoring (TLD) (Cont'd)	011505	NW	4.7	Located on the 12th pole west of Saluda on the south side of Road 600 South.
	011605	NNW	4.8	Located on pole no. 791-197, which is along Road 500 southeast of Paynesville Road.
	010111	N	11.0	Located at North Madison Service Station on Clifty Drive.
	011029	SSW	29.0	Located at LG&E Generating Station at 3rd Street and River Road, Louisville.
	011422	WNW	22.0	Attached to pole no. 729-979 located in the northwest corner of the 1st Assembly Church parking lot, Austin, Indiana.
Drinking Water Monitoring	091025	SSW	25.0	Surface water composite sample from Louisville Water Company's B. E. Payne Water Treatment Plant.
Surface Water Monitoring	110401	ENE	0.5	Located 0.5 mile upstream of intake structure.
	110501	E	0.5	Located 0.5 mile downstream of discharge structure.
Groundwater Monitoring	100201	NNE	0.6	Marble Hill Station floodplain potable wells.
Terrestrial Monitoring a. Milk	061607	NNW	6.1	Dairy located along Garrel Road approximately 2.5 miles northeast of Saluda.
	060505	E	4.9	Dairy located approximately 10.0 miles south of KY 421 on KY 625.
	061003	SSW	2.4	Dairy located 4.7 miles east of Rt. 62 on Bethlehem Road.
	061116	SW	16.0	Dairy located 3.0 miles southwest of Charlestown on Rt. 403.
b. Fruits and Vegetables	071502	NW	1.5	Reed's peach orchard.
	071229	WSW	29.0	Huber Orchards, Starlight, Indiana.
	080104	N	3.9	Turner residence. Located 0.5 mile south of Road 500 S on River Road.

2

See footnotes on last page of table.

TABLE 6.1-9 (CONT'D)

EXPOSURE PATHWAYS	SAMPLE CODE[a]	DIRECTION[b]	DISTANCE[b] (miles)	REMARKS
Terrestrial Monitoring (Cont'd)				
b. Fruits and Vegetables (Cont'd)	081112	SW	11.2	Zollman residence. Located 5.2 miles north of Monroe Street on Tunnel Mill Road.
	050105	N	4.5	Hall residence. Located on Road 500 S, 2.6 miles from the junction 1 mile north of Saluda.
	051116	SW	16.0	Kines residence. Located on Monroe Street, Charlestown, Indiana.
c. Soil	040101	N	0.7	Same location as 020101.
	040301	NE	0.2	Same location as 020301.
	040801	SSE	0.5	Same location as 020801.
	041202	WSW	1.3	Same location as 021202.
	040508	E	7.3	Same location as 020508.
	041206	WSW	5.7	Same location as 021206.
	040111	N	11.0	Same location as 020111.
	041029	SSW	29.0	Same location as 021029.
Fish, Invertebrates[c], and Shoreline Sediment Monitoring				
a. Fish	120105	N	5.0	Located 5.0 miles upstream from intake structure.
	120501	E	0.5	Located 0.5 mile south of pumping station.
b. Shoreline Sediment	130105	N	5.0	Same location as 120105.
	130501	E	0.5	Same location as 120501.
c. Invertebrates	140105	N	5.0	Same location as 120105.
	140501	E	0.5	Same location as 120501.

See footnotes on last page of table.

2

TABLE 6.1-9 (CONT'D)

[a]Sample Code Designations:

SAMPLE TYPE	SECTOR	DISTANCE
01 = TLD	01 = N	Broken down into 1 mile rings. Consistent with NUREG-0654.
02 = Air Particulate	02 = NNE	
03 = Airborne Iodine	03 = NE	
04 = Soil	04 = ENE	0 - 1 = 1
05 = Cabbage	05 = E	1 - 2 = 2
06 = Milk	06 = ESE	2 - 3 = 3
07 = Fruit	07 = SE	3 - 4 = 4
08 = Tobacco	08 = SSE	4 - 5 = 5
09 = Drinking Water	09 = S	10 - 11 = 11
10 = Groundwater	10 = SSW	
11 = Surface Water	11 = SW	
12 = Fish	12 = WSW	
13 = Shoreline Sediments	13 = W	
14 = Invertebrates	14 = WNW	
	15 = NW	
	16 = NNW	

2

ID Numbers are written in following order:

Sample Type	Sector	Distance
—	—	—

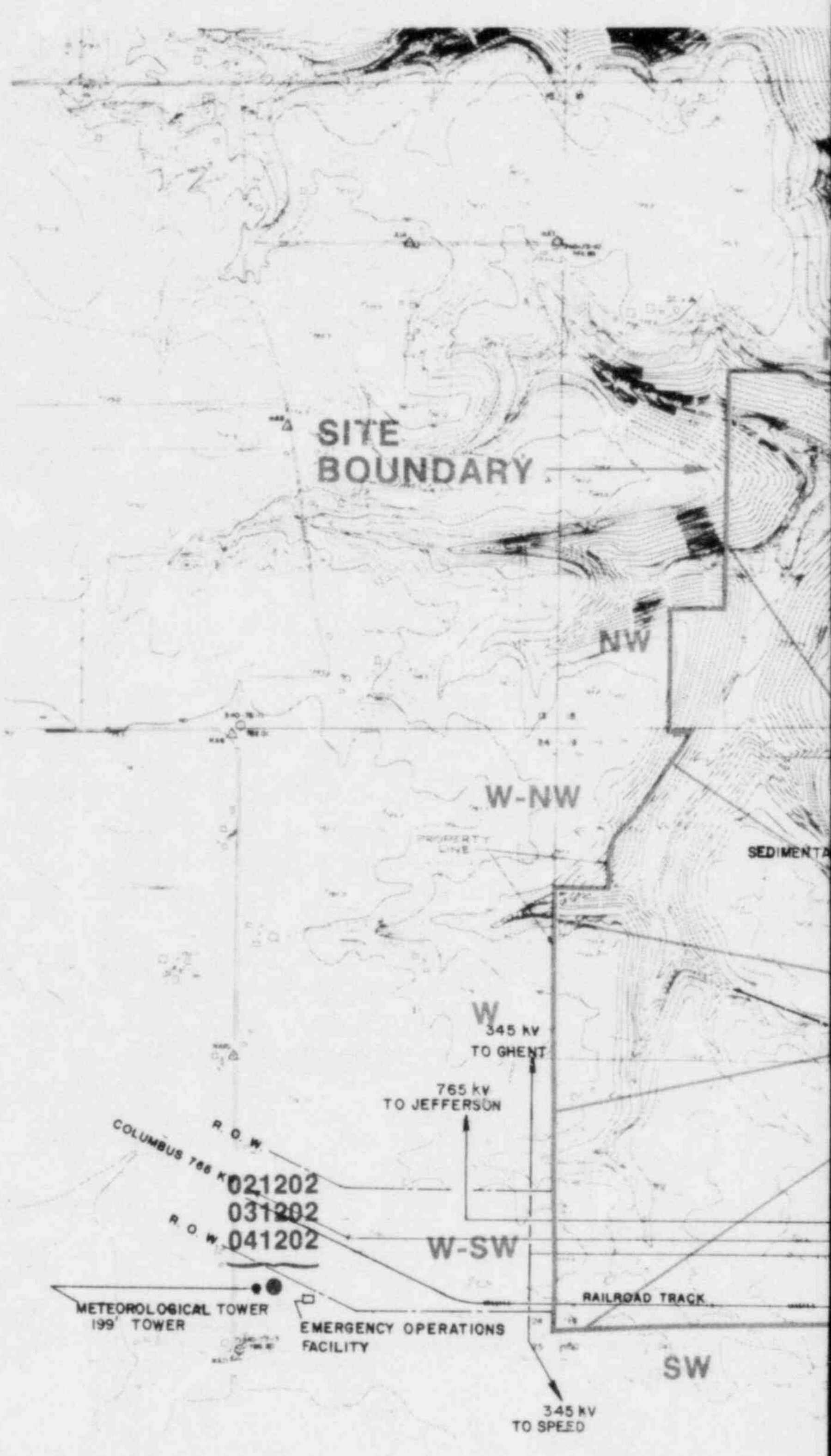
Examples:

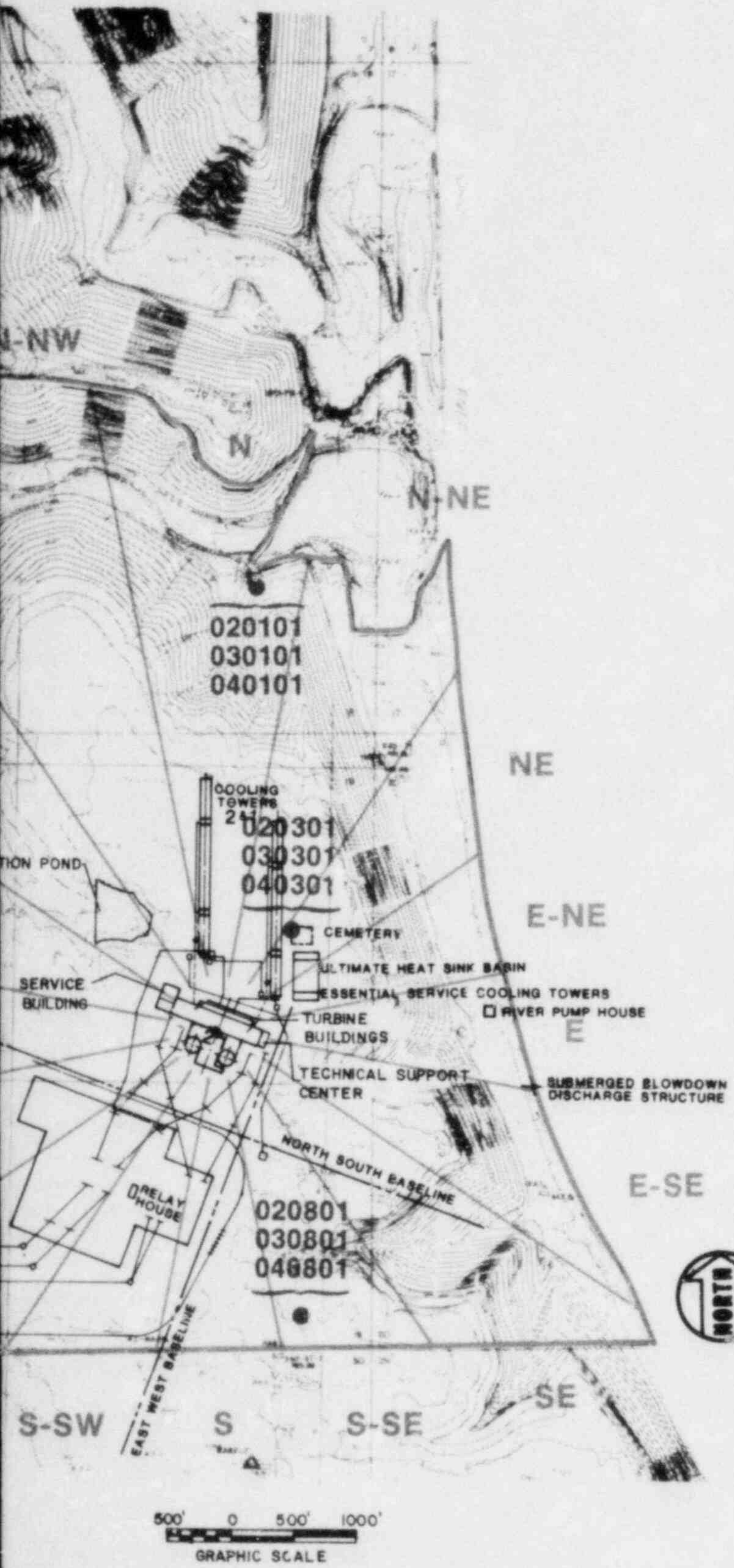
051103 Cabbage,	SW Sector	3 mile ring
011501 TLD	NW Sector	1 mile ring

[b]Direction and distance are measured from the vent stack.

[c]Invertebrates will be sampled at each of the fish and sediment locations if they are available.

Also Available On
Aperture Card





2

PRC APERTURE CARD

NOTE: SAMPLE CODE EXPLANATION ON ER-OL TABLE 6.1-9

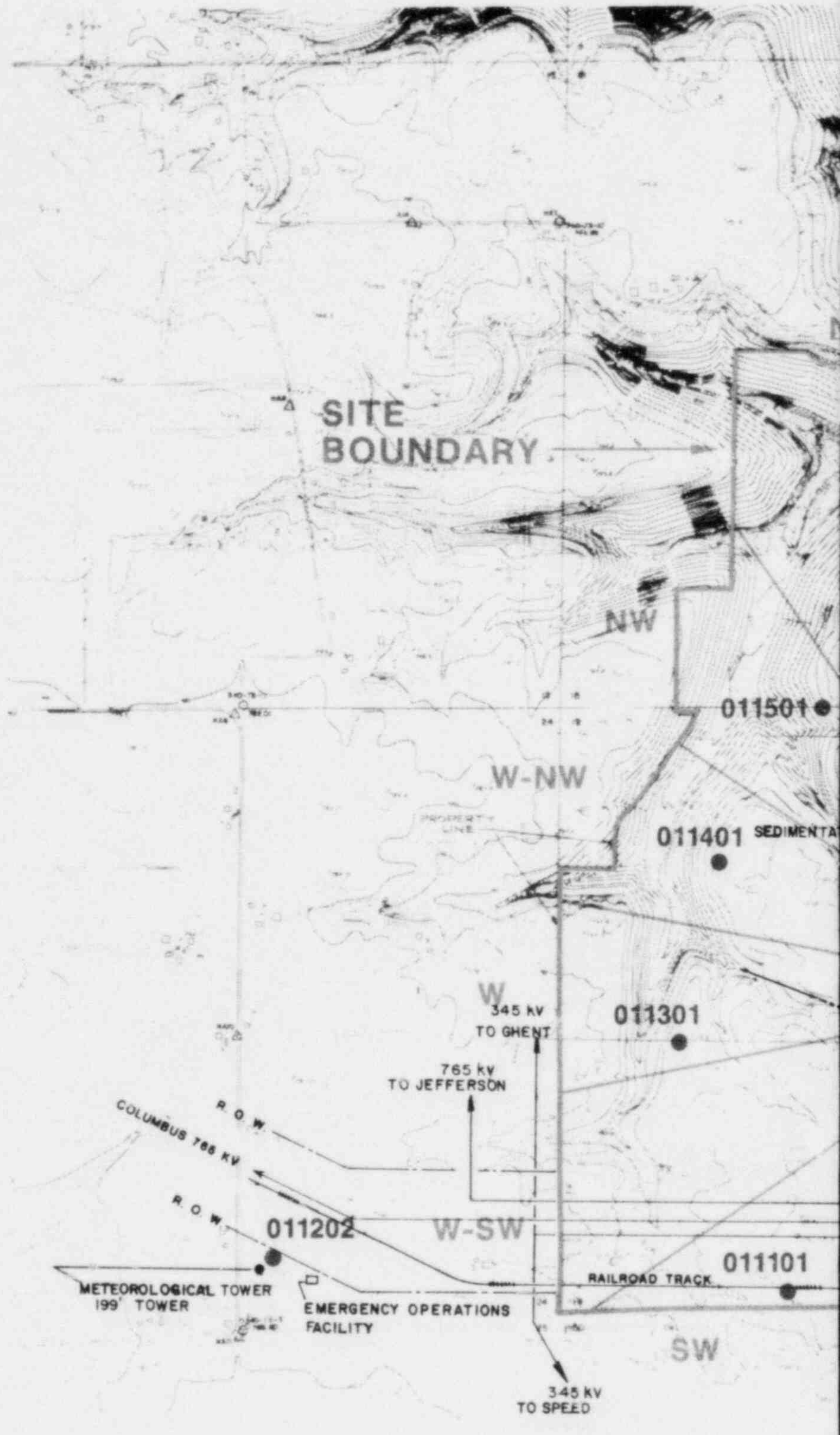
MARBLE HILL NUCLEAR GENERATING STATION - UNITS 1 & 2
ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE

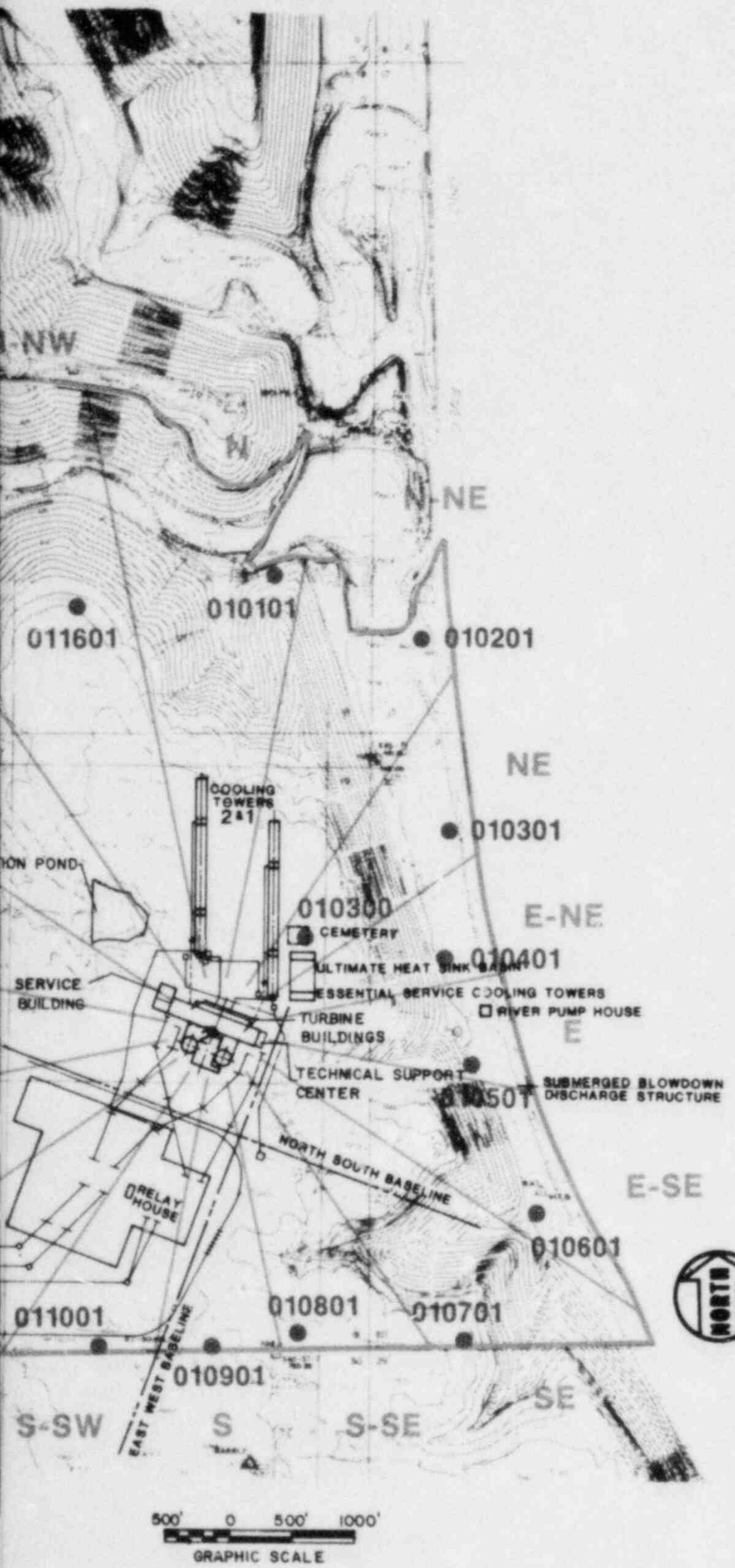
FIGURE 6.1-5

ONSITE AIR AND SOIL RADIOACTIVITY MONITORING SAMPLING LOCATIONS

8306270149-01

Also Available On
Aperture Card





PRC APERTURE CARD

2

NOTE: SAMPLE CODE EXPLANATION ON ER-OL TABLE 6.1-9

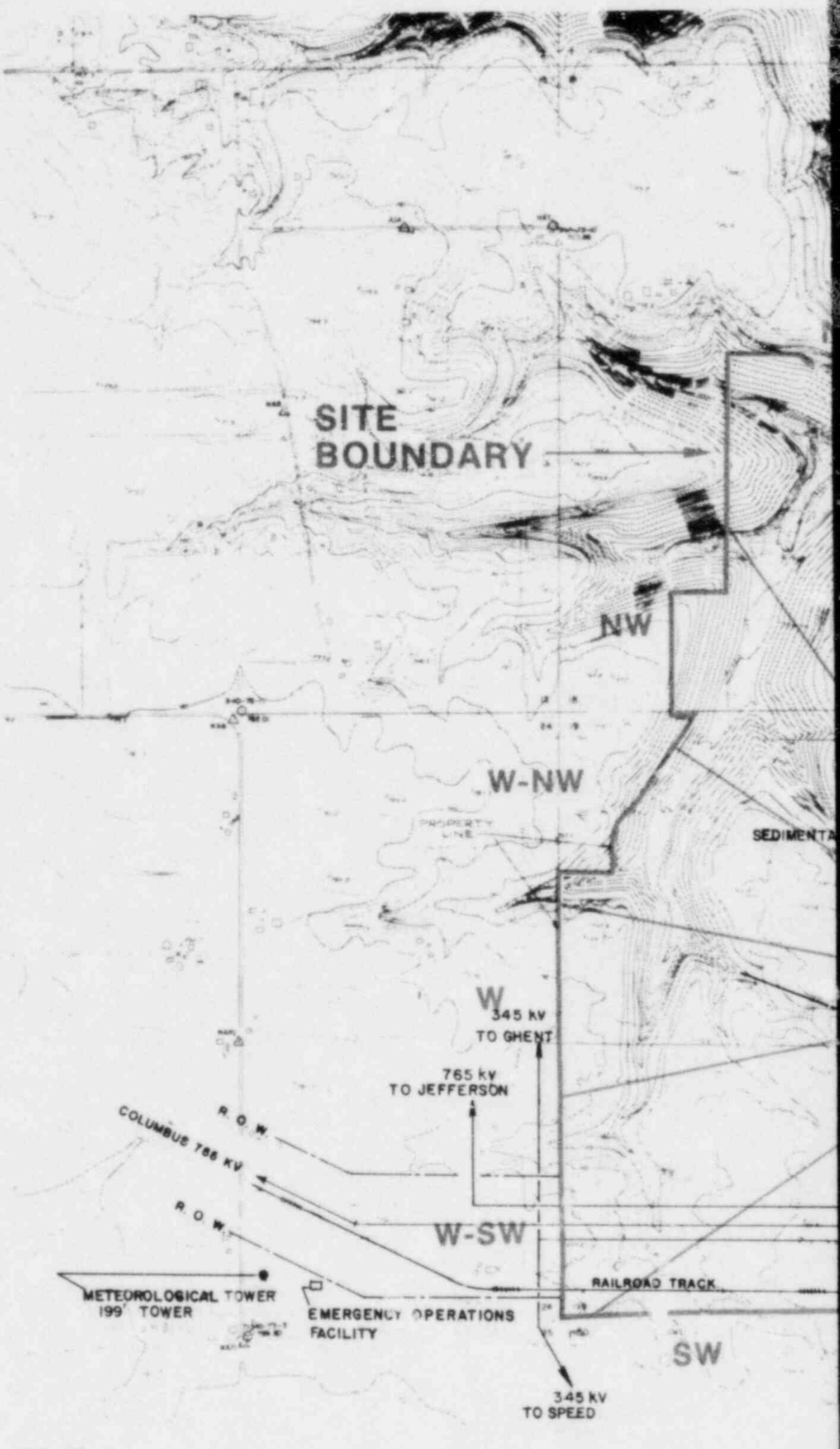
MARBLE HILL NUCLEAR GENERATING STATION - UNITS 1 & 2
ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE

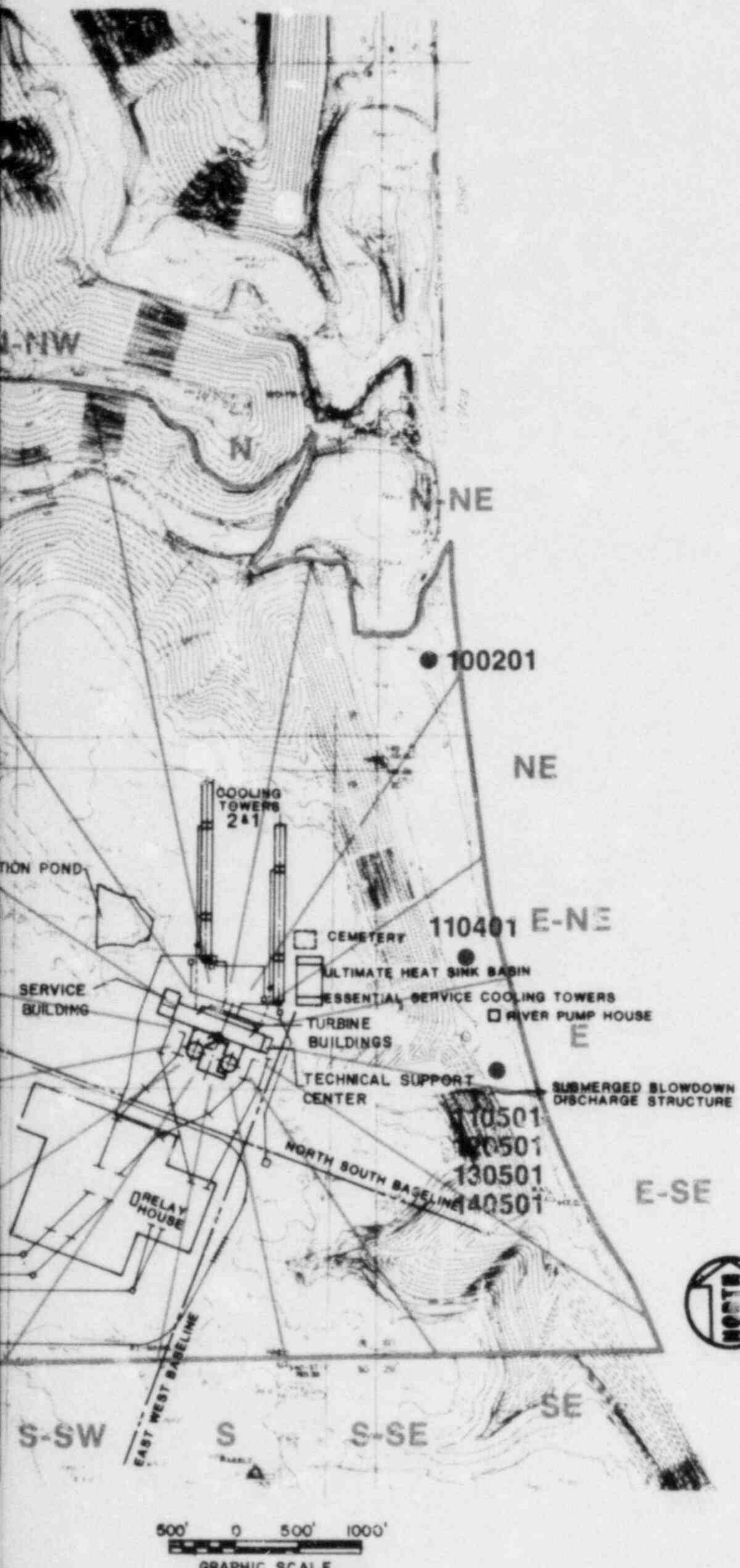
FIGURE 6.1-6

ONSITE DIRECT RADIATION MONITORING SAMPLING LOCATIONS

9306270149-02

Also Available On
Aperture Card





2

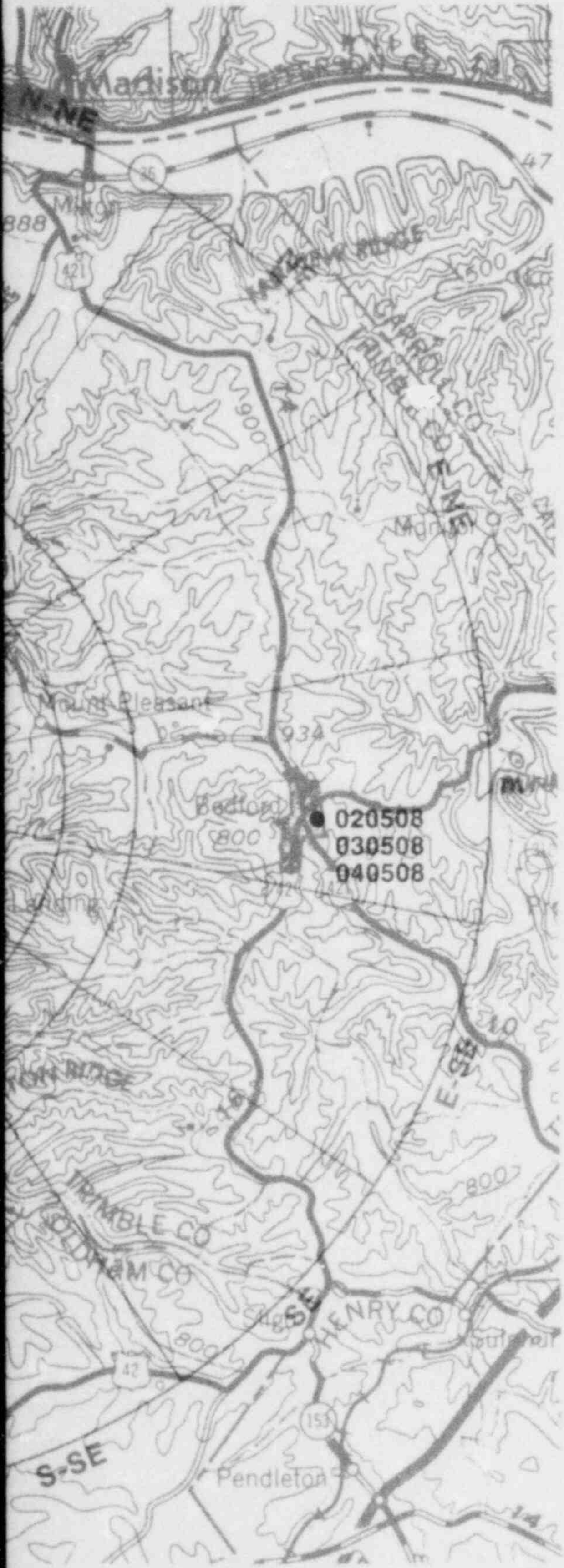
NOTE: SAMPLE CODE EXPLANATION ON ER-OL TABLE 6.1-9

MARBLE HILL NUCLEAR GENERATING STATION - UNITS 1 & 2
ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE

FIGURE 6.1-7
ONSITE GROUNDWATER AND SURFACE WATER AND DOWNSTREAM FISH, INVERTEBRATE, AND SHORELINE SEDIMENT MONITORING SAMPLING LOCATIONS


Hanover
Antioch Grange
Hanover Beach
Saluda
Chelsea
R 8 E
R 9 E
Paynesville
SCOTT CO
JEFFERSON CO
CLARK CO
T 2 N
Nabb
Otto
021206
031206
041206
New Washington
New Market
Bethlehem
Solon
Vesta
GRANT
Westport
Owen
INDIANA
KENTUCKY
CLARK CO
TRIMBLE CO
COVINGTON RIDGE
S-SW
SW
W-SW
S
NW
N
5
0
5
MILES

Also Available On
Aperture Card



2

PRC
APERTURE
CARD

★ MARBLE HILL SITE

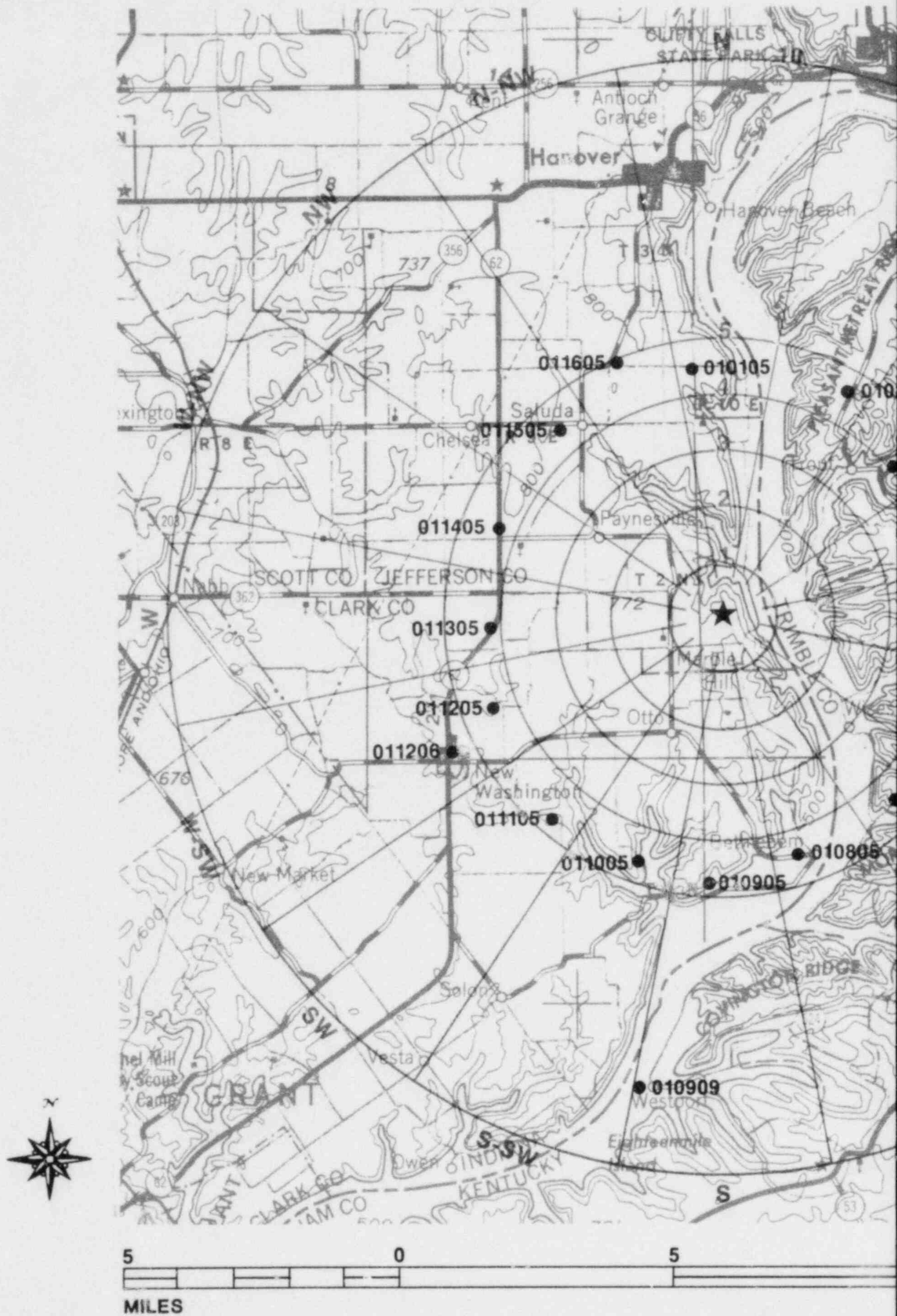
NOTE: SAMPLE CODE EXPLANATION
ON ER-OL TABLE 6.1-9

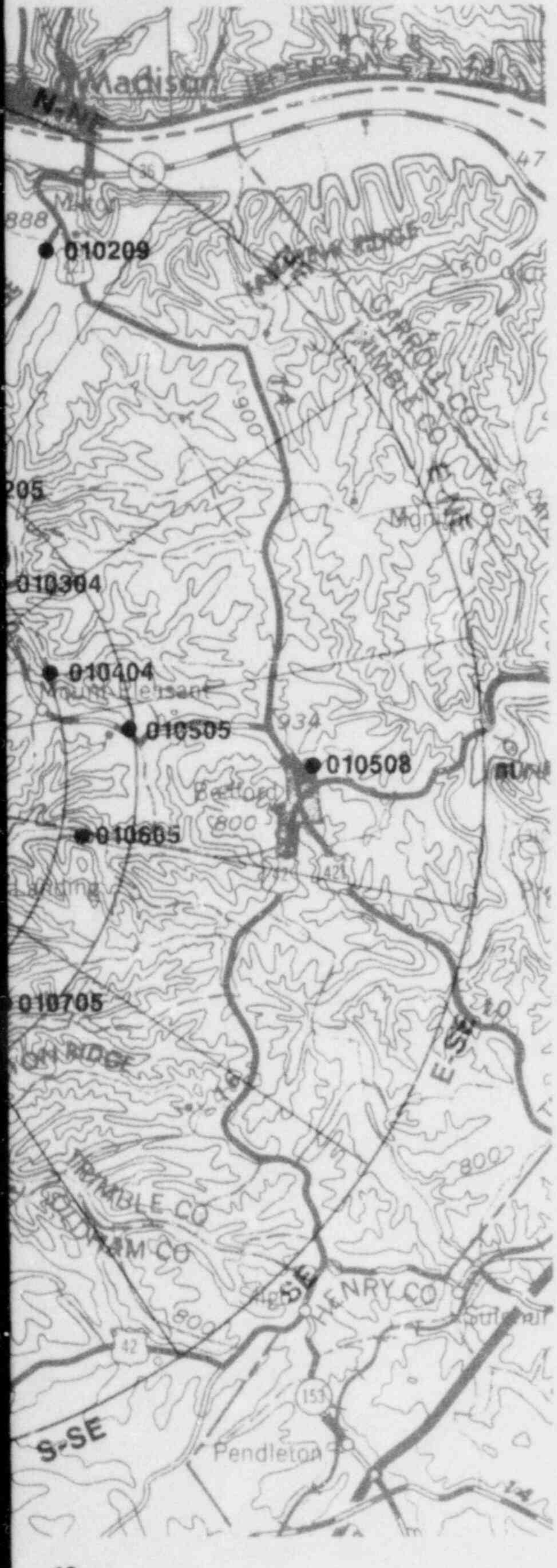
MARBLE HILL NUCLEAR GENERATING STATION - UNITS 1 & 2 ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE
FIGURE 6.1-8 OFFSITE AIR AND SOIL RADIOACTIVITY MONITORING SAMPLING LOCATIONS

SUPPLEMENT 2
JUNE 1983

8306270149-04

Also Available On
Aperture Card





2

★MARBLE HILL SITE

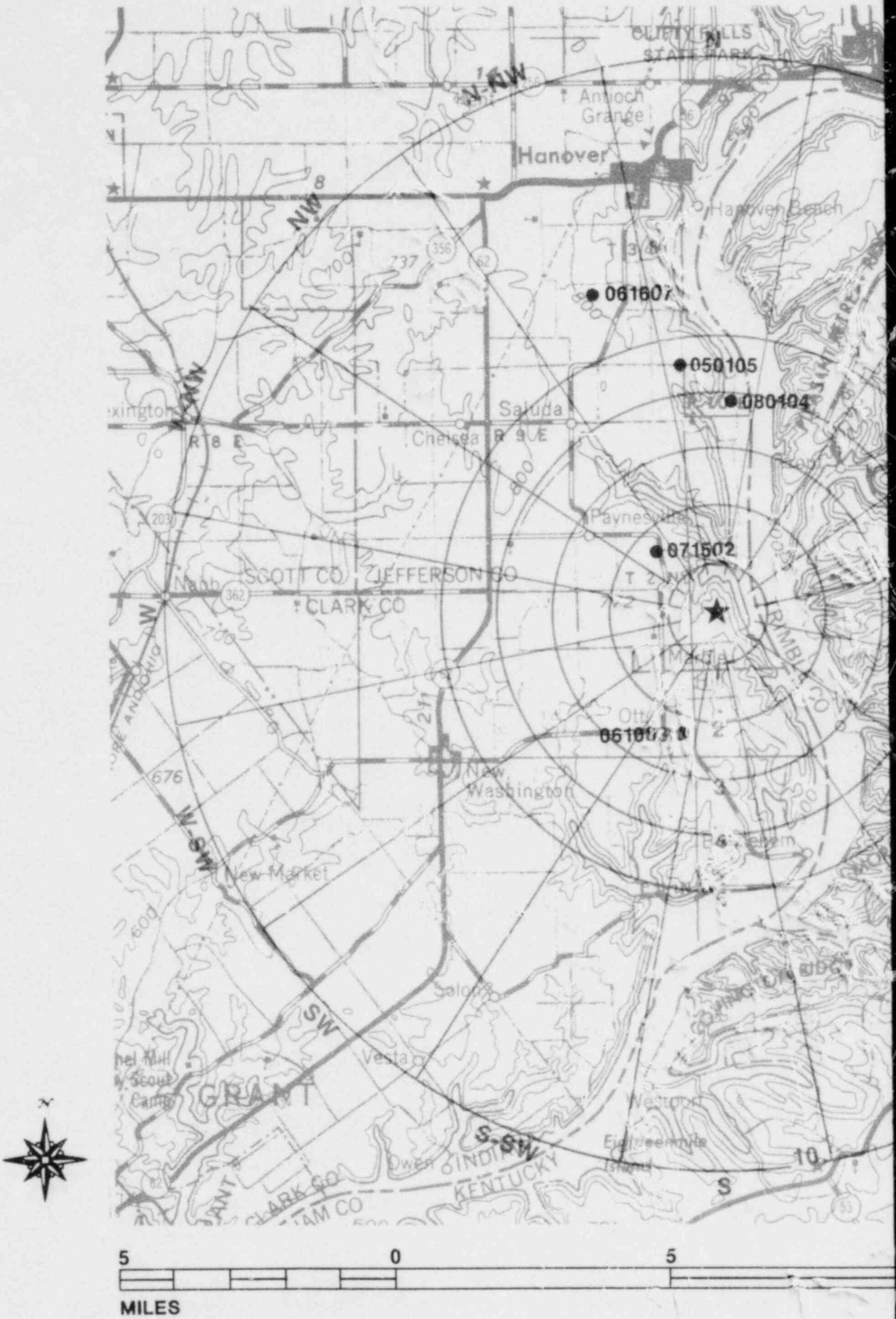
NOTE: SAMPLE CODE EXPLANATION
ON ER-OL TABLE 6.1-9

MARBLE HILL NUCLEAR GENERATING STATION - UNITS 1 & 2 ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE
FIGURE 6.1-9 OFFSITE DIRECT RADIATION MONITORING SAMPLING LOCATIONS

SUPPLEMENT 2
JUNE 1983

8306270149-05

Also Available On
Aperture Card



PRC
APERTURE
CARD

2

★ MARBLE HILL SITE

NOTE: SAMPLE CODE EXPLANATION
ON ER-OL TABLE 6.1-9

MARBLE HILL NUCLEAR GENERATING STATION - UNITS 1 & 2 ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE
FIGURE 6.1-10 OFFSITE TERRESTRIAL MONITORING SAMPLING LOCATIONS

SUPPLEMENT 2
JUNE 1983

8306210149-06

Also Available On
Aperture Card

2

★MARBLE HILL SITE

NOTE: SAMPLE CODE EXPLANATION
ON ER-OL TABLE 6.1-9

MARBLE HILL NUCLEAR GENERATING STATION - UNITS 1 & 2
ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE

FIGURE 6.1-11

AIR, WATER, TERRESTRIAL, FISH, INVERTEBRATE, AND SHORELINE SEDIMENT CONTROL SAMPLING LOCATIONS

SUPPLEMENT 2
JUNE 1983

QUESTION 290.6

Identify locations and acreages by crop type for agricultural lands within the salt drift isopleths of 50 and 100 kg/hectare/year depicted in Figure 5.1-2 of the ER-OL.

RESPONSE

Maps depicting locations and acreages by crop type within the predicted 50 and 100 kg/hectare/year drift deposition isopleths were provided to the U.S. Nuclear Regulatory Commission on June 24, 1983. The 50 and 100 kg/hectare/year areas were derived from the revised drift deposition analysis described in the response to Question 290.7.

QUESTION 290.7

Why are the annual average drift deposition values shown in ER-OL Figure 5.1-2 higher than maximum values presented in the applicant's presentation in the FES-CP, page 5-8, given a reduction in drift rate from :0.02% of the flow to 0.008% of flow?

RESPONSE

The drift deposition values cited in the FES-CP were extracted from the applicant's drift deposition analysis presented in Subsection 5.1.7.3.1 of the Marble Hill Environmental Report - Construction Permit Stage (ER-CP). The ER-CP and FES-CP both contain deposition values in English units (lb/acre-month). The FES-CP also contains the equivalent values in metric units (kg/hectare-month). A comparison of the metric values and English values on page 5-8 of the FES-CP indicates that the metric values should actually be approximately 6 times higher in order to correctly correspond to the English values. If the deposition values in lb/acre-month from the FES-CP are converted to kg/hectare-year and compared with the values shown in ER-OL Figure 5.1-2, the FES-CP values are found to be higher than the ER-OL values by a factor consistent with the change in the drift rate. This comparison is shown in Figure Q290.7-1. The change in the deposition is not uniform because different periods of meteorological data were used in the FES-CP and ER-OL analyses.

In responding to this question, it was discovered that the drift deposition analysis originally presented in the ER-OL was based on a total dissolved solids (TDS) concentration in the circulating water of 1500 mg/l. Although this concentration was the correct value at the Construction Permit stage, the TDS concentration in the circulating water is now expected to average 1635 mg/l (see ER-OL Tables 3.6-2 and 5.3-1). For consistency and conservatism, the drift deposition analysis has been revised using the higher TDS concentration. The revised values have been incorporated in Supplement 2 to ER-OL Subsection 5.1.4, which was provided to the U.S. Nuclear Regulatory Commission on June 24, 1983. As expected, the revised values are still generally lower than those presented at the Construction Permit stage and entail no significant change in environmental impacts from those originally presented in the ER-OL.

QUESTION 290.8

Provide aerial color infrared photographs of the areas expected to receive maximum cooling tower salt drift.

RESPONSE

Aerial color infrared photographs covering the area within the predicted 50 and 100 kg/hectare/year drift deposition isopleths were provided to the U.S. Nuclear Regulatory Commission on June 24, 1983. The photographs were taken in June 1983 to allow for complete foliage development.

SUPPLEMENT 2

VOLUNTARY REVISIONS

Supplement 2 consists of voluntary revisions to the following portions of the ER-OL:

Subsection 2.6.2.5	Elizabeth to Gwynneville Transmission Line Corridor (Archaeology)
Subsection 5.1.4	Atmospheric Effects of Heat Dissipation Facilities
Table 5.1-6	Expected Rate of Deposition of Drift Solids
Table 5.1-7	Area Affected by Various Magnitudes of Drift Residue Deposition
Table 5.1-8	Ground-Level Concentration of Drift Minerals in Ambient Air for Marble Hill 1&2 Cooling Towers
Table 5.1-9	Comparisons of Ground-Level Concentrations of Drift Minerals with Air Quality Standards
Figure 5.1-1	Frequency of Visible Cooling Tower Plumes for the Period November 1978 to October 1979
Figure 5.1-2	Annual Average Deposition Rate of Drift Solids
Subsection 6.1.5	Radiological Monitoring
Table 6.1-9	Sampling Locations for the Radiological Monitoring Program
Figure 6.1-5	Onsite Air and Soil Radioactivity Monitoring Sampling Locations
Figure 6.1-6	Onsite Direct Radiation Monitoring Sampling Locations
Figure 6.1-7	Onsite Groundwater and Surface Water and Downstream Fish, Invertebrate, and Shoreline Sediment Monitoring Sampling Locations

SUPPLEMENT 2

VOLUNTARY REVISIONS (Cont'd)

Figure 6.1-8	Offsite Air and Soil Radioactivity Monitoring Sampling Locations
Figure 6.1-9	Offsite Direct Radiation Monitoring Sampling Locations
Figure 6.1-10	Offsite Terrestrial Monitoring Sampling Locations
Figure 6.1-11	Air, Water, Terrestrial, Fish, Invertebrate, and Shoreline Sediment Control Sampling Locations
Q290.6-1	Request for Crop Type Information
Q290.7-1	Cooling Tower Drift Deposition Values
Q290.8-1	Request for Color Infrared Photograph

These revisions, along with related changes to the tables of contents, have been incorporated into the report as changeout pages or entirely new pages.