INSERTION INSTRUCTIONS FOR AMENDMENT 4

Remove old pages and insert Amendment 4 pages as instructed below.

Transmittal letters along with these insertion instructions should either be filed or entered in Volume 1 in front of any existing letters, instructions, distribution lists, etc.

LEGEND

Remove/Insert Columns

Entries beginning with "T" or "F" designate table or figure numbers, respectively. All other entries are page numbers:

T2.3-14 = Table 2.3-14	F5.4-3 = Figure 5.4-3	
2.1-9 = Page 2.1-94	EP2-1 = Page EP2-1	vii = Page vii

Pages printed back to back are indicated by a "/":

1.2-5/1.2-6 = Page 1.2-5 backed by Page 1.2-6

T2.3-14(5 of 5)/T2.3-15(1 of 3) = Table 2.3-14, sheet 5 of 5, backed by Table 2.3-15, sheet 1 of 3

Location Column

Ch = Chapter, S = Section, Ap = Appendix

Remove	Insert	Location
	VOLUME 1	
EP-i/blank	EP-i/blank	Before i/ii
EP2-1/EP2-2 EP2-3/blank	EP2-1/EP2-2 EP2-3/blank	After Section 2 tab
2-vii/2-viii	2-vii/2-viii	After 2-v/2-vi
F2.1-5/blank	F2.1-5/blank	After F2.1-4/blank
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2.6-1/2.6-2 thru 2.6-3/blank	2.6-1/2.6-2 thru 2.6-3/2.6-4	After 2.6 tab
T2.6-1/blank	T2.6-1/T2.6-2	After 2.6-3/2.6-4

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	VOLUME 1 (Cont)	
EP3-1/EP3-2	EP3-1/EP3-2 thru EP3-3/blank	After Section 3 tab
F3.1-1/blank	F3.1-1/blank	After T3.1-1/blank
3.4-1/3.4-2	3.4-1/3.4-2	After 3.4 tab
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F3.5-2/blank	F3.5-2/blank	After F3.5-1/blank
-	3.6-2a/blank	After 3.6-1/3.6-2
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T3.7-1/blank	T3.7-1/blank	After 3.7-3/blank
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EP-i/blank	EP-i/blank	Before Section 5 tab
EP5-1/EP5-2 thru EP5-3/EP5-4	EP5-1/EP5-2 thru EP5-3/EP5-4	After Section 5 tab
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T5.1-2(4 of 4)/ T5.1-3(1 of 1)	T5.1-2(4 of 4)/ T5.1-3(1 of 1)	After T5.1-2 (2 of 4)/(3 of 4)

INSERTION INSTRUCTIONS FOR AMENDMENT 4 (Cont)

VOLUME 2 (Cont)

Remove	Insert	Location
EP8-1/blank	EP8-1/blank	After Section 8 tab
8.1-1/8.1-2 thru 8.1-3/blank	8.1-1/8.1-2 thru 8.1-3/blank	After 8.1 tab
T8.1-1(1 of 2)/ (2 of 2)	T8.1-1(1 of 2) (2 of 2)	After 8.1-3/blank
EP12-1/blank	EP12-1/blank	After Section 12 tab
12.3-1/blank	12.3-1/blank	After 12.3 tab
EPQ1-1/EPQ1-2	EPQ1-1/EPQ1-2	After May 4, 1983 tab
TE100.1-1(2 of 4)/ (3 of 4) thru (4 of 4)/ QE240.01-1	TE100.1-1(2 of 4)/ (3 of 4) thru (4 of 4)/ QE240.01-1	After May 4, 1983 NRC Questions and Responses Index (3 of 4)/(4 of 4)
-	October 20, 1983 tab	After E470.4-1/ blank
	EPQ2-1/blank	After October 20, 1983 tab
-	October 20, 1983 NCR Questions and Responses Index (1 of 2)/(2 of 2)	After EPQ2-1/blank
-	QE291.32-1/QE291.33-1 thru QE460.2/blank	After October 20, 1983 NRC Questions and Responses Index (1 of 2)/(2 of 2)

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EP11-1	E
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LIST OF EFFECTIVE PAGES (Cont)

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F2.4-7	0
F2.4-8	0
F2.4-9	0
F2.4-10	0
F2.4-11	0
F2.4-12	0
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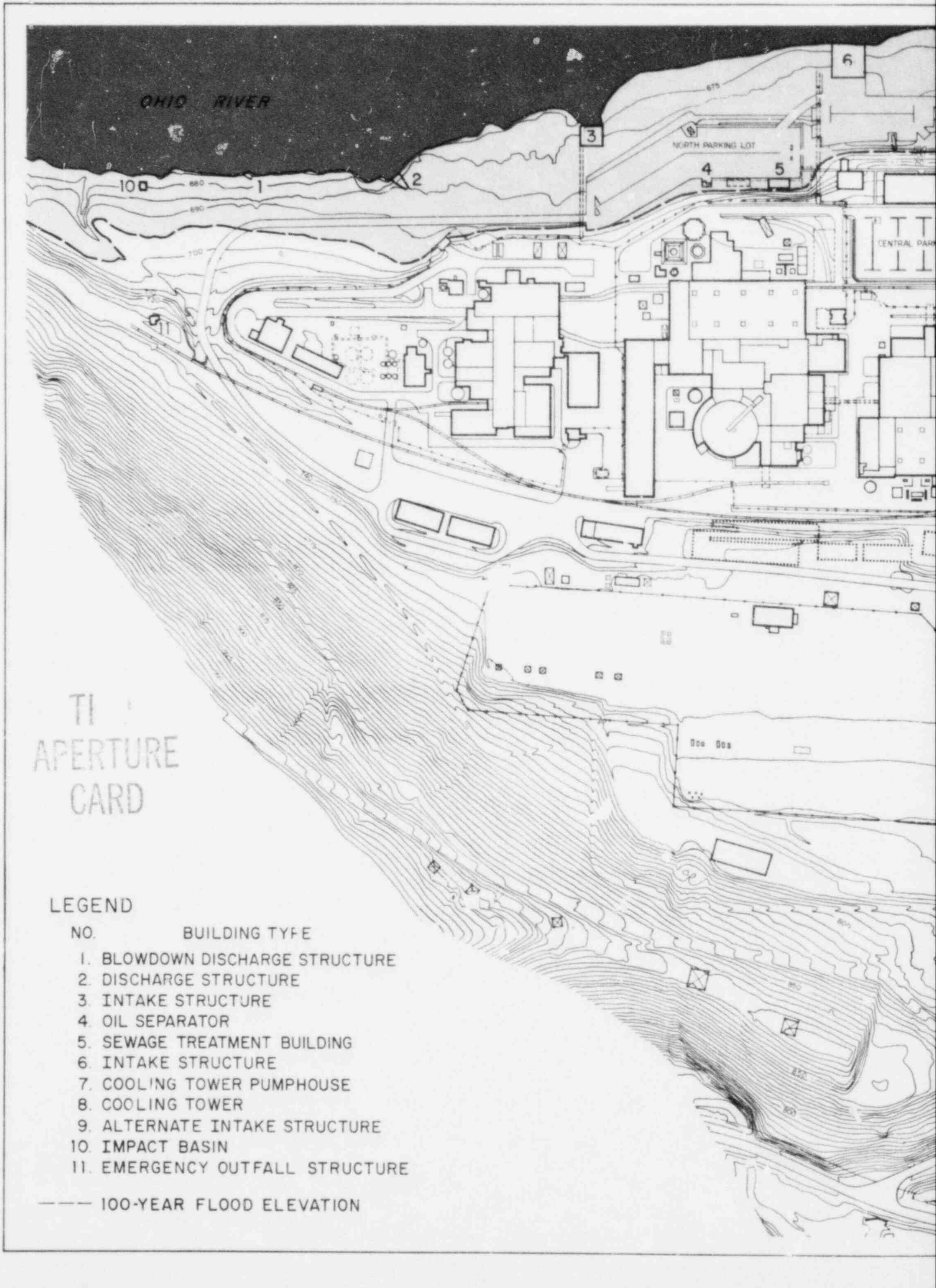
T2.7-2 (1 of 1)	0
T2.7-3 (1 of 1)	0
T2.7-4 (1 of 1)	0
F2.7-1	0

LIST OF TABLES (Cont)

LIST OF TABLES (Cont)


OHIO RIVER
NORTH PARKING LOT
1
2
3
4
5
6
10
11
LEGEND
NO. BUILDING TYPE
1. BLOWDOWN DISCHARGE STRUCTURE
2. DISCHARGE STRUCTURE
3. INTAKE STRUCTURE
4. OIL SEPARATOR
5. SEWAGE TREATMENT BUILDING
6. INTAKE STRUCTURE
7. COOLING TOWER PUMPHOUSE
8. COOLING TOWER
9. ALTERNATE INTAKE STRUCTURE
10. IMPACT BASIN
11. EMERGENCY OUTFALL STRUCTURE
100-YEAR FLOOD ELEVATION

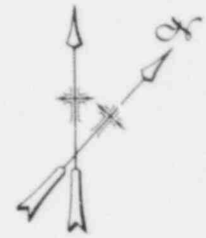


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FIGURE 2.1-5
100-YEAR FLOOD ELEVATION
BEAVER VALLEY POWER STATION-UNIT 2
ENVIRONMENTAL REPORT
OPERATING LICENSE STAGE

southward from the southern bank of the Ohio River. The hills forming the small drainage course slope at approximately 2 or 3 horizontally to 1 vertically. The watershed boundary defines the area contributing runoff to Peggs Run, which flows generally from south to north into the Ohio River and is approximately 3 miles long. The flow in Peggs Run is normally very low and has a mean annual flow estimated to be under 5 cfs.

A 1,400-foot length of Peggs Run is enclosed in a 15-foot diameter culvert which connects to the culvert under the New Cumberland-Pittsburgh Railroad. Downstream of the railroad culvert, Peggs Run follows the existing stream bed for about 350 feet before entering a sheet-piled channel which connects to the Ohio River. The design flow of the culvert is 2,000 cfs and the maximum capacity is 2,960 cfs. The small drainage area of Peggs Run makes it susceptible to a flash flood, which is most likely to occur during a period of low river stage.

2.4.4 Water Temperatures

Variations in water temperatures in the BVPS vicinity are shown on Figures 2.4-8, 2.4-9, and 2.4-10. These figures represent the monthly average and the maximum and minimum daily average values recorded at two ORSANCO electronic monitoring stations located at South Heights (RM 15.8) and East Liverpool (RM 40.2). The two ORSANCO stations were chosen for their close proximity to the BVPS site. The South Heights station, located 19 miles upstream of the station, has a continuous record of temperature data since 1964. Based on the period 1964 to 1977, water temperatures at this location range from an average monthly value of 79.5°F in August to a minimum average monthly value of 36.5°F in January.

The ORSANCO sampling station at East Liverpool is located 5 miles downstream from BVPS. The station has been in operation since 1975. During the period April 1975 through December 1977, the range of record values at this location varied from a maximum monthly average of 82°F in August 1975 to a minimum monthly average of 32°F in January 1976. Extreme average daily temperatures were 85°F in August 1975 and 32°F in January 1977. Comparison of these data with the temperature data recorded during the same period at the South Heights station indicates temperatures are very similar at both locations, with a tendency towards increasing temperatures from upstream to downstream. This trend has been documented by ORSANCO in their statistical analysis of water temperatures recorded at several electronic monitoring stations on the Ohio River (ORSANCO 1975). Temperatures observed at the BVPS intake are similar to those measured at the ORSANCO stations at East Liverpool and South Heights. A frequency analysis of ORSANCO data at these two stations was performed. Figures 2.4-11 and 2.4-12 show the results.

Thermal characteristics of the Ohio River, as represented by ORSANCO and the USGS monitoring programs, indicate the temperature distribution in the river in both the horizontal and vertical directions is nearly uniform (ORSANCO 1976). Natural fluctuations of surface temperatures are expected since surface temperatures continuously change (approach the equilibrium temperature) in response to meteorological conditions.

In general, meteorological effects dominate the thermal regime of the Ohio River. However, background waste heat, in the form of localized temperature gradients, are expected to influence the temperature distribution in the immediate vicinity of BVPS. This is due to the operation of BMP, located 1 mile upstream from BVPS, and SAPS, adjacent to BVPS. A study conducted by the West Virginia Department of Water Resources indicates the thermal discharges raise the temperature of the top few feet of the river but generally do not increase the temperatures significantly at the 10-foot and lower levels (ORSANCO 1975). The effects due to these localized thermal gradients induced by the discharge of waste heat from electric generating facilities are dissipated within 5 to 20 miles downstream of the discharge (ORSANCO 1975).

2.4.5 Water Quality

Baseline water quality studies were performed for BVPS beginning in October 1970. Table 2.4-9 presents annual means, minimum, and maximum values of water quality parameters for the four study years from 1971 to 1974. During the 1974 study period (November 1973 through December 1974), 14 monthly field surveys were conducted to collect baseline physical, chemical, and biological water quality data on the Ohio River near the BVPS site. Monthly surveys during this study period provided data for the most complete seasonal characterization of the Ohio River water quality since studies were initiated. Previous water quality descriptions were based on less than 12 surveys.

Comparison of recent water quality data (November 1976 to October 1980) from ORSANCO monitoring stations located at Ohio River miles 15.2 and 40.2 indicates no significant change in water quality from that observed during the 1974 study period. These data are presented in Table 2.4-10.

The following discussion and characterization of Ohio River chemical water quality is based primarily on analyses of samples collected monthly from November 1973 to October 1974. Results discussed for minimum and maximum values are mean values of three replicate composite samples, unless otherwise noted. Minimum and maximum values presented in Table 2.4-9 are based on actual recorded values and may differ from the values presented in the discussion.

The complete 1974 baseline report (NUS Corporation 1975) for the aquatic ecology study was submitted to the U.S. Nuclear Regulatory Commission (USNRC) on October 13, 1975 in support of the licensing of BVPS-1.

In general, the chemical water quality of the Ohio River near the site exhibited little spatial variability among the sampling stations

2.6 REGIONAL HISTORIC, ARCHAEOLOGICAL, ARCHITECTURAL, SCENIC, CULTURAL, AND NATURAL FEATURES

Historic sites in the Beaver Valley Power Station (BVPS) region including National Register Historic Places within 10 miles of BVPS-2 and State of Pennsylvania historic sites within 5 miles of BVPS-2 are indicated in Tables 2.6-1 and 2.6-2. However, the historic character of the region, summarized in the following sections, remains as described in Sections 2.2 and 2.3 of the Environmental Report - Construction Permit Stage (ER-CPS).

2.6.1 Historic Background of the Region

The Beaver Valley Power Station - Units 1 and 2 (BVPS-1 and BVPS-2) is located on a series of terraces on the south bank of the Ohio River about 25 miles northwest of Pittsburgh, Pennsylvania. The region has played an important role in the nation's history, primarily as a result of its location along the Ohio River in the area known in the early nineteenth century as the "Gateway to the West."

Some traces of the history of the area, when it was an important stepping-off point for the west, can still be found within a few miles of BVPS-2. Many of the physical structures, however, have disappeared.

There are 12 National Register Historic Places within 10 miles of the BVPS-2 site as presented in Table 2.6-1. These sites, except for the U.S. Public Lands Survey Marker, were registered after the publication of the ER-CPS. Only the Beginning Point of the United States Public Lands Survey (U.S. Department of Interior 1981a) located on the Pennsylvania-Ohio border 5 miles west-northwest of the station is within 5 miles of the station. The properties listed in the National Register of Historic Places are generally located in nearby towns and cities and are examples of the area's early industrial history, its famous persons, and strategic location.

The State of Pennsylvania also maintains a data base of historic sites. At present, there are 11 recorded sites in the area within 5 miles of the station. The locations and distances of the sites from the station are listed in Table 2.6-2.

During the construction permit stage, BVPS-2 was evaluated in accordance with the requirements of the National Historic Preservation Act to determine whether any historic landmarks would be affected by station construction or operation. The Advisory Council on Historic Preservation (1969) concluded that the probable effect of the station could not be judged to be sufficiently adverse to warrant council comment. This conclusion was reaffirmed in 1978 by the Pennsylvania State Historic Preservation Office (Pennsylvania Historical and Museum Commission 1978).

Historic preservation officers for Pennsylvania, Ohio, and West Virginia were contacted in 1983 to verify listings of historic places and reevaluate the potential impacts on these places due to the operation and maintenance of BVPS-2. Based on the results of this assessment, no impact on National Register or other historic places during the operation or maintenance of BVPS-2 is expected (Pennsylvania Historical and Museum Commission 1983, Ohio Historic Society 1983, West Virginia Department of Culture and History 1983).

2.6.2 Natural Landmarks

There are no registered natural landmarks in any of the three counties located within a 5-mile radius of the station (U.S. Department of Interior 1981b).

2.6.3 Regional Archaeological Sites

A number of archaeologically significant sites are located in the upper Ohio River region. Almost every major floodplain in the area was the site of a prehistoric Indian village which was occupied intermittently for many thousands of years. The first Indians inhabited the region as early as 12,000 B.C. when the glaciers began to recede. Numerous Indian artifacts, such as stone arrowheads, tools, and utensils, have been excavated from some of these sites, but many of the sites have been destroyed by urban and industrial expansion.

The Anthropology Center of the Carnegie Museum of Pittsburgh lists several archaeological sites in the BVPS vicinity. One Indian village site is near the abandoned Shippingport ferry docks on the south bank of the Ohio River about 0.5 mile upriver from the station. Other archaeological sites are found along the Ohio River at Industry and Vanport and throughout the Raccoon Creek valley beginning at the mouth of the creek 5 miles upriver from the station site (Carnegie Museum Archaeology Center 1978, 1981).

2.6.4 Visual Effects of the Station

The immediate area surrounding the station is one of physical and cultural contrasts. Along the Ohio River, major industrial plants commingle with small- to medium-sized towns on the river terraces. Steep bluffs rise 400 to 600 feet above the river with many small, short streams cutting deep canyons down to the river's edge.

Above and back from the river, rolling hills surround expansive, plateau-like level areas. The area has many small farms, scattered rural settlements, and small crossroads villages. To the west of the site, the topography becomes more gentle, while to the east, even a mile back from the river, there are many steep-walled stream valleys and precipitous changes in elevation.

Seen in this setting, BVPS-2 poses no severe visual change. Almost all views of the plant are confined to the Ohio River Valley or the top of the adjacent bluffs, where the panorama has shown evidence of industry for decades. In addition, due to its proximity to BVPS-1 and Shippingport Atomic Power Station (SAPS), almost all views which include BVPS-2 also include BVPS-1 and SAPS. The Bruce Mansfield Plant, located approximately 1 mile northeast of BVPS-2, further reinforces the industrial character of the region. Therefore, no new or unique viewscape is created by BVPS-2, and visual impacts from BVPS-2 can be considered negligible.

Depending on meteorological conditions, the cooling tower plume may be visible over a greater area. However, experience with BVPS-1 indicates that when the plume is most extensive, the background sky is usually light white, and the clouds and fog merge with the plume, making it much less noticeable. In addition, plumes from BVPS-1 and the Bruce Mansfield Plant already exist and will occur simultaneously with those from BVPS-2. Thus, a minimal change will be added to the view by BVPS-2 plumes. Plume description and occurrence is discussed further in Section 5.1.4.

Since BVPS-2 does not change the established visual character of the area, no ground-level photographs are included in this section.

2.6.5 Transmission Corridor

Historic, archaeological, architectural, scenic, cultural, and natural features of the region will not be impacted by BVPS-2 transmission since existing corridors and transmission towers will be utilized in all offsite areas.

2.6.6 References for Section 2.6

Advisory Council on Historic Preservation 1969. Letter dated April 14, 1969.

Carnegie Museum Archaeology Center 1978. Letter from Dr. Stanley Lance, Field Archaeologist, dated August 17, 1978.

Carnegie Museum Archaeology Center 1981. Personal communication from Dr. Stanley Lance, Field Archaeologist, December 29, 1981.

Ohio Historic Society 1983. Signed concurrence by W. Ray Luce, State Historic Preservation Officer, September 12, 1983 on letter from E.G. Nelson, Stone & Webster Engineering Corp. (SWEC), dated August 30, 1983.

Pennsylvania Historical and Museum Commission 1978. Stamped approval by Vance Packard, State Historic Preservation Officer, August 17, 1978 on letter from Stuart L. Miner, Environmental Planner, NUS Corporation, dated August 14, 1978.

Pennsylvania Historical and Museum Commission 1983. Signed concurrence by Ms. Brenda Barrett, Director, November 14, 1983 on letter from E.G. Nelson, SWEC, dated October 25, 1983.

Pennsylvania Historical and Museum Commission 1983b. Letter from Ms. Donna Williams, Chief, Division of Planning and Protection, September 29, 1983.

U.S. Department of Interior 1981a. National Register of Historic Places. Heritage Conservation and Recreation Service, Annual Listing of Historic Properties.

U.S. Department of Interior 1981b. National Registry of Natural Landmarks. Heritage Conservation and Recreation Service.

West Virginia Department of Culture and History 1983. Letter from Rodney S. Collins, Director, Historic Preservation Unit, dated August 23, 1983.

TABLE 2.6-1

NATIONAL REGISTER OF HISTORIC PLACES
SITES WITHIN 10 MILES
OF BEAVER VALLEY POWER STATION

Site	Location	Distance from Station (Miles)	Direction from Station
Pennsylvania			
Fort McIntosh Site*	Beaver	9.0	NE
Matthew S. Quay House*	Beaver	9.0	NE
William B. Dunlap Mansion*	Bridgewater	9.0	NE
B.F. Jones Memorial Library*	Aliquippa	10.0	E
Merrill Lock No. 6*	Industry	5.2	NE
Ohio			
Beginning Point of U.S. Public Land Survey	East Liverpool (on Ohio-Pennsylvania boundary)	4.8	WNW
East Liverpool Post Office*	East Liverpool	7.5	W
East Liverpool Pottery*	East Liverpool	7.2	W
Cassius Clark Thompson House*	East Liverpool	7.0	W
Carnegie Public Library*	East Liverpool	7.5	W
Ikirt House*	East Liverpool	7.5	W
West Virginia			
Old Courthouse*	New Manchester	10.0	SW

NOTE:

*Sites added to National Register since publication of the ER-CPS.

TABLE 2.6-2

ADDITIONAL HISTORIC SITES WITHIN 5 MILES OF BVPS

Name	Location	Approximate Distance (miles)	Direction
Indian Petroglyphs*	Smiths Ferry	3.75	WNW
Service Creek Monuments*	Raccoon Township	4.25	SE
Service United Presbyterian Church*	Raccoon Township	4.50	SE
John Anderson Cemetery*	Raccoon Township	4.50	SE
Christler's Landing*	Shippingport	0.50	NNE
Christy Home*	Shippingport	0.50	NNE
Bethlehem Church*	Shippingport	1.25	NE
Nelson Place*	Greene Township	4.00	SW
Littell Homestead*	Greene Township	4.00	S
Bakers Landing*	Potter Township	5.00	ENE
Shippingport Atomic Power Station**	Shippingport	0.25	SW

NOTES:

*Pennsylvania Historical and Museum Commission 1978.
**Pennsylvania Historical and Museum Commission 1983b.

LIST OF EFFECTIVE PAGES

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3-i thru 3-ii	2
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T3.1-1	0
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T3.3-2 (1 thru 2 of 2)	1
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3.4 HEAT DISSIPATION SYSTEM

The cooling water systems of Beaver Valley Power Station - Unit 2 (BVPS-2) consist of the main circulating water and service water systems. The piping and instrumentation diagrams for these systems are shown on FSAR Figures 9.2-1 through 9.2-5, 9.2-20, and 10.4-3 through 10.4-6.

The main circulating water system (CWS) is closed loop, utilizing a natural draft hyperbolic cooling tower including blowdown discharge capability. The purpose of the closed loop design is to reduce thermal effects on the Ohio River. Cold water flows by gravity from the cooling tower basin to the circulating water discharge flume where the blowdown is discharged through a 36-inch butterfly valve to the blowdown discharge lines. The remainder of the cold water flow is circulated from the discharge flume to the main condenser, and is then siphoned through the condenser to the pumphouse. From there, it is returned to the top of the tower fill by four 25-percent capacity pumps. Principal piping consists of dual 108-inch diameter reinforced concrete lines buried below grade.

The service water system (SWS) takes water from the Ohio River via a four-bay screenwell, which also serves Beaver Valley Power Station - Unit 1 (BVPS-1), as shown on Figure 3.4-1. Water passes through coarse bar racks and then through vertical traveling water screens with a 3/8-inch opening mesh screen. The maximum entrance velocities at the bar racks for bays A, B, C, and D, with two units operating, are 0.27, 0.26, 0.26, and 0.34 feet per second (fps) respectively. These velocities are based on the design flows for all major pumps in the structure. They are also based on no fire pump operation under normal conditions and a normal river pool elevation of 664.5 feet. During actual operation, however, the service water flow of 27,573 gpm is pumped to BVPS-2 by only two of the three 50-percent capacity pumps to the cooling equipment in the various unit buildings.

Service water is discharged to the main circulating water lines downstream of the main condenser and travels from there to the cooling tower. By this means, the SWS provides the makeup water necessary to replace water loss due to evaporation and drift and to maintain acceptable concentrations of impurities in the CWS. This discharge is normally returned via a 36-inch reinforced concrete blowdown line to an outfall structure which serves the cooling towers of BVPS-1 and BVPS-2, and is located on the Ohio River downstream of the existing Shippingport Atomic Power Station discharge structure (Figure 3.4-2). There are separate blowdown lines from both the BVPS-1 and BVPS-2 cooling towers to the outfall structure. Chemical constituents are concentrated in the CWS by as much as 2.4 times the concentrations in the makeup water. Ambient water quality of the Ohio River is discussed in Section 2.4.5. Impacts of the heat dissipation system are discussed in Sections 5.1 and 5.3.

3.4.1 Circulating Water System

The CWS is a closed-loop system designed to dissipate a total of 6.412×10^9 Btu/hr of waste heat to the atmosphere: 6.286×10^9 Btu/hr from the main condenser and 1.26×10^8 Btu/hr from the SWS. The design temperature of the system is equal to the maximum expected water temperature of 120°F. The total design circulating water flow rate is 507,400 gpm, which includes cooling water from the main condenser and water discharged from the SWS which serves as makeup water to the natural draft cooling tower. The maximum flow from the SWS is 27,573 gpm. However, during normal operating conditions, about 8,400 gpm of this 27,573 gpm service water is discharged directly to the Ohio River through the emergency outfall structure. This flow is a result of several components downstream of the circulating water line connection which utilize service water. Six hundred gpm of this flow is directly used by the components, while the balance of the flow serves to control silting in the emergency service water discharge lines.

The CWS consists of circulating water pumps, circulating water piping, main steam condenser, mechanical tube cleaning system, vacuum priming system, natural draft cooling tower, blowdown discharge system, and associated hydraulic and electrical equipment. The system contains four 25-percent capacity circulating water pumps which are located in a pumphouse between the turbine building and cooling tower. Each pump is rated as indicated in Table 3.4-1.

Circulating water flows by gravity from the basin of the cooling tower via a discharge flume containing panel screens into two 108-inch diameter circulating water pipes and into the inlet water boxes of the condenser. Four 78-inch steel lines connect the 108 inch circulating water pipes to the inlet water boxes. The water passes through the tubes of the condenser to the outlet water box. It takes approximately 18 seconds for circulating water to travel across the condenser. The condenser operates as a siphon with the prime maintained by the vacuum priming system. Four 78-inch steel lines connect the outlet water boxes of the condenser to the two 108-inch lines which carry the condenser discharge cooling water to the pumping structure outside the turbine building. The discharge lines of the SWS connect to the CWS between the condenser outlet water boxes and the pumphouse. The circulating water pumps lift the water to the cooling tower distribution system above the cooling tower fill.

The BVPS-1 chlorination system provides chlorine solution to chlorinate the BVPS-2 circulating water system. The system is provided with interlocks so that simultaneous chlorination of BVPS-1 and BVPS-2 will not occur. Chlorine solution is injected into each 108-inch circulating water line upstream of the condenser by diffusers. Each 108-inch line feeds one-half of the condenser (that is, two out of four water boxes). Only one 108-inch line will be chlorinated at a time. The system is designed to maintain a maximum blowdown flow rate by the same amount during any given set of meteorological conditions during normal full plant load operation.

3.4.2 Service Water System

The SWS is a once-through system, taking water from the Ohio River, pumping it through the various heat exchangers, and discharging it to the CWS. A total of 27,573 gpm is pumped to the system by two of three 15,000-gpm capacity pumps located in the primary intake structure shared by BVPS-1 and BVPS-2. In addition to the primary intake structure, an auxiliary intake structure is provided, containing two 15,000-gpm capacity pumps for the BVPS-2 flow requirement. The auxiliary intake structure is located upstream of the Pennsylvania Route 168 bridge (Figures 3.4-4 and 3.4-6). During normal operation, the SWS provides cooling water to both the primary and secondary component cooling water heat exchangers, centrifugal water chillers, control room air conditioning, safeguards area air conditioning, main steam valve area cooling coils, motor control center cooling units, and the charging pump coolers. The system is shown on FSAR Figures 9.2-1 through 9.2-5. A separate emergency outfall structure (EOS) is provided to discharge service water during emergency conditions. Two 30-inch diameter service water discharge lines convey the discharge to the EOS located downstream of the blowdown discharge structure, as shown on Figure 3.4-7. Design flow of the EOS is 40,000 gpm. Discharge from the EOS is conveyed through a 27-inch diameter line to the impact basin in the Ohio River (Figure 3.4-8).

3.4.2.1 Component Water Heat Exchangers

3.4.2.1.1 Primary Cooling Water Heat Exchanger

During normal operation, primary component cooling water is pumped to the shell side of the primary component cooling water heat exchanger, where it is cooled by service water and flows through parallel circuits to cool the various system components.

Three primary component cooling water heat exchangers and three primary component cooling water pumps are provided. The heat load for the primary component cooling water heat exchangers during normal operation is approximately 66,000 MBH. The corresponding flow rate of service water to the primary component cooling water heat exchangers is approximately 11,000 gpm. The primary component cooling water requirements are to supply cooling water to systems and components in the primary plant. In addition to normal operation, primary component cooling water is supplied for unit cooldown. The rate of heat transfer for cooldown reaches a maximum of approximately 185,000 MBH, with three primary component cooling water heat exchangers in service at the beginning of the residual heat removal phase of unit cooldown. The primary component cooling water system is designed to reduce the temperature of the reactor coolant after start of the residual heat removal system.

3.4.2.1.2 Secondary Component Cooling Water Heat Exchanger

The secondary component cooling water systems supply cooling water to the steam and power conversion system equipment. Secondary component cooling water is pumped to the shell side of the secondary component cooling water heat exchanger, where it is cooled by service water, and then to the various equipment coolers. Two secondary component cooling water heat exchangers and two secondary component cooling water pumps are provided. The heat load for the secondary component cooling water heat exchanger is approximately 65,000 MBH. The corresponding flow rate of the service water to the tube side of the secondary component cooling water heat exchanger is approximately 11,000 gpm. Service water to the heat exchangers is isolated during a containment isolation phase A (FSAR Section 9.2.1).

3.4.2.2 Centrifugal Water Chillers

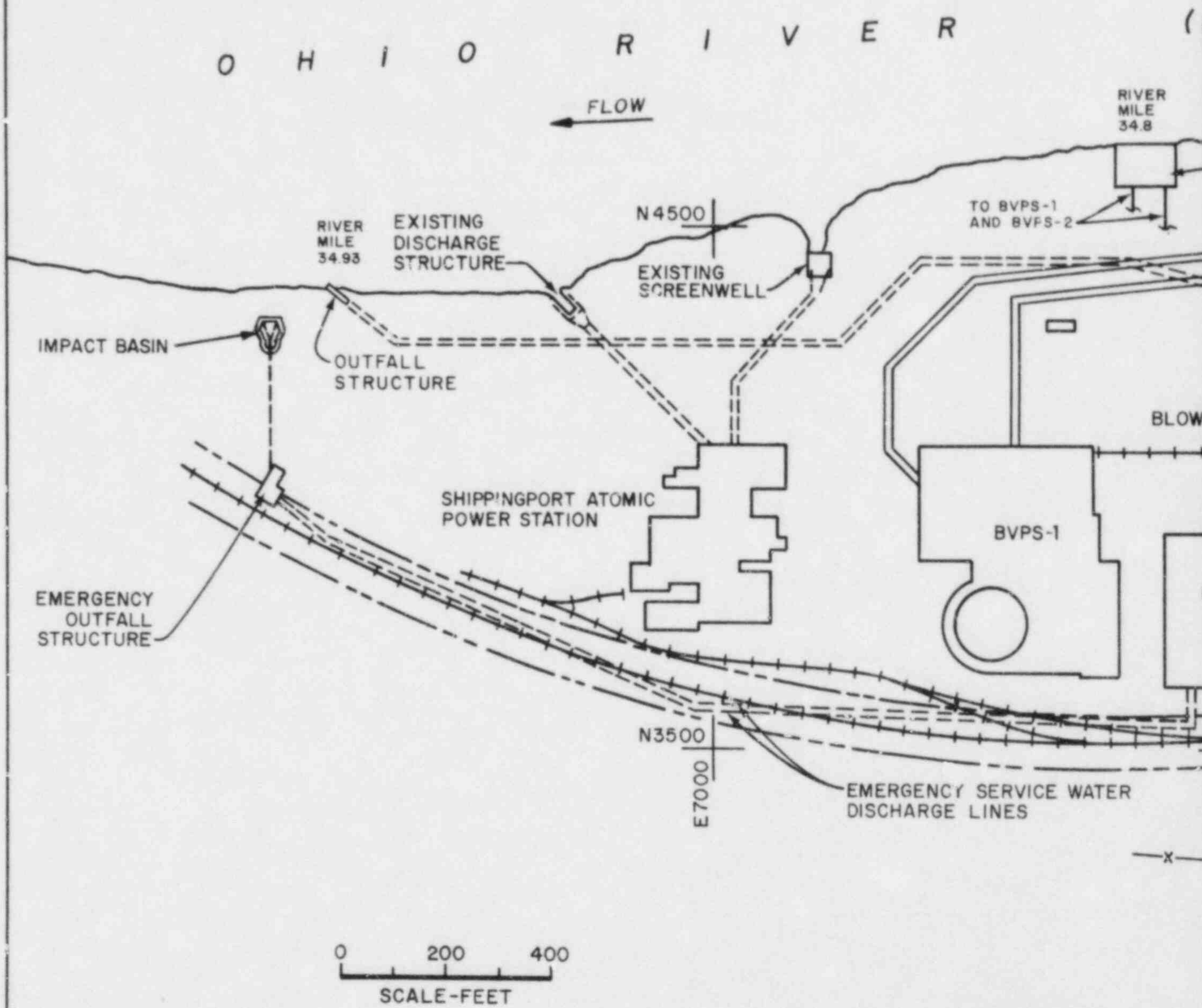
Three centrifugal water chillers, rated at 650 tons each, supply chilled water for the plant. Two units out of the three run concurrently. Service water is used for the heat rejection from the chiller units. The maximum total heat rejected to the SWS by the chillers is 19,500 MBH, at a flow rate of about 4,500 gpm, with a temperature rise of 9°F. One of two 4,500-gpm condenser water booster pumps supplies the service water to the chiller condensers. Chiller units are not utilized during accident conditions to supply the containment air recirculation cooling coils. Backup cooling water is provided by the SWS (FSAR Section 9.2.1).

3.4.2.3 Control Room Air-Conditioning Condensers

Either of the two 57.8-ton capacity freon refrigerant condensing units provides the necessary cooling and dehumidification of the main control room area. Service water is used for the condenser of the refrigerant condensing unit. The water flow to these condensers is controlled by two-way control valves. The total required service water flow is 240 gpm with a temperature rise of 10°F. The design maximum room temperature during normal operation for the control room is 75°F.

Two other cooling coils, used one at a time, serve as an additional backup to the refrigeration system. Service water is used in the coils as the cooling medium. The flow rates to the cooling coils are 95 gpm each.

Service water is also supplied to the cooling coil of the safeguards area air-conditioning units, the rod control area air-conditioning units, the main steam valve area cooling coils, and the charging pump coolers. Other systems which use service water as the coooing medium during loss of power and/or emergency conditions are the reactor containment recirculation spray system, the emergency diesel



NOTE:

U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT 1978.

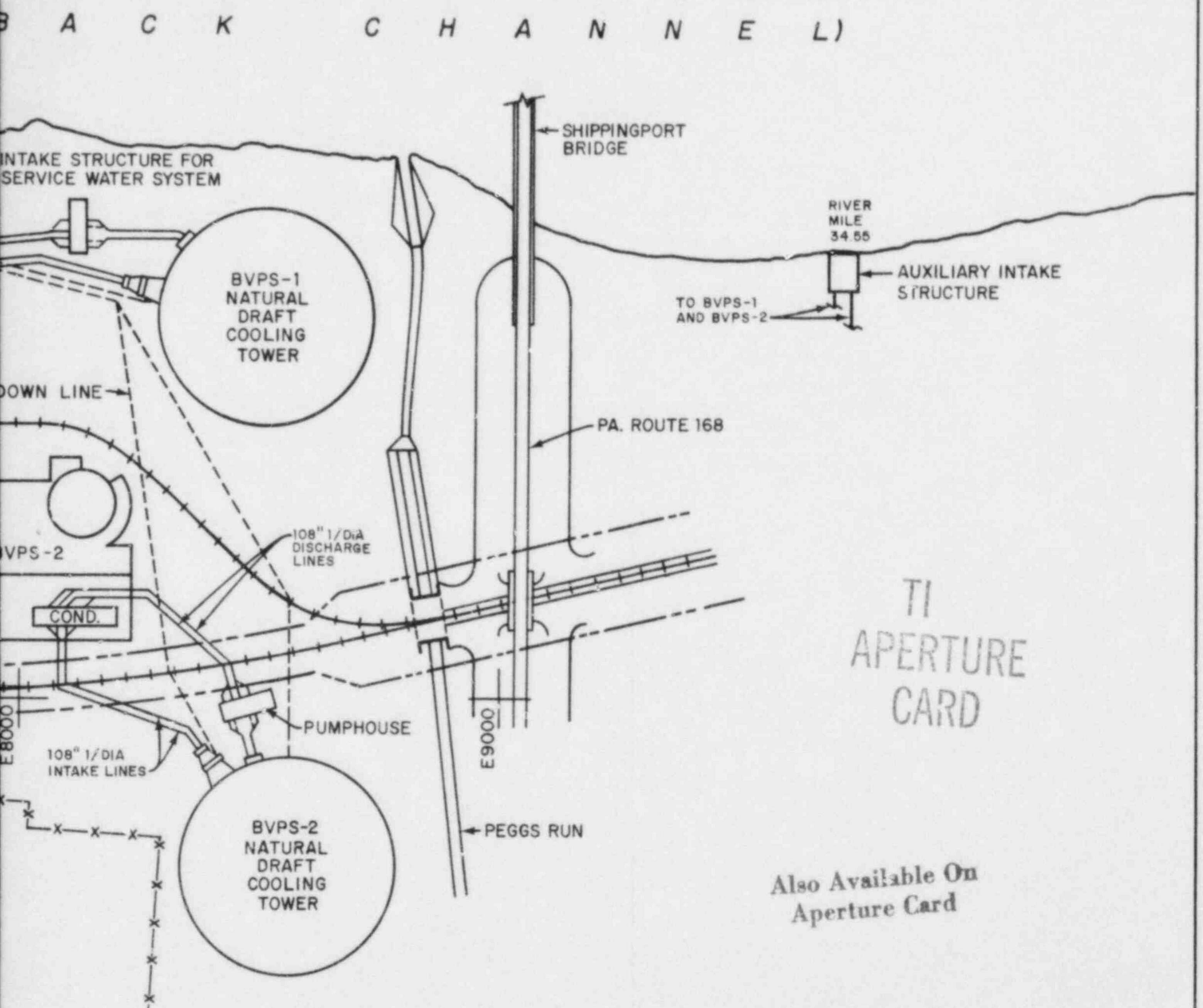
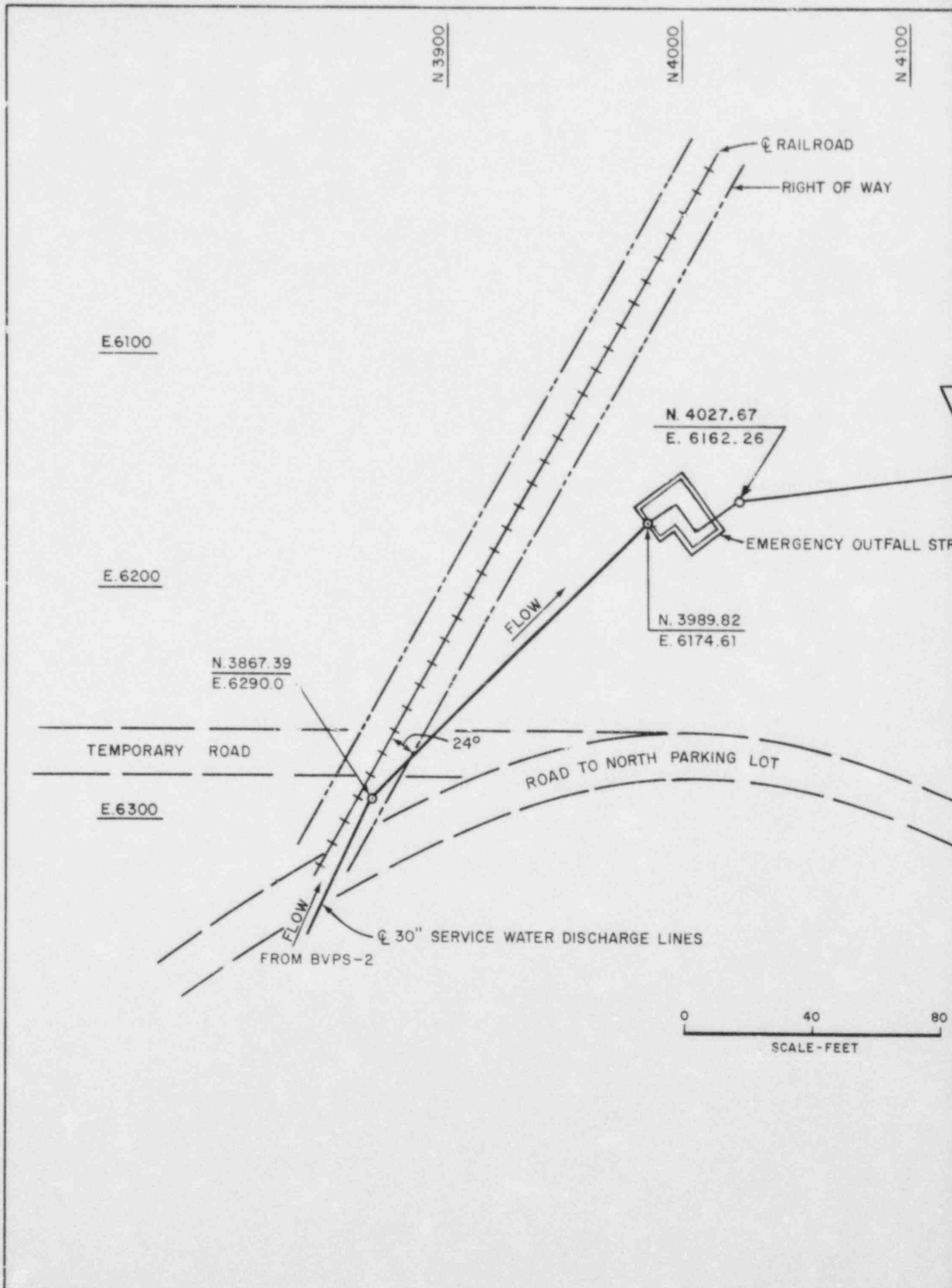


FIGURE 3.4-4
CIRCULATING WATER SYSTEM PIPING ARRANGEMENT
BEAVER VALLEY POWER STATION-UNIT 2
ENVIRONMENTAL REPORT
OPERATING LICENSE STAGE


N 3900
N 4000
N 4100
℄ RAILROAD
RIGHT OF WAY
E.6100
E.6200
E.6300
N. 4027.67
E. 6162.26
EMERGENCY OUTFALL STR
FLOW
N. 3989.82
E. 6174.61
N.3867.39
E.6290.0
24°
TEMPORARY ROAD
ROAD TO NORTH PARKING LOT
FLOW
℄ 30" SERVICE WATER DISCHARGE LINES
FROM BVPS-2
0
40
80
SCALE-FEET

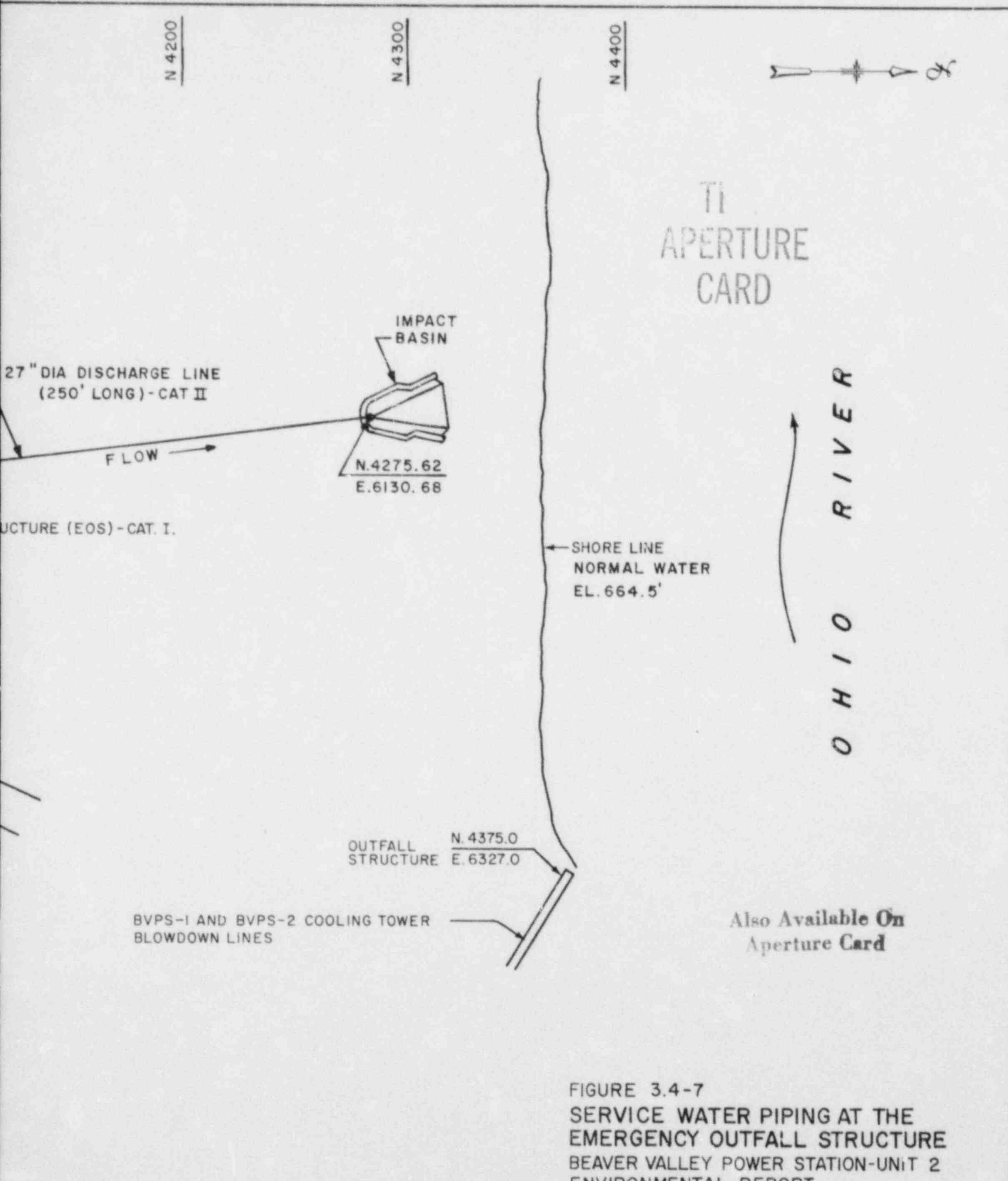
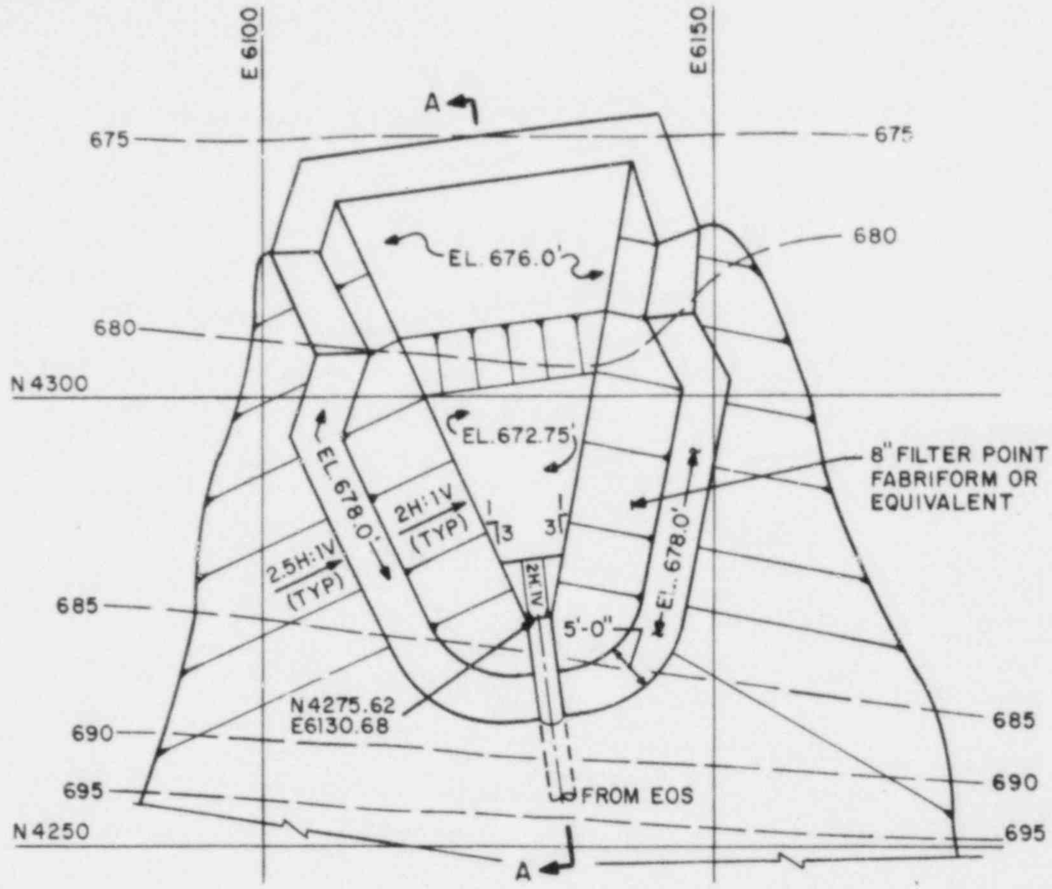
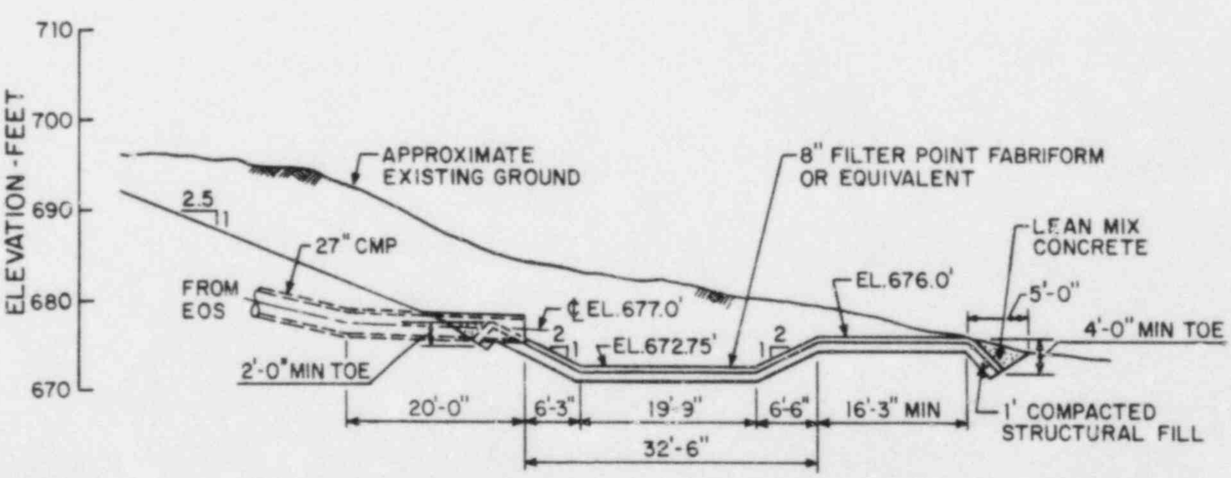


FIGURE 3.4-7
SERVICE WATER PIPING AT THE EMERGENCY OUTFALL STRUCTURE
BEAVER VALLEY POWER STATION-UNIT 2
ENVIRONMENTAL REPORT
OPERATING LICENSE STAGE



PLAN



SECTION A-A

FIGURE 3.4-8

IMPACT BASIN FOR SERVICE WATER DISCHARGE

BEAVER VALLEY POWER STATION-UNIT 2
ENVIRONMENTAL REPORT
OPERATING LICENSE STAGE

Distillate from the evaporators is collected in test tanks, sampled, and, if within allowable chemistry and activity limits, recycled to the BVPS-1 primary grade water storage test tanks for re-use or discharged to the BVPS-1 or BVPS-2 cooling tower blowdowns.

If contaminants are to be further reduced, the distillate can either be sent back to the steam generator hold tanks for reprocessing or circulated through one of the two cleanup ion exchangers and outlet strainers prior to re-sampling.

The demineralizer is a mixed bed of ion exchange resins in the H^+ and OH^- form. The resin is normally replaced when analysis of influent and effluent samples indicates that the decontamination factor falls below the design value of 10, or that the radiation level exceeds a predetermined limit.

The preceding features combine to form a system with extremely high separation factors for nonvolatile nuclides. A separation factor of 10^4 for nonvolatile nuclides is anticipated.

It is expected that liquid from the test tanks could be recycled. However, for the purpose of evaluating the radiological impact on the environment, 100 percent of test tank contents is assumed to be discharged, and 140,000 gallons per year of boron recovery system distillate released to control tritium buildup in the reactor coolant. Assurance that waste exceeding activity limits is not inadvertently discharged to the environment is provided through sampling of the effluent in the test tanks, and by the liquid waste monitor, which activates an alarm and automatically terminates the release if activity levels in the effluent exceed limits.

Each batch is analyzed prior to release using gamma spectroscopy, and the activity of each radionuclide discharged is recorded. Isotopic analyses and composites of retained samples are made in accordance with procedures outlined in Regulatory Guide 1.21. Detailed administrative records of all radioactive liquid releases are maintained.

3.5.2.2 Process Subsystems

Normal flow path of the steam generator blowdown liquid waste is from the steam generator to a steam generator blowdown flash tank. The liquid goes back to the condenser via the fourth point feedwater heaters and is processed as a part of the main condensate stream by the condensate polishing system (FSAR Section 10.4.6). The vapor is an additional heat source for the second point heaters.

The turbine building floor drains and sumps discharge to collection manholes in the yard and gravity-drain through oil separators to the environment via the BVPS-2 yard drainage system. Grab sampling is used to determine activity of the turbine building floor drains.

Provisions are included to reroute flow to the liquid waste system if needed to process drainage of high activity.

3.5.2.3 Radioactive Releases

Annual expected releases of radionuclides in Ci/yr and expected release concentrations of radionuclides in μCi/g are given in Tables 3.5-5 through 3.5-8.

There are two potential liquid waste release points. These are the cooling tower discharge point, and a separate release point for the turbine building drains.

The liquid waste discharge is diluted by blowdown from BVPS-1 and BVPS-2 cooling towers of approximately 15,000 gpm and approximately 7,800 gpm (Section 3.3), respectively. These blowdown rates are the yearly minimum values considering the largest drift and evaporation rates.

Calculated effluents do not exceed the concentration limits of 10 CFR 20, Appendix B, Table II, Column 2, and doses due to effluents do not exceed the numerical design objectives of Appendix I to 10 CFR 50 and the dose limits of 10 CFR 20. The liquid effluent doses are given in Section 5.2.

3.5.3 Gaseous Radwaste Systems

The gaseous waste management system consists of two subsystems: the degasifier gas effluent subsystem and the air ejector effluents subsystem.

The gaseous waste management system and the ventilation systems are designed to meet the requirements of 10 CFR 20, and the dose design objectives specified in the Annex to Appendix I to 10 CFR 50, including provisions to treat gaseous radioactive wastes such that:

1. The calculated annual total quantity of all radioactive material released from the site to the atmosphere does not result in an estimated annual external dose from gaseous effluents to any individual in unrestricted areas in excess of 5 milliRems (mRems) to the total body or 15 mRems to the skin.

2. The calculated annual total quantity of all radioactive iodine and radioactive material in particulate form released from the site to the atmosphere does not result in an estimated annual dose or dose commitment for any individual in an unrestricted area from all pathways of exposure in excess of 15 mRems to any organ.

The containment atmosphere filtration subsystem recirculates containment air and removes airborne radioactive contaminants from the containment atmosphere. The subsystem consists of two 50-percent capacity fans and two 50-percent capacity filtration units. Each filter bank includes a prefilter, carbon adsorber, and two HEPA filters. Since the subsystem is designed to operate only during normal plant operation, when no water droplets or mist exist in the incoming air, electric heaters and demisters are not provided in the filter banks.

The containment purge subsystem is designed to reduce the airborne radioactivity in the containment, to limit radiation exposure to operating personnel, and to provide outdoor air during extended periods of occupancy, such as refueling.

During normal plant operation, the containment isolation valves are closed and the containment is not purged. The isolation valves are opened and the purge subsystem is started manually only prior to refueling and/or maintenance in the containment. Radiation monitors are provided in the exhaust air duct for isolation of the containment and for the capability of diverting contaminated air through the main filter banks in the supplementary leak collection and release system to the elevated release.

The safeguards area ventilation system is designed to maintain an ambient temperature suitable for equipment operation and personnel access during all plant operating conditions.

North and south safeguard areas are redundant, and each area is provided with independent ventilation systems. The areas are also kept under negative pressure by the supplemental leak collection and release system as described in FSAR Section 6.5.3.2 to eliminate any radioactively contaminated air from leaking out to the atmosphere.

Ventilation is provided in the condensate polishing building to maintain personnel comfort and to provide an environment suitable for the operation of the equipment during normal plant operation.

Filtration is accomplished by two separate systems. One removes contaminated particulates through HEPA filters from areas which require filtration. The other removes gaseous contaminants through charcoal filters and HEPA filters from areas which require filtration. Both ventilation and filtration systems exhaust air to the ventilation vent on top of the condensate polishing building.

3.5.3.4 Steam and Power Conversion Systems

The steam generator blowdown system is normally not a source of gaseous effluent. Blowdown is reduced in pressure, with flashed steam routed to a feedwater heater and cooled liquid routed to the condenser for treatment by the condensate polishing demineralizers.

The turbine gland steam seal system in the steam and power conversion systems is a potential source of radioactivity; therefore, a charcoal filtration system with a heater is provided to treat effluent before discharging to the atmosphere (FSAR Section 9.4.15).

3.5.3.5 Radioactive Releases

The gaseous radionuclide releases for each potentially radioactive feedstream are given in Tables 3.5-11 and 3.5-12 in curies per year per nuclide, for BVPS-1 and BVPS-2. Parameters used in the evaluation of these releases are given in Table 3.5-10. Releases from containment vacuum pump operation are negligible and therefore are not included in the tables.

Any gaseous waste effluent not recycled is directed to the BVPS-1 gaseous waste disposal system process vent for disposal. The process vent discharge is located at the top of the BVPS-1 cooling tower, approximately 500 feet above grade elevation. The release point inside diameter is 10 inches. The exit velocity is about 2,000 ft/min, and the maximum temperature is 106°F.

Ventilation from the auxiliary building, waste handling building, fuel building, the main steam valve area, the containment, and those areas contiguous to the containment including the cable vault, rod control building, pipe tunnel, and the north and south safeguard areas, is discharged through the supplementary leak collection and release system. The supplementary leak collection filter exhaust fans discharge through a duct to an elevated release 150 feet above grade. The elevated release is located atop the containment structure. The leak collection release point inside diameter is 42 inches. A venturi effect is produced by a reduction in ductwork from a rectangular cross section of 48 by 54 inches to a circular exit point 42 inches in diameter. The exit velocity is 6,100 ft/min, and the maximum temperature is 139°F.

3.5.4 Solid Radwaste System

The solid radwaste system as described in Section 3.6.6 of the Environmental Report - Construction Permit Stage (ER-CPS) has been changed. A solidification system has been added at BVPS-2. Piping which connects the solid radwaste systems of the two units will be retained for greater flexibility. This allows BVPS-2 solid radwaste to be dewatered, as an option, at BVPS-1. Spent resin and evaporator bottoms will not be pumped into casks as described in the ER-CPS but are solidified in containers (such as 55-gallon drums) using cement as a solidification agent. Excess water from the resin flushing process is decanted and reused. Both BVPS-1 and BVPS-2 have separate steam generator blowdown systems; normally only waste concentrates from BVPS-2 are treated in the BVPS-2 solid radwaste system. Miscellaneous compressible and incompressible material (trash) is transferred to the BVPS-1 waste compaction building for disposal.

The solid radwaste system is designed to provide collection, holdup, processing, solidification, packaging, handling, and temporary storage facilities for radioactive materials prior to their shipment offsite and ultimate disposal as noted in FSAR Section 11.4.

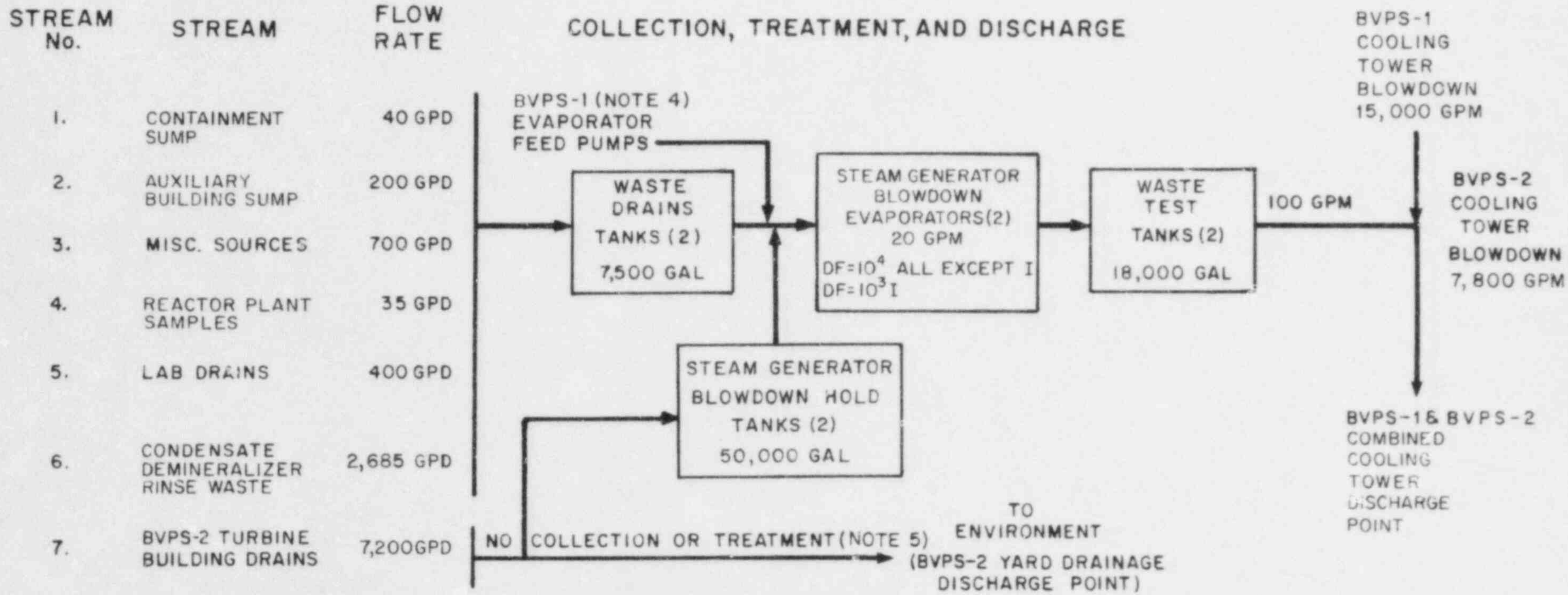
The solidification system has the capability to sample, solidify, and package evaporator concentrates, condensate treatment powdered resin

The liquid release points include the BVPS-1 and BVPS-2 cooling tower blowdown paths and the turbine building drains. The BVPS-1 and BVPS-2 cooling tower blowdown release points are continuously monitored by the liquid waste process effluent monitor. This monitor will automatically terminate the liquid waste discharge when release limits are exceeded. The BVPS-2 turbine building drains will be monitored by grab sampling. The normal turbine building drain path will be transferred to the liquid waste system when release limits are exceeded.

3.5.6 References for Section 3.5

American Nuclear Society 1979. American National Standard - Solid Radioactive Waste Processing System for Light Water Cooled Reactor Plants. ANSI/ANS-55.1, La Grange Park, Ill.

U.S. Nuclear Regulatory Commission (USNRC) 1976. Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Pressurized Water Reactors (PWR-GALE code). NUREG-0017, Washington, D.C.



NOTES:

1. NO STEAM GENERATOR BLOWDOWN IS DISCHARGED.
2. DF MEANS DECONTAMINATION FACTOR.
3. DECONTAMINATION FACTORS ARE FOR EVAPORATOR SYSTEM INCLUDING THE CLEANUP ION EXCHANGERS.
4. THERE IS NO EXPECTED INPUT FROM BVPS-1 EVAPORATOR FEED PUMPS DURING NORMAL BASE LOADED OPERATION. LOAD FOLLOWING OPERATIONS IS DISCUSSED IN FSAR SECTION 11.2.1.
5. TURBINE BUILDING DRAINS ARE PROCESSED BY THE LIQUID WASTE SYSTEM UPON HIGH ACTIVITY.

FIGURE 3.5-2
DISCHARGES TO BVPS-2 COOLING TOWER BLOWDOWN AND ENVIRONMENT
BEAVER VALLEY POWER STATION-UNIT 2
ENVIRONMENTAL REPORT
OPERATING LICENSE STAGE

In 1977-1978, a Chlorine Minimization Study was performed on the BVPS-1 circulating water system (Duquesne Light Company 1978). The study showed that under full load conditions with the chlorination system operating at full rate the maximum allowable free chlorine residual in the cooling tower blowdown was never exceeded. The maximum measured free available chlorine concentration was 0.32 mg/l and the average of the daily maximum concentrations was 0.08 mg/l. The maximum total residual chlorine concentration measured was 0.65 mg/l while the average of the daily maximum concentrations was 0.20 mg/l. The results of the Chlorine Minimization Study are a good indication of the chlorine concentrations expected in the BVPS-2 cooling tower blowdown.

3.6.2 Floor and Equipment Drainage and Roof Drainage

Potentially radioactive floor drainage is processed by the liquid radwaste treatment system, as discussed in Section 3.5.2. Nonradioactive floor and equipment drainage is discharged to the yard storm sewer system. Potentially oil-contaminated floor and equipment drainage is conveyed to oil separators for removal of oil prior to being discharged to the storm sewer system. Oil removed by the oil separators is collected and stored in drums prior to offsite disposal. The floor and equipment drainage discharged to the Ohio River complies with the effluent limitations of 40 CFR 423 (suspended solids 30 mg/l; oil and grease 15 mg/l average).

The roof drainage and noncontaminated floor and equipment drainage systems discharge to the Ohio River via the yard storm sewer.

3.6.3 Service Water Discharge System

Service water from BVPS-2 is normally discharged to the circulating water system. In addition, a portion of the service water will be discharged into the Ohio River through the emergency outfall structure (EOS) approximately 200 feet downstream from the cooling tower blowdown structure. The service water system is described in Section 3.4.

Design and normal operating flows for the EOS are:

Design flow	40,000 gpm
Normal continuous flow	8,400 gpm

The normal water flow through the EOS consists of 825 gpm of cooling water from the heating, ventilating, and air conditioning (HVAC) systems in the safeguards area and in the control room area. An additional 7,575 gpm of service water is discharged through the two 30-inch discharge headers to prevent the buildup of silt in these lines. The chemical composition of this water will be the same as that of the Ohio River (Table 3.6-2).

During emergency diesel generator testing, an additional 1,170 gpm of diesel generator cooling water will be discharged through the EOS. There are two diesel generators provided for BVPS-2. Each generator will be tested at least once per month for approximately 1 hour.

Intermittent chlorination of the service water system is required to control biological growths on tube surfaces in the heat exchangers. Chlorine is added in the header pipes upstream of each set of heat exchangers in doses sufficient to maintain a maximum free available chlorine concentration of 0.5 mg/l at the discharge from the heat exchanger in each set that is the farthest downstream. Each set of heat exchangers will be chlorinated at one time for a period of one-half hour twice per day. Chlorination of the service water system will occur at the same time as the chlorination of the circulating water system. The chlorinator setting for the service water system will range from 400 to 2,000 lb/day, depending on the cleanness of the heat exchangers. The chlorine demand of the water in the remainder of the system is expected to reduce the residual chlorine so that discharge through the EOS will be less than or equal to 0.2 mg/l (average) and 0.5 mg/l (maximum) free available chlorine.

The total residual chlorine concentration in the EOS discharge will be somewhat greater than the free available chlorine concentration. The BVPS-1 circulating water system Chlorine Minimization Study (DLC 1978) indicates that the total residual chlorine concentration can be expected to be roughly twice the free available concentration.

3.6.4 Corrosion Products

The BVPS-1 and BVPS-2 condenser tubes are fabricated of Type 304 stainless steel. Assuming the corrosion rate of Ohio River water on stainless steel is comparable to the rates found for rivers cited by LaQue and Copson (1963), the corrosion rate should be less than 0.1 mil per year per unit. Based on the surface area of the main condenser tubes in each unit, the corrosion rate has been calculated to be less than 6 ft^3/year per unit. Assuming a stainless steel density of 0.29 lb/in^3 and an average annual river flow of 1.75 x 10^7 gpm, the increase in the total metal concentration in the Ohio River is expected to be 0.078 part per billion (ppb) due to the operation of BVPS-1 and BVPS-2.

3.6.5 Water Treatment Wastes

Demineralized water, required as makeup to the BVPS-2 feedwater system, is supplied by the BVPS-1 makeup water treatment system. Potable water for BVPS-2 is supplied from onsite wells. The well water is softened prior to use. The following sections describe the wastes generated by the BVPS-1 water treatment and BVPS-2 softener systems. Estimated chemical usage by the plant water treatment systems is presented in Table 3.6-3.

3.6.5.1 Demineralizer System

The BVPS-1 makeup demineralizer system provides high quality demineralized water for both BVPS-1 and BVPS-2 feedwater systems to replace steam generator blowdown and other system losses. The treatment system includes pretreatment of Ohio River water by clarification and filtration prior to demineralization.

Makeup water from the Ohio River is treated for suspended solids removal in a single clarifier with a design capacity of 1,000 gpm. Hydrated lime and ferric sulfate are added to the clarifier to promote flocculation, and a coagulant aid and/or clay may also be added to enhance flocculation and settling. Clarified effluent is conveyed to three gravity sand filters to remove any remaining suspended solids. The filtered water is conveyed to either the demineralization system or to the filtered water storage tank.

The clarifier wastewater system operates in conjunction with the water treatment system. Wastewater from clarifier sampling, blowdown, and chemical feed overflow are collected in the clarifier waste pit, then directed to the clarifier settling tank for system. The quantities of these wastes are expected to be small.

2. Liquid wastes associated with the resin transfer system used for sluicing the ion-exchange resins to the solid waste disposal facility will contain trace amounts of suspended and dissolved solids.

3. Laboratory wastes will consist of small quantities of non-radioactive reagent chemicals (less than 200 pounds per year) used for testing and are treated in the radwaste system.

4. Liquid wastes from reactor coolant system tanks and drains will consist of quantities of boric acid, lithium hydroxide, and hydrazine - used for reactivity, pH, and corrosion control, respectively. Hydrazine will essentially be chemically degraded to ammonia, nitrogen, and water prior to discharge.

3.6.7 Auxiliary Boiler Blowdown

The BVPS-1 is equipped with two 43,000 lb steam/hr auxiliary boilers which supply auxiliary steam for heating and process. The boilers are blown down at a maximum rate of 9 gpm (design) to maintain boiler water quality. During plant shutdown for refueling and maintenance, one or both boilers can be used as required. The blowdown from both of the BVPS-1 auxiliary boilers is conveyed to the chemical waste sump for neutralization prior to discharge to the BVPS-1 cooling tower blowdown.

The BVPS-2 is equipped with two 150,000 lb steam/hr auxiliary boilers. Only one boiler is used during refueling and maintenance, and the maximum blowdown rate (design) is 15 gpm.

Blowdown from the BVPS-2 auxiliary boilers is conveyed to and mixed with BVPS-2 service water upstream of the emergency outfall structure discharge.

The maximum auxiliary boiler blowdown rate of 24 gpm occurs when both BVPS-1 auxiliary boilers are being used during a BVPS-1 shutdown and one BVPS-2 auxiliary boiler is being used during a concurrent BVPS-2 shutdown.

The auxiliary boilers will operate several days per year for testing purposes and approximately 6 to 8 weeks per year during shutdown and refueling.

3.6.8 Screenwash System

3.6.8.1 Main Intake Structure

The main intake structure is common to both units.

When only BVPS-1 is operating, the intake traveling screens are backwashed at 770 gpm for approximately 10 minutes, three times a day. When both BVPS-1 and BVPS-2 are operating, the frequency and daily average flows are doubled.

3.6.8.2 Auxiliary Intake Structure

The auxiliary intake structure is common to both units.

Although the auxiliary intake structure is not normally used, the intake travelling screens are backwashed at 195 gpm for approximately 3 hours once a week to prevent the buildup of debris.

3.6.9 Salt and Water Drift

A mathematical model was developed to determine the downwind distribution of salt and water deposition rate and airborne salt concentration resulting from cooling tower operation. A detailed description of the model and results are contained in Appendix 3B. The model takes into account the following: configuration and performance of the towers, drift rate, exit velocity, total dissolved solids level, droplet size distribution, evaporation rate, plume buoyancy, wind speed, wind direction, wet-bulb temperature, and relative humidity. One year of onsite meteorological data (January 1, 1976 to December 31, 1976) was used in the drift model.

A maximum salt deposition rate of 9.9 pounds per acre per year (0.11 $mg/cm^2/year$) occurs approximately 4,750 feet east of the cooling towers. The maximum water deposition rate of 20,300 pounds per acre per year (227.3 $mg/cm^2/year$) occurs at a distance of approximately 4,000 feet east of the towers. The maximum annual average airborne salt concentration is predicted to be 0.07 g/m^3 (7×10^{-8} mg/l) approximately 7,000 feet east of the towers, while the maximum hourly airborne concentration of 21.9 g/m^3 (2.19×10^{-5} mg/l) occurs 3,250 feet west-southwest of the towers. These maxima are the largest values occurring over the entire spatial grid of the model. Spatial averages of these concentrations are not given due to their insignificance in light of the small impacts caused by the maximum values (Section 5.3.3).

3.6.10 References for Section 3.6

Duquesne Light Company (DLC) 1978. Letter from R.J. McAllister, DLC, to B. Smith, U.S. Environmental Protection Agency, Region III, dated July 20, 1978.

LaQue, F. L. and Copson, H. R. 1963. Corrosion Resistance of Metals and Alloys, Second Edition. Reinhold Publishing Corporation, New York, N.Y.

NUS Corporation 1975. 1974 Baseline Report and Addenda November 1973 through December 1974. Aquatic Ecology Study.

U.S. Environmental Protection Agency 1974. Effluent Guidelines and Standards for the Steam Electric Power Generating Point Source Category. 40 CFR 423. Federal Register, Vol. 39, No. 196.

TABLE 3.7-1

FUEL CONSUMPTION AND EMISSIONS OF FOSSIL-FUELED EQUIPMENT*

	Auxiliary Boilers		Emergency Diesel Generators		Diesel Fire Pump	Standby Diesel Generator
	BVPS-1	BVPS-2	BVPS-1	BVPS-2		
Quantity, each	2	2	2	2	1	1
Rating, each	43,000 lb/hr	150,000 lb/hr	2,600 kW	4,238 kW	2,500 gpm	2,500 kW
Total maximum hours of operation per year	1,440	1,424	24 (each)	24 (each)	26	12
Total annual equipment fuel consumption (gal)	1.18×10^{6}	1.9×10^{6}	-------6,480 Total--------		975	810
Emissions (lb/year)						
Particulates	3,400**	34,600	22***	36***	18	95**
Sulfur dioxide	85,200****	137,840****	344	600	30	156
Carbon monoxide	5,800	9,540	1,116	1,200	99	35
Hydrocarbons	1,200	1,420	412	720	37	25
Nitrogen oxides	26,600	80,950	5,168	5,414	457	1,511

NOTES:

*The two BVPS-1 auxiliary boilers may operate simultaneously; the two BVPS-2 auxiliary boilers operate alternately. The diesel fire pump is installed in BVPS-1 and shared by BVPS-2. The standby or "black" diesel generator, utilized for the emergency response facility, is common to both units.

**Based on a USEPA AP-42 emission factor (USEPA 1977).

***Based on smoke emissions provided by vendor.

****Based on an assumed sulfur-in-fuel content of 0.5 percent.

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CHAPTER 5

ENVIRONMENTAL EFFECTS OF STATION OPERATION

5.1 EFFECTS OF OPERATION OF HEAT DISSIPATION SYSTEM

5.1.1 Effluent Limitations and Water Quality Standards

Liquid waste discharges during operation of Beaver Valley Power Station - Unit 2 (BVPS-2) will be in compliance with the following:

1. U.S. Environmental Protection Agency (USEPA) effluent guidelines and standards for steam electric power plants (40 CFR 423), and

2. Discharge limitations established and/or certified by the Pennsylvania Department of Environmental Resources (DER) in the National Pollution Discharge Elimination System (NPDES) discharge permit and in the DER industrial waste permits.

The USEPA granted an NPDES permit for Beaver Valley Power Station - Unit 1 (BVPS-1) in 1975 with amendments through 1977. The Pennsylvania DER then gained NPDES permitting authority and amended the BVPS-1 permit in 1979. The DER has indicated that it will further amend the existing BVPS-1 NPDES permit to include discharges from BVPS-2. Discharges from BVPS-2 which will be included in the amended permit are:

1. Cooling tower blowdown from BVPS-2,

2. Service water (Section 3.6.3),

3. Floor and equipment drainage,

4. Low level radwaste from BVPS-2, and

5. Sanitary waste treatment effluent.

The application for an amended NPDES permit was submitted to the DER on March 15, 1983. When issued, the amended permit will be contained in Appendix 5A. Table 5.1-1 lists the existing discharge permits for BVPS-1 as well as the anticipated permits for BVPS-2.

Effluent limitations contained in the existing BVPS-1 NPDES permit are presented in Table 5.1-2. Table 5.1-3 presents effluent limitations anticipated for BVPS-2 discharges, based upon the existing BVPS-1 limitations and current USEPA effluent guidelines for the steam electric industry (40 CFR 423), revised in 1982.

Among the revisions potentially affecting BVPS-1 and BVPS-2 are restrictions on the discharge of cooling tower maintenance chemicals and limitations on toxic and hazardous substances not presently regulated. It is anticipated that the new BVPS-1 and BVPS-2 NPDES permit which will be issued by the Pennsylvania DER will include the revised USEPA effluent limitations.

In addition, the Pennsylvania DER has been charged with establishing water quality standards for the Ohio River and to ensure these standards are maintained. Therefore, it is possible that the Pennsylvania DER could impose discharge limitations more stringent than those outlined in the USEPA's effluent guidelines for the steam electric industry (40 CFR 423). The effects of wastewater discharges to the Ohio River are discussed in Section 5.3.

Water quality standards applicable to the Ohio River are presented in Table 5.1-4. These standards are taken from the Pennsylvania Code, Title 25, Part I, Chapter 93, Water Quality Standards. General water quality criteria for all waters of the state, as outlined in Section 93.6 of this Code, are as follows:

a) Water shall not contain substances attributable to point or nonpoint source waste discharges in concentration or amounts sufficient to be inimical or harmful to the water uses to be protected or to human, animal, plant, or aquatic life, and

b) Specific substances to be controlled shall include, but shall not be limited to, floating debris, oil, grease, scum and other floating materials, toxic substances, pesticides, chlorinated hydrocarbons, carcinogenic, mutagenic and teratogenic materials, and substances which produce color, tastes, odors or settle to form sludge deposits.

In addition to these water quality standards, the Ohio River Valley Water Sanitation Commission (ORSANCO) has developed a set of recommended water quality criteria for the Ohio River in order to provide uniform standards for the main stem of the river. These standards were adopted by ORSANCO on September 9, 1976 and amended on May 12, 1977 and September 8, 1977. The Commonwealth of Pennsylvania is a signatory member of ORSANCO. Table 5.1-5 presents a summary of the ORSANCO water quality criteria for selected parameters.

As discussed in Section 5.3, waste discharges from BVPS-1 and BVPS-2 will have no detectable impact on the Ohio River water quality in the vicinity of the site and, therefore, will have no impact on the river water quality in the state of Ohio. The state boundary is approximately 5 miles downstream of the BVPS site.

5.1.2 Physical Effects

The cooling tower blowdown will have minimal thermal effects on the Ohio River, since the BVPS-2 main condenser is cooled by a closed-loop cooling tower system. The major station effluent discharged into the river occurs at the blowdown line outfall (Figure 3.4-2), where the cooling tower blowdown, as discussed in Section 3.4, is returned to the river from the cooling tower basins of both BVPS-1 and BVPS-2. The temperature rise and amount of this flow are subject to the seasonal and daily variability of the parameters affecting cooling tower operation. The station shoreline structures which have interaction with the river are shown on Figure 3.4-4.

As discussed in Section 3.4.2, BVPS-2 will utilize a separate discharge for the emergency service water system. The discharge through the emergency outfall structure (EOS) is approximately 8,400 gpm (19 cfs) with a temperature rise of 12°F. The heat rejection rate is small in comparison with the BVPS-2 cooling tower blowdown discharge, except in July and August when it would be equivalent. The impact of this discharge under normal operating conditions is minimal.

The water quality standards for thermal discharges are defined in Section 5.1.1. In order to meet the heat discharge standards of the Pennsylvania DER and ORSANCO, 10 years of available daily data on weather, river temperature, and river flow were analyzed to determine the most critical situations likely to be encountered. The results of the calculations from this analysis were used as the test conditions for the physical hydraulic model discharge plume study in order to determine the allowable heat discharge rate and the mixing zone required to dissipate the waste heat. A more complete treatment of these calculations can be found in Section 5.1.4 of the BVPS-2 ER-CPS.

As discussed in Section 5.1.1, an NPDES permit has been granted to BVPS-1 by the USEPA (USEPA Permit PA 0025615). The NPDES regulations state that "outside a zone defined by a 5°F isotherm, the heat content of the discharge shall not exceed a 5°F rise above ambient, or a maximum of 87°F, whichever is less; not to be changed by more than 2°F during any 1 hour period. This zone shall not exceed an area of 33 acres." It is anticipated that this mixing zone will include the effects due to the discharge from BVPS-2 when the BVPS-1 NPDES permit is amended to include BVPS-2.

The results of the hydraulic model studies discussed in this section indicate that BVPS-2 will be in compliance with the anticipated NPDES permit mixing zone criteria for both average and extreme seasonal conditions.

Table 5.1-6 lists the anticipated monthly thermal effect of BVPS-1 and BVPS-2 blowdown on the Ohio River. The cooling tower blowdown temperatures vary seasonally with meteorological conditions, from an average of approximately 28°F above ambient river temperature in the winter to approximately 3°F above ambient in the summer.

The flow rate and temperature rise of BVPS-2 discharges have changed from those described in the ER-CPS. In order to prevent silt buildup in the EOS, described in detail in Section 3.4, the discharge rate through the EOS will be 8,400 gpm during normal plant operation. The implementation of zoning in the cooling tower for ice prevention during winter months, not discussed in the ER-CPS, also affects the blowdown discharge. The average blowdown rates have been reduced by approximately 5 cfs while the blowdown temperature rises have increased by 6°F to 7°F during winter months (December through March) from those cited in the ER-CPS. These changes will have no significant additional impacts to the Ohio River.

5.1.2.1 Hydraulic Model Studies

Extensive physical hydraulic model studies of the effect of the discharge of heated effluent from BVPS-1 and BVPS-2 to the Ohio River have been performed for both a once-through and a closed-cycle cooling system (Ferron 1969, 1971, 1972). These studies considered various Ohio River flows, and several topographical configurations of Phillis Island, in conjunction with varying discharge conditions. The final stage of the model study dealt with the effect of blowdown in conjunction with the operation of the Shippingport Atomic Power Station (SAPS), an experimental reactor which utilizes a once-through cooling system (Ferron 1972). The results of this study indicate that the extent of lateral and vertical isotherms induced by Beaver Valley Power Station (BVPS) blowdown and SAPS effluent will be minimal. Table 5.1-7 gives thermal plume sizes for the various seasonal conditions.

In general, the conditions simulated in the physical hydraulic model studies are more conservative than those anticipated during the operating life of BVPS-2. A discussion of the factors leading to this conservatism follows.

The model studies include the SAPS discharge. However, because SAPS is no longer operating, the actual thermal effect on the river due to BVPS alone will be much less than that of SAPS and BVPS combined. For the annual average condition, the BVPS thermal discharge including the cooling tower blowdown and the discharge through the emergency service water system is only 28 percent of the heat discharged by both SAPS and BVPS. During the winter months, the BVPS heat contribution accounts for only 40 percent of the heat from both SAPS and BVPS. In the summer months, the contribution of the BVPS heat discharge is even smaller and accounts for only approximately 13 percent of the combined SAPS and BVPS discharges.

The isotherms shown on Figures 5.1-1 through 5.1-3 depicting the temperature rises at the downstream vicinity of the BVPS site are for

TABLE 5.1-2 (Cont)

b. There shall be no discharge of polychlorinated bi-phenyl transformer fluids to navigable waters.

c. There shall be no discharge of sludges from clarification water treatment.

d. Amended February 14, 1978, as follows (in part):

"Permittee shall comply with applicable Pennsylvania Water Quality Standards for the Ohio River. Outside a zone defined by a 5° isotherm, the heat content of the discharge shall not exceed a 5° rise above ambient temperature or a maximum of 87°F, whichever is less; not to be changed by more than 2°F during any one-hour period. This zone shall not exceed an area of 33 acres. This heat limitation would be applicable only when river flows were equal to or greater than the 7-day - 10-year flow conditions (6,500 cfs)."

NOTES:

*Effluent limitations are as defined in USEPA Permit No. PA 0025615.
**N/A = Not applicable.

TABLE 5.1-3

ANTICIPATED EFFLUENT LIMITATIONS*
FOR BVPS-2 WASTE DISCHARGES

Effluent Description	Effluent Limitations
Cooling tower blowdown	Same limits as BVPS-1 discharge 001**
The 126 priority pollutants contained in chemicals added for cooling tower maintenance***	Daily avg - No detectable amount Daily max - No detectable amount
Except:	
Chromium, total	Daily avg - 0.2 mg/l Daily max - 0.2 mg/l
Zinc, total	Daily avg - 1.0 mg/l Daily max - 1.0 mg/l
Floor and equipment drainage	Same limits as BVPS-1 discharge 303**
Service water	
Oil and grease	Daily avg 15 mg/l Daily max 20 mg/l
Free available chlorine	Daily avg 0.2 mg/l Daily max 0.5 mg/l Free available chlorine may be discharged for not more than 2 hours in any one day.
pH	Not less than 6.0 nor greater than 9.0
Sanitary waste treatment effluent	Refer to Table 5.4-1 for a list of effluent limitations

NOTES:

*Effluent limitations have not been established for BVPS-2 waste discharges. The above limitations are based on limits imposed on waste discharges from BVPS-1 contained in USEPA Permit No. PA 0025615.

**Refer to Table 5.1-2.

***Effluent limitation regulations imposed November 19, 1982.

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CHAPTER 8

ECONOMIC AND SOCIAL EFFECTS OF STATION OPERATION

8.1 BENEFITS

This section describes the benefits associated with the operation of Beaver Valley Power Station - Unit 2 (BVPS-2) and supplements those benefits presented in Chapter 8 of the Environmental Report - Construction Permit Stage. The costs presented in this Chapter are in 1986 dollars.

8.1.1 Primary Benefits

Beaver Valley Power Station - Unit 2 is scheduled to be operational in May 1986 and will generate 833 MWe (net) of reliable base load electric power to meet the projected needs of industrial, commercial, residential, and other customers for the area served by the Central Area Power Coordination (CAPCO) group.

The ownership of the participants in BVPS-2 is as follows:

Duquesne Light Company	13.74 percent
The Cleveland Electric Illuminating Company	24.47 percent
Ohio Edison Company	41.88 percent
The Toledo Edison Company	19.91 percent

The BVPS-2 is intended to help supply electric energy to five major cities and their surrounding areas. These cities are Pittsburgh, Cleveland, Akron, Youngstown, and Toledo, which have broad economic bases of business and industry.

Socioeconomic benefits are both direct and indirect. Direct benefits affect the owners and operators of the facility and their customers (Table 8.1-1). Indirect benefits, often referred to as external effects, impact persons and interests in the vicinity of the proposed activity or those indirectly related to the facility. These indirect benefits, which include the expansion of business and industry, are the backbone for economic growth in an area. An important factor in this growth is an adequate supply of electric energy. The BVPS-2 will help contribute electric energy needed to maintain economic growth in these areas.

The BVPS-2 is expected to generate approximately 4,962 million net kilowatt-hours (kWh) annually assuming an average capacity factor of approximately 68 percent (Table 8.1-2). Of the 1989 projected generation of 5,004 million kWh, approximately 1 262 million kWh will go to residential customers, 1,149 million kWh to commercial customers, 2,349 million kWh to industrial customers, 33 million kWh to street lighting, and 211 million kWh to sales for resale and other uses, as shown in Table 8.1-3. The primary benefit of the proposed plant lies in the 4,962 million kWh per year of electricity to be delivered to customers over its 40-year operational life. This can also be represented by an annual revenue to CAPCO of $387,709,000 in 1986, which will rise to $586,255,000 in 1987 when BVPS-2 is fully operational. This value is based on the rate structure and fuel clauses of each CAPCO party in effect as of 1981. No sales of steam or other products or services from the plant are anticipated. There is also a savings in natural fuel resources; this is discussed further in Section 8.1.2.4.

8.1.2 Other Social and Economic Benefits

8.1.2.1 Tax Revenues

Although tax rates levied on BVPS-2 are under the discretion of state and local authorities, certain tax revenues generated during the operation of BVPS-2 can be approximated.

There is a minimal amount of local property tax assessed on non-utility property. The Commonwealth of Pennsylvania, under the Public Utility Realty Tax Act (PURTA), levies a tax of 30 mills on certain utility property. The taxable property includes land, buildings, towers, smokestacks, and other structures but excludes machinery, equipment, poles, and transmission towers whether or not attached to taxable property. This tax revenue is distributed to various local governments in the state based upon a formula established by the state. The state will realize an estimated levelized annual PURTA tax of $15,735,053 (in 1986 dollars). In addition to the PURTA tax, Ohio and Pennsylvania will also realize an average annual gross receipts tax of $13,000,000 (in 1986 dollars) through taxes on the sale of electricity. Pennsylvania and the federal government will jointly realize average annual state and federal corporate net income tax revenue of approximately $90 million (in 1986 dollars) paid by plant owners on the sale of electricity generated by BVPS-2.

In addition to these tax revenues, the federal, state, and local governments will realize tax revenues through the collection of personal income taxes on the payroll generated in operating the plant. A discussion of these revenues follows.

8.1.2.2 Payrolls and Employment

The present worth of the payroll in 1986 dollars for the 465 operating personnel of BVPS-2 is estimated to be approximately $126 million (40 years).

From the operating payroll, personal income taxes will be realized by various municipalities and the state and federal governments. The federal income tax to be paid by the operating personnel on an annual basis is estimated to be $3,294,990 (in 1986 dollars) assuming 1983 rates. State income tax paid by operating personnel is estimated to be $431,985 on an annual basis (in 1986 dollars). Local wage taxes to be paid by operating personnel to various municipalities are estimated at $183,768 on an annual basis (in 1986 dollars). Total annual local, state, and federal taxes are $122,600,000 in 1986 dollars (Table 8.1-1).

8.1.2.3 Environmental Studies

The operation of BVPS-2 will contribute to knowledge of the surrounding environment. These contributions will result from ecological studies already completed and monitoring activities that will be conducted throughout the life of the plant. The data from these studies will provide the scientific community with information which will enable it to predict the effect of a similar activity on the environment. These studies are discussed in Chapters 2, 5, and 6.

8.1.2.4 Fuel Oil Conservation

The operation of BVPS-2 will result in a significant savings of No. 2 and No. 6 crude oil. As shown in Table 8.1-4, a 1-year delay in the operation of BVPS-2 will result in the use of an additional 24.1 million gallons of oil in 1986 and 11.7 million gallons of oil in 1987; a 3-year delay in BVPS-2 will result in the use of an additional 102.3 million gallons of oil by 1989. The dollar savings of fuel oil associated with the on-schedule operation of BVPS-2 is estimated to be $121 million (in 1986 dollars) for the years 1986 through 1989.

8.1.2.5 Air Quality

The on-schedule operation of BVPS-2 will result in less fuel oil burned by CAPCO utilities, thus precluding the emission of air pollutants associated with burning oil. The quantities of sulfur dioxide, nitrogen oxides, particulate matter, carbon monoxide, and non-methane hydrocarbon emissions due to a one-year delay of BVPS-2 are shown in Table 8.1-1.

TABLE 8.1-1

ANNUAL BENEFITS FROM BVPS-2

Direct Benefits

Expected average annual generation* (kWh/yr)	$4,962 \times 10^6$
Capacity (kWe)	833×10^3
Proportional distribution of electrical energy expected (kWh/yr)	
Industrial	$2,349 \times 10^6$
Commercial	$1,149 \times 10^6$
Residential	$1,262 \times 10^6$
Other	244×10^6
Expected average annual steam sold from the facility	0
Expected average annual delivery of other beneficial products	0
Revenues** from delivered benefits	
Electrical energy generated (1987)	$586,000,000
Steam sold	0
Other products	0

Indirect Benefits

Annual taxes**	
State PURTA, gross receipts tax	$ 28,735,000
State, federal income tax	90,000,000
State personal income tax	432,000
Federal personal income tax	3,295,000
Local wage tax	184,000
Research	Past and present environmental studies
Environmental enhancement	
Recreation	None
Navigation	None
Air quality (savings in emissions, May 1986-April 1987, tons)	
SO_2	1,474
NO	812
Particulates	82
Others:	
CO	89
HC	15

TABLE 8.1-1 (Cont)

Indirect Benefits (Cont)

Environmental monitoring	Meteorological, ecological, radiological
Savings of fuel oil*** (gal/yr)	34.1×10^6
Operating employment (number of employees)	465

NOTES:

*Based on 68.0 percent plant capacity factor.
**1986 dollars.
***Represents increased running of peaking units if BVPS-2 is not in service for the first 3 years. The annual savings of 34.1×10^6 gallons equals the total oil savings for 1986 through 1989 divided by the 3 years of delay. In practice, the availability of BVPS-2 for base load will probably save additional fossil fuels which would have been consumed in base load fossil plants.

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12.3 WATER QUALITY CERTIFICATION AND DISCHARGE PERMIT

The water quality certification for waste water discharges from Beaver Valley Power Station - Unit 2 (BVPS-2) operation, required under Section 401 of the Federal Water Pollution Control Act (FWPCA) as amended, was issued by the Commonwealth of Pennsylvania, Department of Environmental Resources (DER) on January 23, 1974.

The application for a National Pollution Discharge Elimination System (NPDES) permit for waste water discharges from BVPS-2 operation, required under Section 402 of the FWPCA, was submitted to the DER on March 15, 1983. The Beaver Valley Power Station - Unit 1 NPDES permit will be amended to include BVPS-2 discharges. When issued, the amended permit will be contained in Appendix 5A.

NRC LETTER DATED
MAY 4, 1983

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TABLE E100.1-1 (Cont)

ER-OLS Section	ER-CPS Section	Description of Change
3.5.1	3.6.8	Maximum source terms and releases now based on NUREG-0017 instead of 0.25-percent failed fuel.
3.5.2	3.6.4	Liquid radwaste system provides independent capability for BVPS-2, additional liquid waste storage capacity, and allowance for direct discharge of liquid waste through cleanup filter.
3.5.3	3.6.3	Addition of gaseous waste storage tanks.
3.5.4	3.6.6	Solidification system added. Separate BVPS-1 and BVPS-2 steam generator blowdown systems installed. Miscellaneous trash transferred to BVPS-1 waste compaction building.
3.5.5	3.6	Some changes to radiation monitors.
3.6	3.7	Makeup filter backwash is recycled to the clarifier. Potable water will come from ground water softened by BVPS-2 softener. Potentially oil-contaminated floor drainage is treated by oil separators. BVPS-1 and BVPS-2 cooling tower blowdown is combined at the discharge point prior to discharge. BVPS-2 cooling tower cycles of concentration are increased due to incorporation of the emergency outfall structure in the service water system. BVPS-1 auxiliary boiler blowdown is directed to chemical waste sump. BVPS-2 auxiliary boiler blowdown is directed to BVPS-2 service water system. A separate liquid radwaste system is installed for BVPS-2.
3.7	3.8, 3.10	A separate RBC sewage treatment system was installed for BVPS-2. New fossil-fired equipment added, operational frequencies and sulfur-in-fuel content changed.
3.8	3.9	Transportation of fuel and wastes is as set forth in 10 CFR 51.20, Table S-4.
3.9	3.2	Beaver Valley-Crescent transmission line and Hanna-Mansfield connection added.
Ch.4	Ch.4	No discussion required.
5.1.1	5.3	Revised water quality standards and regulations. Revised NPDES permit application.

TABLE E100.1-1 (Cont)

ER-OLS Section	ER-CPS Section	Description of Change
5.1.2	5.1	Change in flow rates and temperature rises of liquid discharges. Discharge through emergency outfall structure is 8,400 gpm. Zoning was implemented in cooling tower. No significant additional impact to Ohio River is expected.
5.1.3	5.1.3	No change.
5.1.4	5.1.1	Change in cooling tower size and drift rates. Updating of meteorological data base used to analyze plume dispersion. No additional impact is expected.
5.2	5.2	Radiation doses to maximum individual calculated according to Regulatory Guide 1.109. Doses remain lower than design objectives of USNRC.
5.3	5.3	Cooling tower concentration factors increased. Mixing zones are required for five chemical constituents to comply with water quality standards.
5.4	5.3	Discharge rate from new sewage treatment plant increased. No significant impact to Ohio River is expected.
5.5	-	New information presented.
5.6	5.4.3	No change in impact of operational noise or gaseous emissions.
5.7	4.3, Ch. 10	No additional land use impact of site acreage increase. No impact on uranium resources is expected, despite change to not reusing fuel.
5.8	-	New information presented.
5.9	5.4	Effects of uranium fuel cycle are as set forth in 10 CFR 51.20, Table S-3.

TABLE E100.1-1 (Cont)

ER-OLS Section	ER-CPS Section	Description of Change
6.1	5.5, Q.C.3	Requirement for thermal study of Ohio River waived by USEPA. Meteorological monitoring program changed per Regulatory Guide 1.23. Other preoperational monitoring was carried out as planned.
6.2	5.5	Some changes to operational monitoring programs.
6.3	-	New information presented.
6.4	5.5, App. D	Change of data base to 1981.
7.1	Ch. 6	Accident analysis not included in ER-OLS at the present time.
7.2	5.4.3	Transportation accidents are as set forth in 10 CFR 51.20, Table S-4.
7.3	-	New information presented.
8.1,8.2	Ch. 8	Construction and alternate sources, sites, and systems not considered in cost-benefit analysis in ER-OLS.
Ch. 9	8.3	Alternative energy sources and sites are not discussed in ER-OLS.
Ch. 10	Ch. 8	Station design alternatives are not discussed in ER-OLS.
Ch. 11	Ch. 8	Summary cost-benefit analysis is not provided in ER-OLS.
12.1	Ch. 11	Some additional permits listed.
12.2	Ch. 11	No change.
12.3	Ch. 11	NPDES permit application submitted to the Pennsylvania Department of Environmental Resources on March 15, 1983.

NRC Letter: May 4, 1983

Question E240.01 (ER Section 2.1.3.1.4)

You state that the elevation of the 100 year flood as determined by the Corps of Engineers is 695 ft msl adjacent to the station. You also state that major topographic alterations at the site will have no significant impact on this flood level. Since construction of the station required soil fill in the floodplain, the 100 year flood level may now be higher than elevation 695 ft msl. Please provide a discussion on the impact of construction on the 100 year flood and the results of any analysis performed to determine whether or not the 100 year flood level and/or extent of inundation has been affected.

Response:

The 100-year flood flow and elevation obtained from the Corps of Engineers was published in March 1979 in the flood insurance study of the Borough of Industry, Pennsylvania. The major site alteration in the floodplain was the placement of fill for the BVPS-1 cooling tower foundation. Because BVPS-1 was in operation during the flood insurance study, the effect of the BVPS-1 construction is reflected in the flood level. In addition, because the size of the alteration in the floodplain for BVPS-2 is very small compared to the river cross sectional area (Section 2.1.3.1.4), the effect of BVPS-2 construction on the 100-year flood level is expected to be insignificant.

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NRC QUESTIONS AND RESPONSES INDEX

BEAVER VALLEY POWER STATION - UNIT 2
ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE
DOCKET NO. 50-412
OCTOBER 20, 1983

NRC Question	ER-OLS Section	Keywords
ENVIRONMENTAL AND HYDROLOGIC ENGINEERING BRANCH (EHEB)		
E291.32	-	Estimated total residual chlorine concentration in circulating and service water systems discharges
E291.33	-	Changes in river water quality between NUS and ORSANCO sampling time periods
SITE ANALYSIS BRANCH		
E310.1	-	Changes in station appearance or layout since CP
E310.2	-	Size of work force required during plant operation
E310.3	-	Residential location of workers and impacts on community facilities and services
E310.4	-	Annual payroll during operation
E310.5	-	Amount of local purchases of materials and supplies
E310.6	-	Estimate of taxes by type and jurisdiction
E310.7	-	Traffic congestion and methods to alleviate
E310.8	-	Properties on National Register of Historic Places within ten miles
E310.9	-	Impacts to cultural resources

NRC QUESTIONS AND RESPONSES INDEX (Cont)

NRC Question	ER-OLS Section	Keywords
E310.10	-	Copies of correspondence with SHPO
METEOROLOGY AND EFFLUENT TREATMENT BRANCH (METB)		
E451.4	2.3	Change in meteorological tower location
E451.5	2.3	Transport and deposition assessment of radioiodines in cooling tower drift
E451.6	2.3	Substitute data for missing meteoroligical data and the basis for the one year selected
E451.7	2.3	Sources of criteria air pollutants and assessment in accordance with DeMinimus criteria
E460.1	3.5.3.3	Containment vacuum system discussion
E460.2	3.5	Dose contribution and effect of containment vacuum system

NRC Letter: October 20, 1983

Question E291.32

The response to request for additional information E291.29 or the amended ER-OL Sections 3.6.1 and 3.6.3 should be expanded to indicate the estimated total residual chlorine concentration, and the bases therefor, in the discharge of the circulating water system and the service water system. This information was requested as part of question E291.29, but was not provided in the response.

Response:

Refer to Sections 3.6.1 and 3.6.3, Amendment 4.

NRC Letter: October 20, 1983

Question E291.33

The response to request for additional information E291.17 concerning "the time differential represented by the site versus ORSANCO stations" indicates that this portion of the request was misunderstood by the applicant. Please provide a discussion of the changes in river water quality in the New Cumberland Lock and Dam pool between the time periods represented by the NUS samples and the ORSANCO samples discussed in the Environmental Report.

Response:

The following is a discussion of the changes in Ohio River water quality in the New Cumberland Lock and Dam Pool between the time periods represented by the NUS program (11/73-10/74) and the ORSANCO program (10/75-12/82).

A t-test was used to statistically evaluate differences in mean concentration between the two data bases. Any differences determined by such an analysis may be attributable to actual changes in water quality, or to other factors such as differences in sampling location, method of sampling, or sample analysis procedures. To minimize effects of differences in sampling location, only data from the NUS transect closest to the ORSANCO sampling site were chosen for analysis.

The following water quality parameters have been collected in sufficient quantity and with sufficient precision in both the NUS and ORSANCO programs to permit statistical comparisons of mean concentrations using t-tests:

Sulfate, sodium, phenol, total Kjeldahl nitrogen, ammonia, copper, manganese, mercury, zinc, fecal coliform, total coliform, calcium, magnesium, total dissolved solids, total organic carbon, potassium, total suspended solids (TSS), alkalinity, total iron, hardness, chemical oxygen demand (COD), total phosphorous, nitrate, and silica.

The statistical comparison procedure requires that for samples in which a constituent is not detected, the concentration of the constituent is assumed to be equal to the lower detection limit of the analytical method used. This assumption may have an effect on the results of the statistical analysis.

Statistical comparisons indicate that there are no significant differences (at the 5% level) in mean concentrations measured in the NUS and ORSANCO programs except for the following parameters: suspended solids, alkalinity, total iron, hardness, COD, total phosphorous, and silica. Means for these statistically significant differences were higher for ORSANCO data except for silica, where the NUS mean was significantly greater than the ORSANCO mean (refer to Table E291.33-1).

In summary, although the concentrations of some parameters varied between the programs, there has not been a notable improvement or degradation within the last 10 years in the general quality of the Ohio River in the New Cumberland Pool. The rationale for using the NUS data base in the ER-OLS was discussed in detail in question response E291.15 (Amendment 2). The above comparsion of the NUS and ORSANCO data bases confirms that the NUS data continues to adequately describe the general water quality of the Ohio River in New Cumberland Pool.

TABLE E291.33-1

RESULTS OF T-TEST COMPARISONS OF
NUS AND ORSANCO DATA*

Parameter	NUS* Mean	ORSANCO*** Mean	5% Level of Significance
Sulfate	87.25	85.44	No
Sodium	19.85	18.78	No
Phenol	5.33 µg/l	6.59 µg/l	No
TKN	0.87	1.14	No
Ammonia	0.65	0.40	No
Copper	25.83 µg/l	21.22 µg/l	No
Manganese	0.54	0.45	No
Mercury	0.85 µg/l	0.28 µg/l	No
Zinc	85.00 µg/l	79.87 µg/l	No
Fecal Coliform	1092 units	1290 units	No
Total Coliform	10425 units	15176 units	No
Calcium	27.98	30.12	No
Magnesium	7.66	9.11	No
Total Dissolved Solids	204.22	196.88	No
Total Organic Carbon	5.20	5.26	No
Potassium	3.40	2.60	No
TSS	18.42	51.01	Yes
Alkalinity	23.92	34.02	Yes
Total Iron	1.341	3.140	Yes
Hardness	101.80	118.43	Yes
COD	6.58	21.14	Yes
Total Phosphorous	0.10	0.19	Yes
Nitrate	1.27	0.94	No
Silica	8.92	5.39	Yes

NOTES:

*All units expressed in mg/l unless expressed otherwise.
**Data from NUS sample station 5S sampled 11/73-10/74.
***Data from Liverpool Station, MP 40.2, sampled 10/75-12/82.

NRC Letter: October 20, 1983

Question E310.1

Provide a description of changes in the station's external appearance or layout which have been made subsequent to the description provided in Chapter 3 of the CP-FES.

Response:

The addition of two structures to the BVPS-2 main plant area, the primary access facility and the south office building, represent the significant permanent changes in BVPS-2 layout subsequent to the CP-FES description of external appearance. Other permanent structures added to the combined BVPS-1 and BVPS-2 site area include the emergency response facilities building, the emergency outfall structure, the alternate intake structure, the solid waste handling building, the sewage treatment facility, the training center, the north office building, and an east parking facility. Figure 3.1-1, Amendment 4 of the ER-OLS, presents a detailed site layout of BVPS-1 and BVPS-2.

The construction of four warehouses, three contractor office buildings and construction parking areas constitute other changes in station layout. The future disposition of these warehouses, buildings, and parking areas is yet undetermined, as they may only be temporary facilities.

NRC Letter: October 20, 1983

Question E310.2

Chapter 8 of the ER-OL indicates that 320 employees will be employed at BVPS-2 during its operation. Is this an estimate of the average annual number of workers (Plant employees and contractor employees) that will be required during operation of BVPS-2?

Response:

Recent manpower projections indicate that an average annual work force of 465, consisting of 440 Duquesne Light Company employees and 25 contracted security personnel, will be required to support the operation of BVPS-2.

This average annual work force does not include the approximately 1,000 contracted workers required every 18 months for approximately 10 weeks to perform outage-related work.

NRC Letter: October 20, 1983

Question E310.3

Identify the likely residential location (i.e., names of communities, counties) of the workers. Identify any anticipated impacts on the affected communities' facilities and services (i.e., schools, hospitals, water and waste treatment, fire, police) that would result from the workers' residence. List facilities and services that would require expansion or additions to capacity. Provide the same information for any BVPS-2 demands on community services.

Response:

Based on the residential locations of employees already supporting the operation of BVPS-1, the likely residential locations for BVPS-2 employees follow:

State:	Pennsylvania	West Virginia	Ohio
County:	Beaver Allegheny	Hancock	Columbiana
Towns:	Aliquippa Ambridge Beaver Beaver Falls Bridgewater Coraopolis Georgetown Industry Midland Monaca New Brighton Pittsburgh Metropolitan Area Rochester Sewickly Shippingport	Chester	East Liverpool

Of the 800 DLC employees currently working at the site (operating BVPS-1 and constructing BVPS-2) approximately 50 percent live within 10 miles of the site while the rest commute from the Pittsburgh metropolitan area. It is anticipated that the DLC employees constructing BVPS-2 will remain onsite to support its operation.

Approximately 205 employees will become available for assignment to BVPS-2 when DLC's contract with the Department of Energy for operating Shippingport Atomic Power Station is ended in 1985. These employees are not expected to change their residential locations.

Therefore, no impacts on schools, hospitals, water and waste treatment, and fire and police services are anticipated to result from worker relocations. Also, no facilities or services would require expansion, nor would demands on community services increase significantly.

NRC Letter: October 20, 1983

Question E310.4

Provide an estimated annual payroll for the first full year of operation (give the year in which the dollars are stated).

Response:

The estimated annual payroll for the 465 employees for the first full year of operation is $18,000,000 in 1987 dollars.

NRC Letter: October 20, 1983

Question E310.5

Provide an estimate of the average annual dollar amount of local purchases of materials and supplies resulting from the operation of BVPS-2. Include a definition of the local area in preparing the estimate (i.e. counties, major towns, SMSA). Give the year in which the dollars are stated.

Response:

The estimated average annual dollar amount of local purchases resulting from the operation of BVPS-2 in its first full year of operation (1987) follows:

County	Purchases (1987 Dollars)
Allegheny	10,000,000
Beaver	87,000
Washington	21,000
Westmoreland	55,000

The Pittsburgh SMSA, which includes Allegheny, Beaver, Washington, and Westmoreland Counties, was used in preparing this estimate.

NRC Letter: October 20, 1983

Question E310.6

In tabular form provide a dollar estimate of the taxes attributable to BVPS-2. For the first five full years of operation, provide the dollar estimates by type of tax and by taxing jurisdictions (give the year in which the dollars are stated).

Response:

Table E310.6-1, Amendment 4, provides dollar estimates of the taxes attributable to BVPS-2.

TABLE E310.6-1

ESTIMATE OF TAX DOLLARS FOR THE FIRST FIVE FULL YEARS OF OPERATION

Type of Tax	Year	Dollar Amount (Thousands)	Present Worth in 1986 Dollars (Thousands)
Corporate Federal Income Tax	1987	87,180	76,140
	1988	94,044	71,733
	1989	102,112	68,024
	1990	93,881	54,621
	1991	85,480	43,435
		462,697	313,953
Pennsylvania Corporate Net Income Tax	1987	9,118	7,963
	1988	9,765	7,448
	1989	10,603	7,063
	1990	9,749	5,672
	1991	8,870	4,507
		48,105	32,653
Pennsylvania Public Utility Realty Tax	1987	18,487	16,145
	1988	18,025	13,749
	1989	17,533	11,680
	1990	17,041	9,914
	1991	16,549	8,409
		87,635	59,897
Pennsylvania Gross Receipts Tax	1987	2,401	2,097
	1988	1,939	1,479
	1989	2,651	1,766
	1990	2,280	1,327
	1991	2,393	1,216
		11,664	7,885
Ohio Public Utility Excise Tax (on Gross Receipts)	1987	12,911	11,276
	1988	9,876	7,533
	1989	13,844	9,222
	1990	11,500	6,691
	1991	12,082	6,139
		60,213	40,861
Personal Federal Income Tax	1987	3,295	2,878
	1988	3,295	2,513
	1989	3,295	2,195
	1990	3,295	1,917
	1991	3,295	1,674
		16,475	11,177

TABLE E310.6-1 (Cont)

Type of Tax	Year	Dollar Amount (Thousands)	Present Worth in 1986 Dollars (Thousands)
Pennsylvania Personal Income Tax	1987	450	393
	1988	450	343
	1989	450	300
	1990	450	262
	1991	450	229
		2,250	1,527
Local Wage Tax	1987	184	161
	1988	184	140
	1989	184	123
	1990	184	107
	1991	184	93
		920	624

NRC Letter: October 20, 1983

Question E310.7

Identify any places where traffic congestion or problems of interference with patterns of local traffic might be anticipated due to plant operation or maintenance. Discuss anticipated measures that would be undertaken to alleviate such possible situations.

Response:

There are no anticipated problems of interference or traffic congestion associated with normal plant operation. Unusual traffic congestion is anticipated only during major outages at BVPS-2. This congestion will be realized at the entrance to BVPS-2 from Pennsylvania Route 168, and at the Pennsylvania Route 168 intersection at the Shippingport Bridge. Whenever these conditions may exist, DLC will implement traffic control procedures similar to those proven effective during plant construction. DLC will request the local municipality (Shippingport) to provide qualified traffic control personnel at these locations as necessary during times of peak traffic flow. The traffic control request will be made in accordance with established and approved agreements between DLC and the local municipality.

NRC Letter: October 20, 1983

Question E310.8

Provide a table which lists any properties on the National Register of Historic Places which are located within ten miles of BVPS-2.

Response:

Refer to Section 2.6 and Table 2.6-1, Amendment 4.

NRC Letter: October 20,1983

Question E310.9

Identify any impacts to cultural resources (on or eligible for the National Register of Historic Places) which could potentially result from the operation and maintenance activities related to the plant and transmission lines.

Response:

Refer to Section 2.6, Amendment 4.

NRC Letter: October 20, 1983

Question E310.10

Provide copies of any correspondence with the cognizant State Historic Preservation Officers relating to any potential operating impacts of the plant on cultural resources.

Response:

Copies of the following correspondence with the State Historic Preservation Officers are provided under separate cover:

- Pennsylvania Historical and Museum Commission 1983. Signed concurrence by Ms. Brenda Barrett, Director, November 14, 1983, on letter from E.G. Nelson, SWEC, dated October 25, 1983.

- Ohio Historic Society 1983. Signed concurrence by W. Ray Luce, State Historic Preservation Officer, September 12, 1983, on letter from E.G. Nelson, SWEC, dated August 30, 1983.

- West Virginia Department of Culture and History 1983. Letter from Rodney S. Collins, Director, Historic Preservation Unit, dated August 23, 1983.

NRC Letter: October 20, 1983

Question E451.4

In the ER-OL, a statement is made that the changes in meteorological tower location, in January 1976, produced a shift in the prevailing wind directions and that this shift was due to the channeling effect of the valley.

a. Provide the basis for changing the tower location.

b. Provide a topographic map, with a scale similar to Figure 2.1-2 of the FSAR, showing the old and new tower locations and the location of major plant structures.

c. Provide a comparative analysis of data from the old and new meteorological towers for wind direction, wind speed and atmospheric stability (ΔT method) at all three levels of both towers.

d. Discuss the causes for the differences in meteorological data at all tower levels and indicate the impact of the data difference on evaluations of the consequences of routine and accidental radioactive releases from the plants.

e. Provide the basis for using the new tower data in the FSAR and ER evaluations.

Response:

a. A meteorological measurements program at the Beaver Valley Power Station site was initiated in April 1969 to collect wind speed, wind direction, and temperature data at heights of 50- and 150-ft above grade during the preoperational stages of the project. The 150-ft meteorological tower was located within 400 ft of the proposed BVPS-1 natural draft cooling tower location. Regulatory Guide 1.23, published in 1972 as Safety Guide 23, required that meteorological measurements be taken in an area where plant structures will have little or no influence on the measurements. Since a 500-ft cooling tower would definitely distort any wind measurements at this location (being less than one obstruction height away), the 150-ft tower was dismantled and a new 500-ft tower was erected in 1975 approximately 2,500 ft northeast of BVPS-2 to minimize the influence of plant structures on the wind measurements.

b. A topographic map showing the locations of the old and new meteorological towers and the major plant structures is given on Figure E451.4-1.

c. As indicated in Part a of this response, meteorological measurements at the old tower location were taken at elevations of 50 and 150 ft above plant grade. The new 500-ft tower collects meteorological data at elevations of 35, 150, and 500 ft above ground level. (The tower base is 60 feet above plant grade). Therefore, comparative analyses of data from the old and new towers cannot be made at three levels. However, data comparisons between the 50-ft level of the old tower and the 35-ft level of the new tower as well as the 150-ft levels of both towers are provided as a means of indicating differences in data between the two locations. Data from the 500-ft level of the new tower are also presented for comparison with the 150-ft data from the old tower location as an indication of the changes in meteorological variables with height.

   Table E451.4-1 presents a comparison of wind direction frequency, average wind speed by direction, and atmospheric stability frequency (ΔT method) for the 50-ft level of the old tower and the 35-ft level of the new tower. The old tower data represent the period from September 1970 to September 1971 while the new tower data are for the entire five-year ER data base (1976-1980). Stability class from the old tower is based on the 150-50 ft ΔT and the classification scheme shown in Table E451.4-4 while the new tower stability class is based on the 150-35 ft ΔT and the Regulatory Guide 1.23 classification scheme (Table E451.4-4). Table E451.4-2 presents the same information as Table E451.4-1 but for the 150-ft level of both towers for wind direction and speed and for a different data period for the old tower (September 1969 to September 1970). One additional table is given (Table E451.4-3) to indicate the differences between the 500-ft data from the new tower and the 150-ft data from the old tower. The 500-35 ft ΔT is used to determine stability class for the new tower data.

   Although the old tower data are from two different annual periods (September 1970 - September 1971 for 50-ft level and September 1969 - September 1970 for 150-ft level) due to availability constraints, small year-to-year differences do not interfere with the comparison of tower locations.

d. The causes of the differences in data between the old and new towers can be broken down into two basic components: those that are related to data collection and reduction differences and those related to topographic influences. With the exception of stability class, the topographic effect appears to be the more dominant component influencing the data collected at the old and new towers.

   The use of high threshold aerovanes at the old tower and the differences in elevations of the instruments between the two towers (50-ft at the old tower and 35-ft at the new tower) may explain some of the differences in the wind data (the lower wind speeds at the new tower, for example) but do not appear to be significant factors. Instrument elevation and analytical technique differences probably explain most of the differences in the distribution of stability class. It can be seen from Tables E451.4-1 and E451.4-2 that A-stability is much more prevalent at the new tower than at the old tower. This is due mainly to the difference in classification schemes between the two towers (as shown in Table E451.4-4), and that the lower temperature sensor at the new tower (35-ft) is closer to the ground than at the old tower and is more likely to record a large lapse rate. This is supported in Table E451.4-3, which shows that the frequency of occurrence of A-stability through a large air layer (500-35 ft) is much lower than through a more shallow layer (150-35 ft). This lower sensor level at the new tower, along with the classification scheme difference, could also help to explain the slightly more frequent occurrence of F- and G- stabilities at the new tower. This difference in stability typing also contributes to the predominance of E-stability at the old tower and D-stability at the new tower.

Examination of the wind data in Tables E451.4-1 through E451.4-3 and the topography shown on Figure E451.4-1 reveals that terrain effects are the prime reasons for the difference in the old and new tower data. The low-level wind data shown in Table E451.4-1 indicate a strong SW to WSW component at the new tower location while the old tower location exhibits a strong WNW to NW component. There is also a relatively strong NE to ENE component of the new tower wind compared to the old tower wind. These tendencies indicate a channeling effect of the valley on the low-level winds based on the valley orientation at the two tower locations (as shown on Figure E451.4-1). In addition, the secondary maxima of SE winds at the new tower and S to SSW winds at the old tower are indicative of nighttime drainage winds down the valley slope at each tower location. These terrain effects are further substantiated by the wind speed data which show relatively strong winds in the channeling directions for each tower and light winds in the drainage wind directions.

The 150-ft winds shown in Table E451.4-2 exhibit some of the same terrain effects as shown in Table E451.4-1 but to a lesser extent. The channeling effect is still evident but with a trend toward more westerly winds. The new tower location exhibits more of a NE channeling at the expense of the shallow drainage winds from the SE. This effect is not as predominant at the old tower location. The 500-ft winds at the new tower location show few terrain effects, if any, based on a comparison with Pittsburgh Airport wind data in FSAR Table 2.3-9.

The differences in the old and new tower data bases do not compromise the evaluations of routine and accidental radioactive releases because of the upriver location of the new tower and because the differences are mainly terrain-induced. Under meteorological conditions that are not conducive to terrain effects, the data collected at the old and new tower locations would essentially be the same and would result in similar radiological analyses. When terrain effects do occur, usually under light to moderate wind speeds and neutral to stable conditions, they can generally be divided into channeling and drainage winds. Under channeling conditions, the new tower location upriver from BVPS-2 (refer to Figure E451.4-1) provides realistic data for plume transport in that NW winds recorded at the old tower location would turn into SW winds at the new tower location, which is the trajectory that a radioactive release would follow. Thus, a SW wind recorded at the new tower under channeling conditions is the correct wind direction to use in dispersion calculations. A NE wind would most likely be recorded as the same direction at both tower locations and thus have no effect on dispersion calculations. Likewise, the occurrence of drainage winds does not affect the use of the new tower data in that a SE drainage wind transporting a release toward the NW will properly simulate a S or SSW drainage wind at the plant which subsequently turns toward the NW as the river flow takes hold of this lightly moving air. Therefore, the upriver location of the new tower provides a proper data base for dispersion calculations.

These valley effects only apply to ground level releases. Elevated releases from the BVPS-1 cooling tower will escape any valley influence and be properly treated using the 500-ft level data on the new tower.

e. As described in Part a of this response, meteorological data collected at the old tower location would be compromised by the presence of the BVPS-1 cooling tower. The new tower location is the best possible site for data collection in order to avoid building wake effects. The data from the new tower are collected using instrumentation, recording methods, and maintenance procedures which meet the requirements of Regulatory Guide 1.23. As discussed in Part d, these data provide a reasonable representation of low-level dispersion and transport within the valley from the 35-ft level of the tower as well as a realistic picture of out-of-valley flows from the 500-ft tower level. Therefore, the use of the new tower data in the ER-OLS and FSAR evaluations is appropriate.

TABLE E451.4-1

Comparison of Meteorological Data Collected at the Old and New Tower Locations at BVPS for the 50- and 35-ft Measuring Levels

Wind From	Wind % Occurrence Old (50 ft)	Wind % Occurrence New (35 ft)	Avg. Wind Speed (mph) Old (50 ft)	Avg. Wind Speed (mph) New (35 ft)	Stability Class	Stability % Occurrence Old (150-50 ft)	Stability % Occurrence New (150-35 ft)
N	6.9	4.9	6.0	4.0	A	0.4	15.7
NNE	2.3	3.4	4.5	3.0	B	0.5	2.5
NE	1.8	4.8	4.0	3.0	C	4.0	3.2
ENE	2.3	5.3	3.5	3.0	D	16.6	32.8
E	3.4	5.6	3.0	2.5	E	57.0	20.5
ESE	6.0	6.9	3.5	2.0	F	9.9	12.2
SE	6.9	9.3	3.5	2.0	G	11.5	13.0
SSE	5.8	5.6	2.5	2.5			
S	9.0	5.9	2.5	3.5			
SSW	8.8	6.7	2.5	5.0			
SW	5.7	10.6	2.5	6.5			
WSW	3.9	10.4	3.0	7.0			
W	5.9	7.5	4.5	7.0			
WNW	11.5	4.7	6.5	5.5			
NW	13.2	4.7	8.5	5.0			
NNW	6.7	3.8	7.5	4.5			
Total	100.1	100.1	4.5	4.5			

TABLE E451.4-2

Comparison of Meteorological Data Collected at the Old and New Tower Locations at BVPS for the 150-ft Measuring Level

Wind						Stability		
	% Occurrence		Avg. Wind Speed (mph)				% Occurrence	
Wind From	Old (50 ft)	New (35 ft)	Old (50 ft)	New (35 ft)		Stability Class	Old (150-50 ft)	New (150-35 ft)
N	5.5	4.9	6.5	5.5		A	0.4	15.7
NNE	2.4	6.2	5.5	4.0		B	1.1	2.5
NE	2.1	10.5	5.0	4.0		C	3.1	3.2
ENE	2.3	6.7	4.5	5.0		D	11.6	32.8
E	4.0	3.3	4.5	5.0		E	66.2	20.5
ESE	5.9	2.0	5.0	5.0		F	8.5	12.2
SE	6.7	1.9	4.5	5.0		G	9.2	13.0
SSE	6.4	1.9	3.5	5.0				
S	8.7	4.5	3.5	5.5				
SSW	7.8	8.2	3.0	6.0				
SW	5.1	12.1	3.0	7.5				
WSW	4.1	11.1	4.0	9.0				
W	8.3	11.1	6.0	11.0				
WNW	13.6	7.3	8.5	9.5				
NW	12.3	4.7	10.0	7.5				
NNW	4.9	3.5	9.0	6.0				
Total	100.1	99.9	6.0	7.0				

TABLE E451.4-3

Comparison of Meteorological Data Collected at the
Old and New Tower Locations at BVPS for the
150- and 500-ft Measuring Levels

	Wind					Stability	
	% Occurrence		Avg. Wind Speed (mph)			% Occurrence	
Wind From	Old (150 ft)	New (500 ft)	Old (150 ft)	New (500 ft)	Stability Class	Old (150-50 ft)	New (500-35 ft)
N	5.5	5.0	6.5	8.5	A	0.4	0.5
NNE	2.4	2.7	5.5	7.0	B	1.1	1.4
NE	2.1	3.6	5.0	7.0	C	3.1	3.1
ENE	2.3	4.3	4.5	7.0	D	11.6	55.8
E	4.0	4.4	4.5	7.5	E	66.2	24.3
ESE	5.9	3.7	5.0	8.0	F	8.5	13.4
SE	6.7	3.9	4.5	9.5	G	9.2	1.5
SSE	6.4	3.5	3.5	8.5			
S	8.7	5.4	3.5	9.0			
SSW	7.8	7.9	3.0	11.0			
SW	5.1	13.3	3.0	11.5			
WSW	4.1	11.7	4.0	11.5			
W	8.3	12.9	6.0	12.5			
WNW	14.6	7.4	8.5	11.5			
NW	12.3	5.9	10.0	10.0			
NNW	4.9	4.4	9.0	9.0			
Total	100.1	100.0	6.0	10.0			

TABLE E451.4-4

Ranges of $\Delta T/\Delta Z$ Used to Classify Stability Class
for the Old and New Tower Data

Stability Class	$\Delta T/\Delta Z$ (°C/100m) Old	New
A	<-2.9	<-1.9
B	-2.9 to -2.4	-1.9 to -1.7
C	-2.4 to -1.3	-1.7 to -1.5
D	-1.3 to -0.2	-1.5 to -0.5
E	-0.2 to 2.0	-0.5 to 1.5
F	2.0 to 3.6	1.5 to 4.0
G	>3.6	>4.0

MIDLAND
Lincoln High Sch
Tanks
Tank
Athletic Field
Oil Tanks
Substation
Mile 36
Mile 35
Midland
INDUSTRY
OHIO RIVER
NORMAL POOL ELEV 665
NORMAL POOL ELEV 665
Phillis Island
BVPS-1
SAPS
Shippingport
1268
1160
1109
0 1000 2000
SCALE-FEET
METEORLOGICAL TOWER
COOLING TOWER

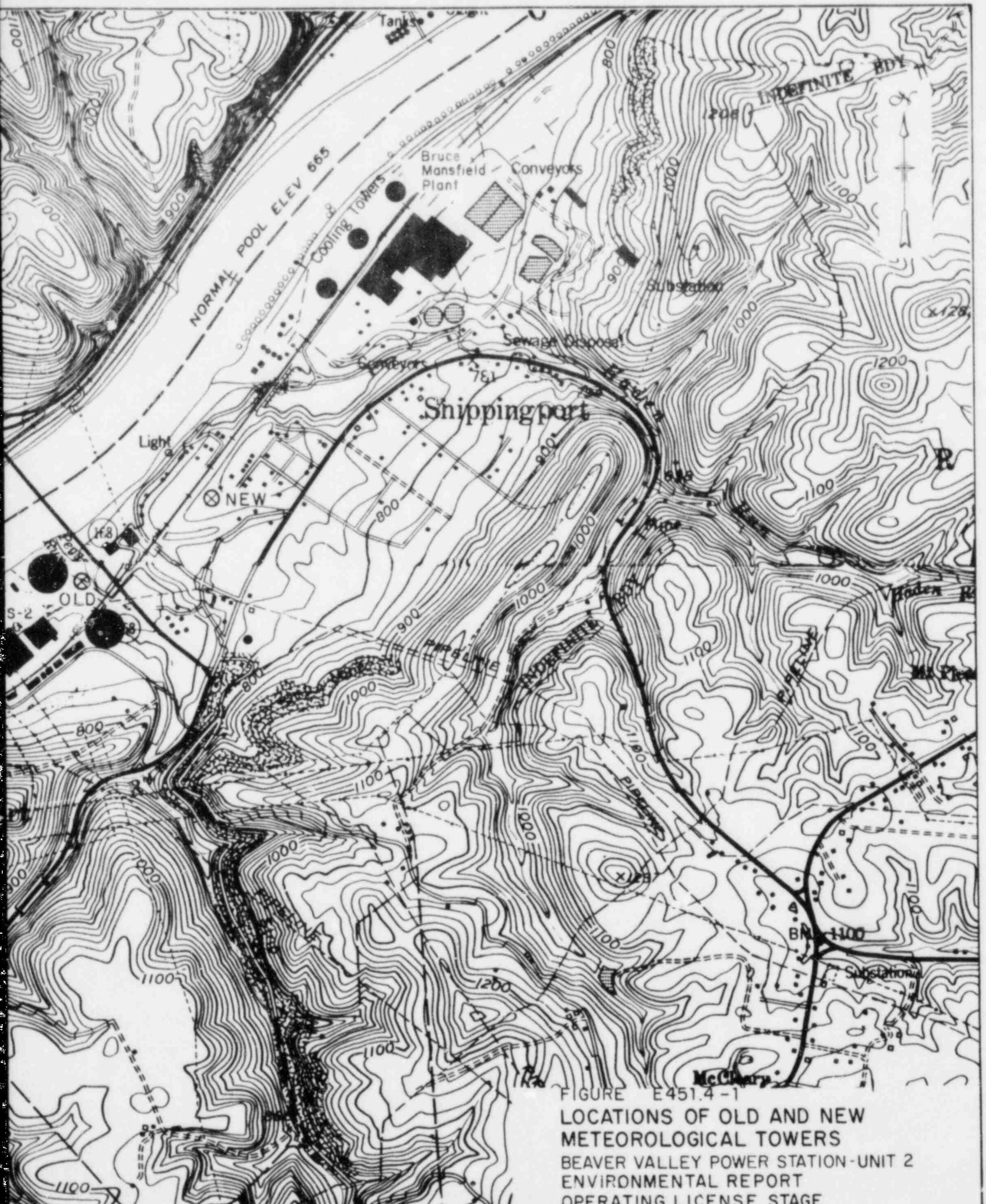

FIGURE E451.4-1
LOCATIONS OF OLD AND NEW
METEOROLOGICAL TOWERS
BEAVER VALLEY POWER STATION-UNIT 2
ENVIRONMENTAL REPORT
OPERATING LICENSE STAGE

8402130048-05

NRC Letter: October 20, 1983

Question E451.5 (ER Section 2.3)

In the assesssment of long-term (routine) diffusion estimates (which is cross referenced to FSAR Section 2.3.5), a methodology is described. Releases from the process vent, attached to the Beaver Valley Power Station Unit 1 natural draft cooling tower, are considered to be totally elevated. According to staff review of effluents expected to be emitted from this process vent, radioiodines will be released. The diffusion models are based on the assumption that all radioactive material is in gaseous form. Provide a transport and deposition assessment of radioiodines captured by the cooling tower drift.

Response:

The response to this question will be provided in a later amendment.

NRC Letter: October 20, 1983

Question E451.6 (ER Section 2.3)

One complete year (8,760 hours) of consecutive hourly meteorological data (i.e., no missing data) is used by the staff in evaluating the environmental impact of postulated accidents through a probabilistic risk assessment (PRA) using a version of the computer code CRAC Calculation of Reactor Accident Consequence (CRAC). Data recovery for each annual period of record is less than 100 percent, requiring that data be substituted to enable the staff to perform the PRA. For the one-year data set considered to be most representative of meteorological conditions in the vicinity of the Beaver Valley site, provide substituted data for all missing periods for wind speed, wind direction, atmospheric stability, and precipitation. Provide the basis for selection of the one-year period, identify the source of substituted data, and provide a brief description of the bases for selecting substituted data. The data set selected for the PRA should be encoded on a magnetic tape as described in the enclosed guidance.

Response:

One complete year (8,760 hours) of consecutive hourly meteorological data for the BVPS site in NRC format for use in the computer code CRAC will be provided under separate cover. The 1-year period of January 1, 1979 through December 31, 1979 was chosen for this purpose since this calendar year displayed the highest data recovery percentage (93.1 percent) from among the five years of data (1976-1980).

The factors in determining the method of data substitution are threefold. First, an analysis of the missing periods of wind speed, wind direction, and atmospheric stability indicate that the majority of outages are 6 hours or less in duration. Second, missing data periods of upper level data often coincide with those of the lower level data, making this possible method of substitutions sporadic. Third, the influence of the valley/ridge terrain characteristic of the BVPS site area on low-level (35-ft) wind data along with the large difference in height increment between the 150-35 ft ΔT and the 500-35 ft ΔT cast significant doubt on the validity of substituting upper level (150- and 500-ft) data for low-level data. Therefore, to be consistent and preserve the representativeness of the low-level data, the substitution of data for missing hours was done by inserting the previous good hour of data, i.e., persistance. This method best maintains the validity of the data.

The onsite precipitation data for the January 1979 to December 1979 period has a data recovery percentage of 93 percent. The missing hours of data have been replaced with the corresponding hourly precipitation amounts from observations at the Greater Pittsburgh Airport.

NRC Letter: October 20, 1983

Question E451.7 (ER Section 2.3)

Section 2.3.6 of the ER provides a qualitative description of air quality in the vicinity of the site and states that these conditions will not "adversely affect station operation." Describe station sources of criteria air pollutants, including estimated emissions, and compare these emissions to the DeMinimus criteria established by the Environmental Protection Agency. If station emissions are in excess of the impact of DeMinimus levels, provide a quantitative assessment of the station emissions on local air quality using current EPA guidelines on atmospheric depression modeling.

Response:

Station sources of criteria air pollutants along with their respective estimated emissions are described in Section 3.7.2. The applicable EPA requirement for a Prevention of Significant Deterioration (PSD) analysis (40 CFR 52.21) is a new source with potential to emit more than 250 tons per year of any criteria pollutant. As indicated in Table 3.7-1, Amendment 4, none of the station sources exceed this 250-tons-per-year criterion, therefore the DeMinimis levels are not applicable.

NRC Letter: October 20, 1983

Question E460.1 (ER Section 3.5.3.3)

The discussion on ventilation systems, Section 3.5.3.3, should also include the containment vacuum system.

Response:

The containment vacuum system is discussed in Section 3.5.3.2.

NRC Letter: October 20, 1983

Question E460.2 (ER Section 3.5)

Several questions regarding the dose contribution from the containment vacuum system have been addressed in the first round of questions on the FSAR. The Environmental Report should also include this additional source of gaseous activity release and the associated effect on site boundary doses.

Response:

The contribution of the containment vacuum pump operation to the environmental gaseous activity releases and to the site boundary doses was evaluated and reported in the response to FSAR Question 460.7.4. The evaluation determined that the contribution from this release path is negligible.