INSTRUCTIONS FOR UPDATING YOUR ER

To update your copy of the Braidwood Station Environmental Report - Operating License Stage, please remove and destroy the following pages and insert the Amendment 6 pages as indicated.

VOLUME 1

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Figure 2.1-4	Figure 2.1-4
Page 2.3-1/2.3-2	Pages 2.3-1 and 2.3-1a/2.3-2

VOLUME 2

REMOVE	INSERT
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Pages 3.6-1 through 3.6-5/3.6-6	Pages 3.6-1/3.6-2 through 3.6-5/3.6-6
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Page QE240.5-1/QE240.5-2	Pages QE240.5-1/QE240.5-2 and QE240.5-3/QE240.5-4 Figure QE240.5-1
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BRAIDWOOD NUCLEAR GENERATING STATION - UNITS 1 & 2

ENVIRONMENTAL REPORT - OPERATING LICENSE STAGE

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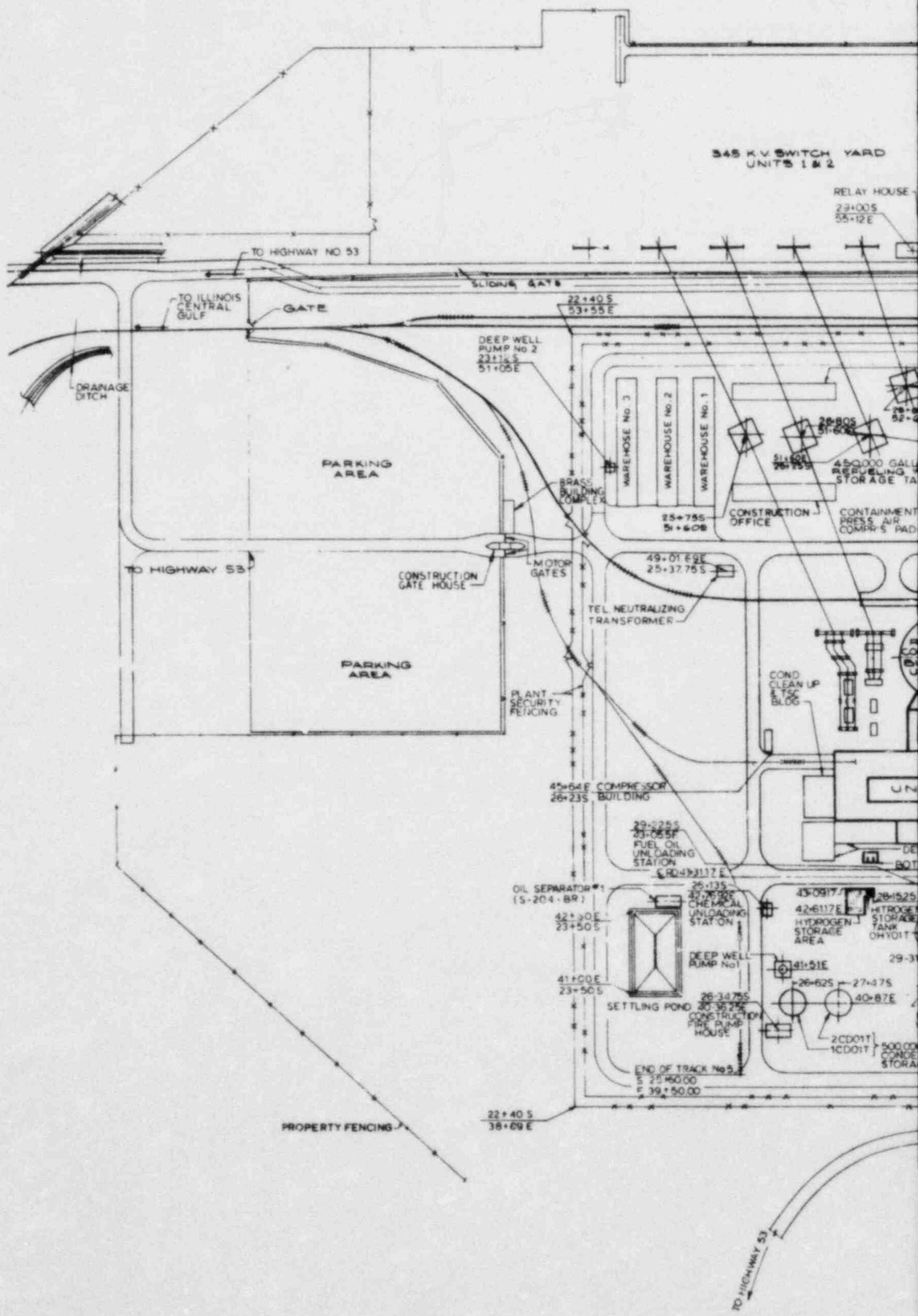

345 K.V. SWITCH YARD
UNITS 1 & 2
RELAY HOUSE
29+00S
55+12E
TO HIGHWAY NO 53
SLIDING GATE
TO ILLINOIS CENTRAL GULF
GATE
22+40S
53+55E
DRAINAGE DITCH
DEEP WELL PUMP No 2
23+12S
51+05E
WAREHOUSE No. 3
WAREHOUSE No. 2
WAREHOUSE No. 1
PARKING AREA
BRASS BUILDING COMPLEX
25+75S
51+60E
CONSTRUCTION OFFICE
CONTAINMENT PRESS. AIR COMPR'S PAD
TO HIGHWAY 53
CONSTRUCTION GATE HOUSE
MOTOR GATES
49+01.69E
25+37.75S
TEL NEUTRALIZING TRANSFORMER
PARKING AREA
PLANT SECURITY FENCING
COND CLEAN UP & TSC BLDG
45+64E COMPRESSOR
26+23S BUILDING
FUEL OIL UNLOADING STATION
OIL SEPARATOR #1
(S-204-BR)
42+50E
23+50S
CHEMICAL UNLOADING STATION
HYDROGEN STORAGE AREA
DEEP WELL PUMP No1
41+51E
41+00E
23+50S
SETTLING POND
CONSTRUCTION FIRE PUMP HOUSE
40+87E
2CD01T
1CD01T
END OF TRACK No5
S 25+60.00
E 39+50.00
22+40S
38+69E
PROPERTY FENCING
TO HIGHWAY 53

AMENDMENT 3
SEPTEMBER 1983
AMENDMENT 6
MAY 1984

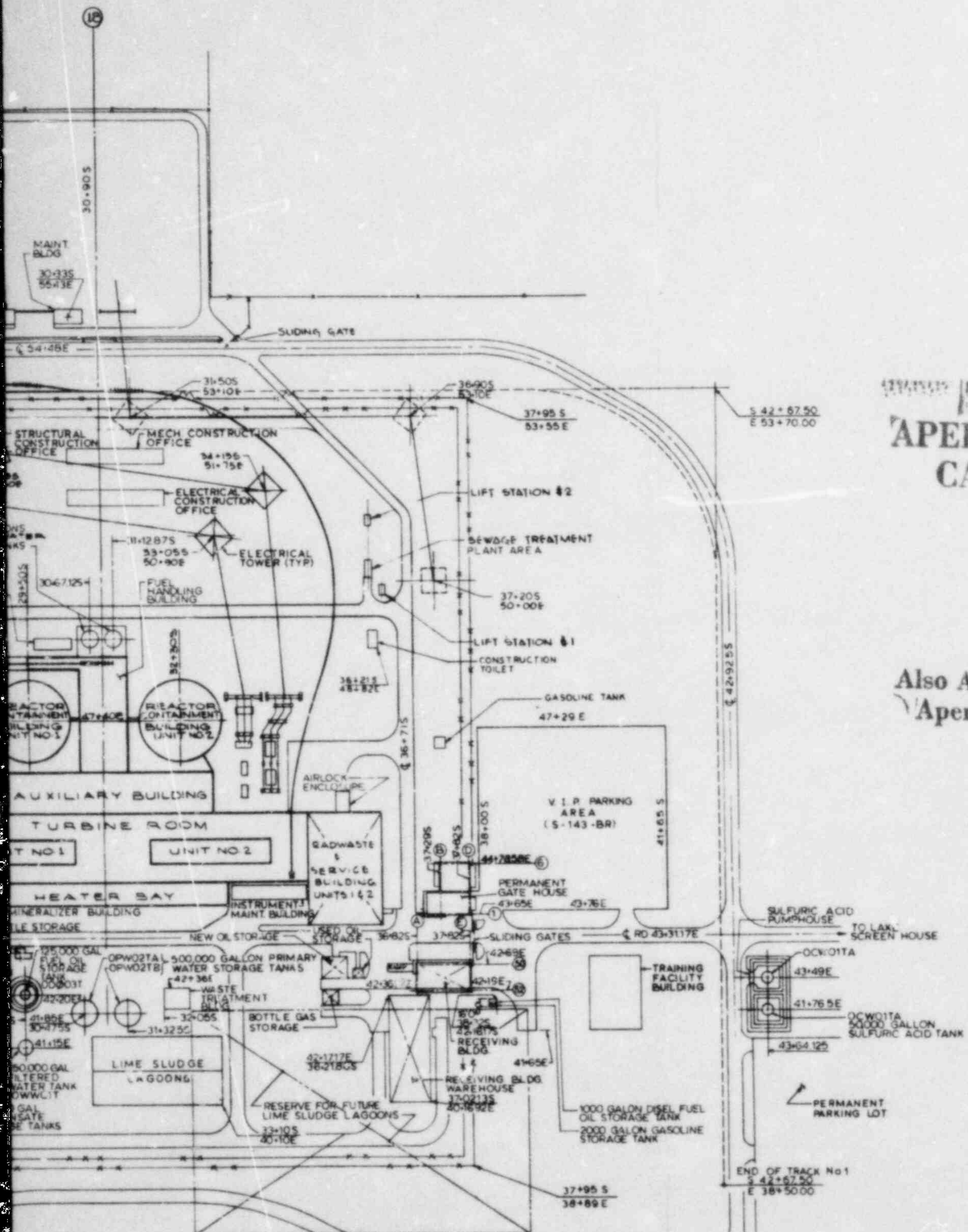

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FIGURE 2.1-4

LOCATION AND ORIENTATION
OF PRINCIPAL PLANT STRUCTURES

8406110244-01

2.3 METEOROLOGY

This section describes the atmospheric environment of the site of the Braidwood Nuclear Generating Station - Units 1 & 2 (Braidwood Station). Data on severe weather phenomena that affect the design of the station itself, and data necessary to describe the interactions between the station and the atmosphere are presented. Based on the information presented in this section, it is concluded that there are no unusual local conditions that should adversely affect the station's operation, the dispersion of the plant effluents, or the dissipation of the station's waste heat.

Most of the information on the regional climatology is derived from climatic atlases and summaries (Bryson 1966; Changnon 1968; Denmark 1959). Other pertinent documents and publications used in relation to specific topics are referenced in the text. Data from an onsite meteorological monitoring system, the first-order National Weather Service stations at Greater Peoria Airport (located about 86 miles west-southwest of the Braidwood Station), and Chicago Midway Airport (located about 56 miles north-northeast of the station), the Argonne National Laboratory (located about 34 miles north-northeast of the station), and the Dresden Station meteorological tower (located about 11 miles north-northwest of the Braidwood Station) are the primary sources of climatic information used in this section.

Peoria and Midway data are taken from the monthly and annual climatological summaries available from the U.S. National Oceanographic and Atmospheric Administration (NOAA) (U.S. Department of Commerce, NOAA 1977a, 1977b). In addition, data from magnetic tapes of meteorological observations at Peoria for the period-of-record from 1966 through 1975 obtained from the Environmental Data Services of the National Climatic Center in Asheville, North Carolina, are summarized. Data from Argonne for the period-of-record from 1950 through 1964 (Moses and Bogner 1967) and onsite data from Dresden for the period-of-record from 1974 through 1976 are also summarized for this report.

Onsite data for the period from January 1974 through December 1976 are summarized and presented. The onsite meteorological monitoring system consists of an instrumented tower with sensors at the 30 and 34-foot and 199 and 203-foot levels. (During November 1977 the wind speed and direction instrumentation at both tower levels was raised by 4 feet from 30 and 199 feet above grade level.) The parameters measured and 6 summarized include wind speed, wind direction, wind direction persistence, temperature, stability, and stability persistence. Estimates for short-term (accident) and long-term (routine) atmospheric dilution factors (X/Q) based on the Braidwood Station onsite meteorological data are also presented. A detailed description of the meteorological monitoring system appears in Subsection 6.1.3.

6

2.3.1 Regional Climatology

Braidwood Station is located in northeastern Illinois, approximately 86 miles east-northeast of the first-order National Weather Service Station at Peoria, Illinois, and 56 miles south-southwest of the first-order National Weather Service Station at Chicago Midway Airport. Although Chicago Midway Airport is located somewhat closer to the Braidwood Station than Greater Peoria Airport, the latter is considered to be more representative of the climate at the Braidwood Station site. Since the moderating influence of Lake Michigan is considerable at Chicago Midway, an inland weather station is likely to be more representative of an inland site. The climatological data from these two stations and Argonne are summarized in Table 2.3-1.

The climate of northeastern Illlinois is typically continental, with cold winters, warm summers, and frequent short-period fluctuations in temperature, humidity, cloudiness, and wind direction. The great variability in northeastern Illinois climate is due to its location, particularly during the cooler months, in a confluence zone between different air masses (Bryson 1966). The specific air masses affecting northeastern Illinois include maritime tropical air, which originates in the Gulf of Mexico; continental tropical air, which originates in Mexico and the southern Rockies; Pacific air, which originates is the eastern North Pacific Ocean; and continental polar and continental arctic air, which originate in Canada. As these air masses migrate from their source regions, their characteristics may undergo substantial modifications. Monthly streamline analyses of resultant surface winds suggest that air reaching northeastern Illinois most frequently originates over the Gulf of Mexico from April through August, over the southeastern United states from September through November, and over both the Pacific Ocean and the Gulf of Mexico from December through March (Bryson 1966).

The major factors controlling the frequency and variations of weather types in northeastern Illinois are distinctly different during the fall, winter, and spring months and the summer months.

During the fall, winter, and spring months, the frequency and variation of weather types is determined by the movement of synoptic-scale storm systems, evidenced by low atmospheric pressure at the ground surface, that commonly follow paths along the major confluence zone, which is usually oriented from southwest to northeast through the region. The confluence zone normally fluctuates in latitude during this period, ranging in position from the central states to the United States - Canadian border. Low-pressure systems pass along this zone about once every 4 to 8 days. The systems are most frequent during winter and spring, causing a maximum of cloudiness during these seasons. Winter is characterized by alternating periods of steady precipitation (rain, freezing rain, sleet, or snow) and periods of clear, crisp, and cold weather. Springtime precipitation is

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3.6 CHEMICAL AND BIOCIDE SYSTEMS

The source of water for the Braidwood Nuclear Generating Station - Units 1 & 2 (Braidwood Station) is the Kankakee River, which supplies water for the initial pond filling and for the pond makeup water. Table 3.6-1 shows the expected seasonal composition of the river water. The flow path and ultimate disposition of the plant's various water systems are shown in Figure 3.3-1. Tables 3.6-2 and 3.6-3 list the average and maximum chemical compositions of the discharge to the Kankakee River, which is made up of the following major components: cooling pond blowdown, sewage treatment plant effluent, and wastewater treatment systems effluent.

3.6.1 Cooling Water Systems

3.6.1.1. Circulating Water System

As discussed in Subsection 3.3.1, each steam turbine unit has a closed-cycle, once-through cooling water system to remove the heat released during condensation of the turbine exhaust steam.

The dissolved solids content of the water in the cooling pond is maintained at the level necessary for operation such that the blowdown meets the applicable State of Illinois water quality standards. Table 3.6-2 lists the expected chemical composition of the blowdown, which is controlled to limit the average total dissolved solids (TDS) to 900 mg/liter. The blowdown contains the same chemical constituents as the river, but in higher concentrations due to evaporation. Chemical analysis of the blowdown may vary depending on the seasonal variations in the concentration of dissolved solids in the Kankakee River water. 2 6

Biological growth and slime buildup in the main condensers are controlled through the use of mechanical cleaning, which greatly reduces the quantity of hypochlorite needed in the plant. The Amertap system at the Braidwood Station uses small, sponge-rubber balls sized to the inside diameter of the condenser tubes. During operation, these balls are injected into the circulating water piping at the inlet to the condenser. The balls, with a submerged density nearly equal to the density of water, are dispersed in the circulating water stream and forced through the condenser tubes by the pressure of the flowing water. As the balls pass through the tubes, they wipe them clean. A system of baffles and screens in the 6 circulating piping at the outlet of the condenser collects the balls as they flow out of the condenser. The balls are removed from the circulating water stream and reinjected at the condenser inlet or stored for later use.

It is also necessary to add small amounts of chlorine derivatives to the circulating water system to control algal growth. Hypochlorite is injected intermittently into the circulating-water line before the main condensers but after the blowdown take-off point. The chlorine dosage is controlled to satisfy the chlorine demand of the cooling water and provide a free residual chlorine concentration of 0.1 ppm. Since the free residual chlorine is dissipated in the cooling pond, the blowdown from the circulating water system has no chlorine residual.

If scale buildup on the main condensers becomes a problem, either CO_2 or crystal growth inhibiting polymers will be 6
injected into the circulating water system to control scale.

3.6.1.2 Service Water System

Service water is used to cool plant and auxiliary equipment. The service water is taken from the circulating cooling water system, pumped through the power plant equipment, and then returned to the cooling pond.

The service water is hypochlorinated to prevent biological growth in the cooling equipment. The hypochlorination method requires controlled addition of hypochlorite solution twice daily for half-hour periods. The service water is chlorinated with a 15% solution of sodium hypochlorite (NaOCl). The essen- 6
tial and nonessential service water systems of each unit are chlorinated separately. Each day an average of 700 pounds of 15% NaOCl is added to the nonessential service water, and an average of 480 pounds of 15% NaOCl is added to the essential service water.

When sodium hypochlorite is added to water the following reactions occur:

$$NaOCl + H_2O \qquad HOCl + NaOH \qquad (3.6\text{-}1)$$

$$HOCl \qquad H^+ + OCl^- \qquad (3.6\text{-}2)$$

The rate at which hypochlorous acid and hypochlorite ion are formed varies depending on the pH; the two are present in approximately equal concentrations at pH 7.5. The hypochlorous acid is the active disinfectant compound formed. This compound kills bacteria by reacting with their enzymatic systems. As the reactions with HOCl and the enzymes proceed, the residual chlorine is dissipated.

The presence of ammonia in the water leads to the rapid formation of chloramines. The reactions are as follows:

$$NH_3 + HOCl \quad NH_2Cl + H_2O \qquad (3.6\text{-}3)$$

$$NH_2Cl + HOCl \quad NHCl_2 + H_2O \qquad (3.6\text{-}4)$$

$$NHCl_2 + HOCl \quad NCl_3 + H_2O \qquad (3.6\text{-}5)$$

The formation of monochloramines (Equation 3.6-3) takes precedence over that of di- and trichloramines and is generally instantaneous. The chloramines formed are present as monochloramines due to the small ratio of HOCl to NH_3. The chlorine in chloramines still retains about half of its oxidizing potential and is still effective as a bactericide. The reaction rate of chloramines, however, is lower than that of HOCl.

The small concentrations of chloramines formed and the residual chlorine present are not expected to persist in the water for three reasons. First, the circulating water contains bacteria that assimilate the residual chlorine and chloramines of the nonessential service water. The residual chlorine and chloramines of the essential service water are assimilated when combined with the blowdown from the essential cooling pond, which will still contain bacteria. Second, part of the volatile chloramines are lost due to evaporation. Third, while retaining their oxidizing potential, HOCl and chloramines react with and are destroyed by reducing agents like S=, F++, and Mn++, as shown in the following equations:

$$H_2S + 4HOCl \quad H_2SO_4 + 4HCl \qquad (3.6\text{-}6)$$

$$2Fe(HCO_3)_2 + HOCl + HCl + Ca(HCO_3)_2 \quad 2Fe(OH)_3 + CaCl_2 + 6CO_2 + H_2O \qquad (3.6\text{-}7)$$

$$MnSO_4 + HOCl + HCl + 4NaOH \quad MnO_2 + 2NaCl + Na_2SO_4 + 3H_2O \qquad (3.6\text{-}8)$$

Since there is no accurate way to predict the chlorine demand of the pond, the exact quantity of NaOCl used is impossible to predict. The feed rate is carefully monitored. The service water, which may have a small residual chlorine content after chlorination, is returned to the cooling pond. Since the condenser cooling water is chlorinated after the blowdown take-off point, chlorine concentration at the point of blowdown discharge is negligible.

3.6.2 Makeup Water Treatment System

Surface water from the freshwater holding pond is used to supply the makeup water required for the steam cycle. As shown in Figure 3.3-1, the water is passed through a chlorine retention tank, clarifiers, and a clear well. From there the water passes through three parallel sand filters. Each filter operates at 3.0 gpm/ft^2 during normal operation and a maximum of 4.5 gpm/ft^2 when one filter is out of service. After each use, each filter is backwashed for 10 minutes, using 570 gpm of filtered water for each filter. The filtered water is stored in a 150,000 gallon tank. 2 6

Three filtered-water transfer pumps (one a spare) supply water to the demineralizer trains for treatment. There are two identical demineralizer trains, each capable of producing a net daily average of 150 gpm. Each train consists of, in order, a strong-acid cation unit, a strong-base anion unit, and a mixed bed unit. After treatment, the water goes to the condensate storage tank or primary storage tank. 6

3.6.2.1 Regeneration Wastes

After a quantity of water has been processed through the demineralizer train, the ion exchange resin is exhausted and needs chemical regeneration. Regeneration of the exhausted resins may take place once each day. During regeneration, which lasts about 4 hours, the only chemicals added are sulfuric acid (H_2SO_4) and sodium hydroxide (NaOH). Each regeneration require 2240 pounds of 93% H_2SO_4 and 792 pounds of 100% NaOH for regeneration and neutralization. The 70,095 gallons of waste produced during each regeneration are routed into the circulating water flow.

3.6.2.2 Filter Backwash Effluent

The makeup filter subsystem consists of three parallel sand filters and carbon filters. Each filter is backwashed once each day with water from the filtered water storage tank. The backwash water contains dissolved solids and suspended solids that are collected during the filtering process. The sand filters are backwashed each day for a 10-minute period at a rate of 1.3 cubic feet per second (cfs), and the carbon filters are backwashed each day for a 10-minute period at a rate of 0.76 cfs. The discharge from this backwashing operation is routed to the waste treatment building. 6

3.6.3 Waste Treatment

Treatment consists of an oil separator, an agitated equalization basin, chemical addition, a Quadricell separator, and 2
filtration, after which the clean water effluent is routed to the circulating water system.

The oil separator is equipped with skimmers to remove oil. The skimmed oil flows to a waste oil holding tank. The waste oil is disposed of, as necessary, by a licensed contractor in an 1
approved manner.

Sludge from the Quadricell is pumped by sludge transfer pumps to sludge drying beds. Underflow from the beds is pumped by underflow pumps to the equalization tank. The dried sludge is scraped off and hauled away by a licensed contractor for disposal in a certified landfill site.

3.6.4 Potable Water System

The volume of water used for potable and sanitary purposes is small (about 15,000 gallons per day [gpd]) in comparison with other plant uses. Water is taken from the filtered water storage tank. The water is chlorinated with hypochlorite, which is fed at a rate proportional to the flow rate. The chlorinated water is then stored for potable and sanitary use.

All sanitary wastes are treated in a sewage treatment system of approved design (for further details see Section 3.7). The discharge from the sewage treatment plant is continuously chlorinated, as indicated in Section 3.7, and is discharged with the cooling pond blowdown. The chlorine dosage is usually 3 to 10 mg/liter. This dose results in a free residual chlorine concentration of about 0.5 ppm. After mixing with the cooling pond blowdown, the chlorine concentration is negligible.

3.6.5 Radwaste System

The discharge from the radwaste system is high-purity distilled water. The radwaste plant receives and decontaminates wastes that result from the operation of the nuclear reactors. After the necessary decontamination, the liquid effluents are batch discharged to the cooling pond blowdown. Section 3.5 discusses the radwaste system in detail.

Table 3.6-2 shows the estimated effluent analysis, and Table 3.6-3 the average analysis, of the final discharge, which in both cases meets all State of Illinois effluent standards.

TABLE 3.6-1

SEASONAL ANALYSIS OF KANKAKEE RIVER WATER

(All Values in mg/liter)

	WINTER	SPRING	SUMMER	FALL	AVERAGE	MAXIMUM
Calcium	71.9	78.7	81.8	77.8	77.6	118
Magnesium	23.9	21.3	24.8	24.0	23.5	31.0
Sodium	16.4	7.2	13.8	14.7	13.0	25.6
Alkalinity (As $CaCO_3$)	178	140	159	202	170	235
Sulfate	62.4	60.4	45.7	93.9	65.6	164
Chloride[a]	23.0	22.5	21.0	21.5	22.0	25
Nitrate	1.7	4.5	2.2	0.9	2.3	6.2
Silica	2.3	3.1	4.2	3.2	3.2	5.3
Filterable Residue	381	361	397	411	388	489

1

Note: pH average 8.2, range 7.0 to 9.0

Samples taken at Location 3, Intake Area

Sources: Illinois Natural History Survey 1977-1979, 1981

[a] Commonwealth Edison 1977-1978

average river flow. A corresponding plot (see Figure 5.1-2) is provided for the month of February which represents the period with the maximum differential between discharge temperature and ambient river temperature. The features of the thermal plume for other months of the year can be obtained from Table 5.1-2. It should be noted that the maximum area ssociated with the $5^{\circ}F$ isotherm occurs in December and has a value of only 0.45 acres.

The extent to which the thermal plume ($5^{\circ}F$ isotherm) is projected into the river was determined to be 28% of the river width in August, 33% in September and 22% in December with corresponding cross sectional areas of 18%, 21% and 13%, respectively. These areas meet the Illinois water quality standards. 6

In the following discussions it will be shown that the estimated Braidwood Station thermal discharges are in compliance with the Illinois Water Pollution Standards.

5.1.3 Biological Effects

This subsection describes the predicted thermal impact of the cooling pond blowdown on the Kankakee River biota, the effect of removing a portion of the river's aquatic organisms in the makeup water, and the potential for entrapment and impingement of fish on the traveling screens at the river intake structure. For a description of the intake structure's operating characteristics, see Section 3.4.

5.1.3.1 Effects of Released Heat on the Kankakee River

The thermal discharge to the Kankakee River from the Braidwood Station will result in a thermal plume that will be well within the Illinois thermal limits (see Subsection 5.1.2) and therefore should not adversely affect biota outside the mixing zone.

A thermal analysis performed for CECo by Sargent & Lundy (S&L), the results of which are presented in Subsection 5.1.2 of this Environmental Report, shows the average plant outlet and cooling pond blowdown temperatures and the thermal plume areas (see Tables 5.1-2 and 5.1-4) for various times of the year, assuming 100% capacity factors. These calculations show compliance with applicable Illinois temperature regulations. The regulations also specify that normal daily and seasonal temperature variations in existence before heat is discharged must be maintained. Seasonal temperatures in the Kankakee River range from a monthly average of $33.5^{\circ}F$ in December to $79.5^{\circ}F$ in August, a total variation of $46^{\circ}F$. Comparatively, discharge temperatures from the cooling pond blowdown range from a median of 55°F in January to 91°F in August. Seasonal variations in temperature are therefore quite similar, even within the mixing zone. Daily temperature fluctuations are also expected to be of similar magnitude for the pond and river since both are responding to the same meteorological conditions. It is, therefore, concluded that these aspects of the water quality standards are satisfied during plant operation.

6

The state regulations designate a 5° F maximum temperature rise above natural water temperatures. This requirement is applicable on all regions outside the established mixing zone area of approximately 26 acres For the median monthly blowdown temperatures, it is estimated that the largest area within the 5° F isotherm line occurs in December and is only 0.45 acres (see Subsection 5.1.2).

A portion of the Kankakee River plankton population will be exposed to above ambient blowdown plume temperatures as they move past the discharge area carried by river currents. Residence time in the thermal plume was calculated for the month of August when the average monthly river flow rate is quite low and the average pond blowdown temperature at full power operation is the highest. Under these conditions, river plankton will be exposed to elevated temperatures within the 5° F isotherm for approximately 10 minutes. A study conducted by Wapora (1970) at four power plants on the Ohio River found no measurable effect on the phytoplankton population or their composition as a result of heated discharge water. The impact on the Kankakee River plankton due to the heated discharge will be further mitigated by the small size of the predicted thermal plume and the rapid mixing of effluent with the Kankakee River water. Plume entrainment effects are expected to be small because of the brief period plankton will be exposed.

No significant benthic effects are anticipated because the thermal tolerance of most benthic species is relatively high and the bottom area affected is small. Caddis flies (Hydropsyche, Cheumatopsyche) and mayflies (Potomanthus, Stenenema, Tricorythodes) form a large portion of the macroinvertebrate population collected at the downstream station in the area of the proposed discharge at the Braidwood Station. Considerable data are available relating to the structure of insect populations living in waters as warm as 106.5° F (Wurtz 1969). In a study of several species of mayflies and stoneflies that normally prefer cooler water, the addition of heated water from a power plant caused no detectable mortality (Langford 1970). Data have indicated that the temperatures at which 50% of seven species of larval midge flies died (the 50% lethal dose or LD_{50} values) ranged from 85° to 102° F (Walshe 1948). These data indicate that any adverse effects on benthos will be confined to the warmest part of the plume during the summer months. Because of the limited area involved and the regrowth and recolonization during the winter months, this effect will not have a significant impact upon the aquatic ecosystem.

The thermal effects of blowdown discharge will not adversely affect Kankakee River fishes (see the Braidwood Station ER-CPS, Subsection 5.1.3.1.1) because plume temperatures will remain within the thermal tolerance limits of most Kankakee River species and because the thermal plume is restricted to a small extent and area of the river. Even if lethal temperatures should occur in a small area of the discharge plume, fish mortalities

Hence, any sulfate discharged to the Kankakee River from the operation of the Braidwood Station complies with water quality standards by river dilution within an area that does not exceed the extent of the 5° F isotherm. As shown in Table 5.1-2, the area of the thermal plume within the 5° F isotherm is 0.16 acres in August; this area is well below the 26-acre mixing zone allowed by Illinois Water quality standards.

The estimated concentrations of chemicals discharged in the cooling pond blowdown at locations on the Kankakee River corresponding to 5° F and 2° F isotherms are provided in Table 5.3-2. This table shows that most chemicals reach near-ambient values at the 2° isotherm. As noted previously, these concentrations are based on the thermal plume model that considers the volume of river water necessary in August to reduce the blowdown temperature to that of the indicated isotherms; this water volume also causes a dilution of chemical effluents from the cooling pond. No adverse effects of these discharges upon the Kankakee River biota are anticipated. All concentrations are below existing standards and most are at near-ambient values.

TABLE 5.3-1

CHEMICAL DISCHARGES OF THE BRAIDWOOD STATION INCLUDING LEACHING EFFECTS

(All values except pH in mg/liter)

	AMBIENT RIVER[a]	AVERAGE POND BLOWDOWN	AVERAGE DISCHARGE TO RIVER	APPLICABLE ILLINOIS STANDARDS	
				EFFLUENT	WATER QUALITY
Alkalinity (as $CaCO_3$)	170	120	120	None	None
Calcium	77.6	100	100	None	None
Chlorides	22.0	44	44	None	500
Magnesium	23.5	50	50	None	None
Nitrates	2.3	5	5	None	None
pH	7.0-9.0	Within Limits	Within Standards	5-10	6.5-9.0
Silica	3.2	6	6	None	None
Sodium	13.0	26	26	None	None
Sulfates	65.6	273	273	None	None
Total Dissolved Solids	388	900	900	3500[b]	1000

6

2

[a]From Table 3.6-1.

[b]Applicable limit for recycling or other pollution abatement practices.

QUESTION E240.5

What are the potential impacts to local population and property of a postulated failure of the dike that forms the onsite pond?

RESPONSE

The cooling pond dikes are designed to be extremely stable structures, with more conservative design criteria than those recommended in the National Dam Safety Program. Most of the exterior dike except a portion of the dike on the west, is either very low or the general ground level is at or above the top of dike elevation. The cooling pond has a spillway designed to safely pass all floods up to the probable maximum flood (PMF). Sufficient freeboard is provided to the top of the dikes over the extreme case of PMF level in the pond to prevent overtopping of the dikes due to wind waves. The upstream face of the dikes is protected with riprap. The dikes are also provided with a slurry trench cutoff. Therefore, it is highly unlikely that the dikes will fail due to heavy precipitation or due to any other natural causes.

In the unlikely event of a dike breach, it is postulated that a 100-foot wide breach will occur in the west dike, south of the spillway location. This location is selected based on the fact the dike is the highest, in relation to the ground elevation on the land side of the dike. The breach is conservatively postulated to have a depth of ten feet below the normal pool level of 595.0 feet. The postulated dike failure section is selected just south of the spillway (Figure QE240.5-1) instead of other locations in the west dike, because the environmental impact of dike failure at that location on the downstream area would be the most severe due to its proximity to the community of Braceville. 6

The peak outflow through the 100' x 10' breach section is estimated to be approximately 9800 cubic feet per second (Reference 1). The outflow will decrease with time as the water level in the pond recedes. The capacity of the cooling pond is 22,297 acre feet at the normal pool elevation of 595.0 feet. However, due to the presence of baffle dikes and the high ground at the pond bottom with elevation of approximately 589.0 feet between east and west sections of the cooling pond, only 17,700 acre feet of the pond capacity would flow out of the breach following a dike failure. 6

The area downstream of the west dike is farmland and slopes down in a westerly direction towards the Mazon River. The outflow through the postulated breach will spread out and flow as shallow overland flow to the the Mazon River (Figure QE240.5-1). Based on the topography and the slope of the area west of the dike failure section, the area was divided into i) a primary flow zone (Zone A) and ii) a backwater zone (Zone B), as shown in Figure QE240.5-1. The primary flow zone would carry the outflow from the dike failure and the backwater zone will form due to the water spreading laterally from the primary flow zone. Three locations were selected in Zone A, where the flow depths and velocities are estimated for outflows from the breach at different times after the dike failure (Table QE240.5-1). The depths and velocities of flow at a given location were estimated based on the slope of the area west of the dike and the width of primary flow zone at that location. 6

It can be seen from Figure QE240.5-1 that the community of Braceville would not be affected directly by the primary flow from the dike failure, however, the backwater zone would extend to parts of the community.

The primary flow will continue beyond Location 3, to the Mazon River with essentially the same depths as at Location 3.

A discussion of the cross-sections, flow capacity and discharge rating curves for the Mazon River between its junction with Granary Creek and the old Route 66 bridge, is given in Section 2.4 of the Braidwood FSAR. It can be seen from the rating curve (Figure 2.4-23, FSAR) for the Mazon River, that the river can carry the maximum outflow of 9800 cfs at an elevation of 570.0 feet, which is at least 10 feet below the general ground elevation of the area west of the cooling pond.

The community of Braceville lies west of the cooling pond; however, it will not be significantly affected by a dike breach since most of the town is north of the path of the outflow from the breach. In addition, the community will be protected by the embankment of Routes 53 and 129 and the Illinois Central Gulf Railroad. There is a small portion of Braceville, consisting of approximately 31 homes, located south of the railroad tracks and 11 farmsteads with homes, some with farm related structures which would be in the impact area. Of the Braceville homes only 7 are in the primary flow zone as are 7 of the farmsteads. The total population of the homes in the impact area is approximately 119, 39 of which are in the primary zone. 6

Therefore, the postulated dike breach would flood some farmland west of the cooling pond but will have very little impact on the population near the cooling pond. 6

Reference:

1. U.S. Army Corps of Engineers, Military Hydrology, R&D Branch, 1957, Flow Through a Breached Dam, Military Hydrology Bulletin No. 9, Washington, D.C.

TABLE QE240.5-1

Time History of Flow Downstream of Cooling Pond Dike Failure

Elapsed Time After Dike Failure (Hours)	Flow Through Breached Section (cfs)	Flow Parameters: Depth at Location* (ft)			Velocity at Location (ft/sec)		
		1	2	3	1	2	3
0	9800	7.1	2.2	1.5	3.5	1.6	1.2
3	8000	6.3	1.9	1.3	3.2	1.5	1.1
8	6000	5.3	1.6	1.0	2.9	1.3	1.1
15	4000	4.1	1.3	0.9	2.4	1.1	0.8
20	3180	3.6	1.1	0.7	2.2	1.0	0.8
30	2100	2.8	0.9	0.6	1.9	0.9	0.7
50	980	1.8	0.5	0.4	1.4	0.6	0.5

*Locations 1, 2, and 3 are shown in Figure QE240.5-1.

AMENDMENT 6
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FIGURE QE 240.5-1

FLOODING DUE TO POSTULATED COOLING POND DIKE FAILURE

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VOLUNTARY REVISIONS

Amendment 6 consists of voluntary revisions to the following parts of the Braidwood Station Environmental Report - Operating License Stage:

Section 2.1	Geography and Demography
Section 2.3	Meteorology
Section 3.6	Chemical and Biocide Systems
Section 5.1	Effects of Operation of Heat Dissipation System
Section 5.3	Effects of Chemical and Biocide Discharges
Amendment 3	Revised Response to QE240.5