1.0 INTRODUCTION AND GENERAL DESCRIPTION OF THE PLANT

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1.1 INTRODUCTION

This updated Final Safety Analysis Report (FSAR) describes the design, construction and operation of a two-unit nuclear power plant designated as the Comanche Peak Nuclear Power Plant (CPNPP), Operating Licenses NPF-87 and NPF-89 for Units 1 and 2, respectively. All future references to the Final Safety Analysis Report (or FSAR) contained in this document refer to the updated FSAR. This report follows the format recommended by Regulatory Guide 1.70, Revision 2, Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants. The design information provided herein reflects the design in sufficient detail to enable a definitive evaluation as to whether CPNPP can be constructed and operated without undue risk to the health and safety of the public.

The Owner of CPNPP is Luminant Generation Company LLC, a subsidiary of TXU Energy Company LLC (Luminant Power) which is a subsidiary of TXU Corporation.

Luminant Power - has corporate responsibility for the design, engineering, construction, licensing, operation, procurement, quality assurance and fuel management support to CPNPP.

1.1.1 STATION LOCATION

Located in Somervell County in North Central Texas, the CPNPP is about 65 miles southwest of the Dallas-Fort Worth Metropolitan Area. In addition, the Squaw Creek Reservoir (SCR), built for station cooling, extends northward into Hood County.

1.1.2 NUCLEAR STEAM SUPPLY SYSTEM

The Nuclear Steam Supply System (NSSS) for each unit is a pressurized water reactor, which along with the design and fabrication of the initial cores, is supplied by Westinghouse Electric Corporation.

1.1.3 CONTAINMENT

The containment for each unit is a steel-lined, reinforced concrete, cylindrical structure with a hemispherical dome designed by Gibbs & Hill, Inc. (Architect-Engineer).

1.1.4 CORE THERMAL POWER LEVEL

Each generating unit core was originally designed for a warranted power output of 3411 Megawatt thermal (MWt), which corresponds to a net electrical output of approximately 1150 Megawatt electric (MWe). This output, combined with the reactor coolant pump heat output of 14 MWt, gives a warranted NSSS output of 3425 MWt, which is the license application rating. A 4.5 percent increase in steam flow results in the maximum calculated NSSS output of 3579 MWt, and thus a maximum calculated core output of 3565 MWt. All safety systems, including the containment and engineered safety features, are designed for operation at the maximum calculated power output.

The thermal power output of Units 1 and 2 were subsequently increased to 3612 MWt.

1.1.5 SCHEDULE

CPNPP Unit 1 was declared for commercial operation on August 13, 1990. Unit 2 was declared for commercial operation on August 3, 1993.

1.2 GENERAL PLANT DESCRIPTION

1.2.1 SITE CHARACTERISTICS

The site of the Comanche Peak Nuclear Power Plant (CPNPP) is in an area of low population (520 persons within four miles of site) having a rural farm-ranch community setting. There are no residents within one mile of the site, and only 75 persons reside within two miles. There are approximately 12,000 persons within 10 miles of the site. The nearest communities, Glen Rose and Granbury (combined 1970 population about 4,000 persons), are 4 1/4 and 10 miles from the site, respectively. Fort Worth (1970 population about 400,000), from 33 to 50 miles from site, is the nearest major population center.

Land use in the site vicinity and surrounding area is predominantly agricultural. Dairy cattle are a minor portion of the total livestock with the closest commercial dairy herd nearly five (5) miles from the site. There is no commercial fishing in the site vicinity.

Although local population is projected to increase, no land use characteristics are projected to be drastically altered during station life. The site is well-suited for locating a nuclear generating installation because of a large exclusion area with a minimum boundary distance of 5,067 feet (1544 meters), a population center distance greater than 20 miles, a rock foundation for all seismic Category I structures, a lack of high surface water conditions, an available cooling water supply, and because of favorable hydrologic, geologic, seismic, and meteorologic conditions.

1.2.1.1 Geology and Seismology

The CPNPP site is located on the Comanche Plateau, a subdivision of the Central Texas section of the Great Plains physiographic province.

Gently dipping Lower Cretaceous limestone and sandstone directly underlie the site.

Structurally, the site occupies the south flank of the Fort Worth basin, a sedimentary depositional trough filled with Pennsylvanian and Permian sediments formed in mid-Pennsylvanian time. A regional unconformity separates the Paleozoic sediments from the lower Cretaceous sediments underlying the site.

Detailed investigation within five miles of the site has disclosed no evidence of surface faulting, thus eliminating the need for considering this factor as a design basis.

With regard to the stability of subsurface materials, there is no evidence in the site region indicating actual or potential uplift or subsidence, cavernous or karst terrain, tectonic warping or deformational zones pertinent to the site. Also not in evidence are zones of alteration, significant weathering, structural weakness, unrelieved residual stresses, or geologically hazardous materials.

Two major fault systems, the Balcones and the Luling-Mexia-Talco fault zones occur within 200 miles of the site. They are not regarded as active faults but are considered in establishing the Safe Shutdown Earthquake (SSE).

Seventeen seismic events have been reported with epicenters within 200 miles of the site. The closest large event was a modified Mercalli Intensity VII which occurred in 1882 near Bonham,

Texas, 155 miles northeast of the CPNPP. The closest known event to the site occurred 90 miles to the north in 1950 and exhibited an intensity of IV. Two events occurred 90 and 100 miles to the southeast of the site in 1932 (V-VI) and 1970 (IV), respectively. For the purpose of establishing the Safe Shutdown Earthquake (SSE), it has been assumed that a Bonham type event could occur at the closest approach of the Wichita-Ouachita tectonic subprovince to the site (70 miles). Based on these considerations, a conservative safe shutdown earthquake of 0.12g has been selected for the site. An acceleration of 0.06g has been selected for the site operating basis earthquake based on similar analysis.

In conclusion, the site is acceptable from a geologic and seismic standpoint for the facility designed for the SSE.

1.2.1.2 Hydrology

The CPNPP site is on Squaw Creek, a tributary of the Paluxy and thence Brazos rivers. Squaw Creek Reservoir (SCR) is impounded for station cooling by a dam constructed on Squaw Creek approximately 4 1/2 miles upstream of its confluence with the Paluxy and Brazos rivers.

The site grade is at elevation 810 feet, which provides 20.3 feet of freeboard above the Probable Maximum Flood (PMF) and superimposed wave runup on Squaw Creek Reservoir. The site grade is well above the maximum water levels conceivable on the Brazos River. Hence, the site will be unaffected by river flooding of any kind and will not be affected by tsunami, seiche, or ice flooding.

A continuous supply of service water is assured by means of a seismic Category I dam which encloses an arm of SCR. For the purpose of controlling the concentration of dissolved solids, SCR receives makeup water from Lake Granbury, on the Brazos River, and SCR blowdown is returned to Lake Granbury.

Most of the groundwater in the site region occurs in bedrock, although some does exist in shallow flood plain alluvium in stream valleys, but is not withdrawn for use. Bedrock aquifers pertinent to the CPNPP vicinity include, in order of increasing age, the Paluxy, Glen Rose, and Twin Mountains formations. Locally, the CPNPP and SCR are on the Glen Rose outcrop, which in turn is underlain by the Twin Mountains Formation. The Paluxy Formation is absent at the CPNPP location and is not found within the limits of the reservoir; the Glen Rose Formation is the upper most stratigraphic unit exposed in these areas.

In these formations, groundwater percolates slowly along bedrock joints and fractures, and through interstices in the rock fabric. The Twin Mountains Formation is the only moderately productive bedrock zone in the site vicinity. The Paluxy Formation has nominal pumpage near the site. The Glen Rose Formation yields very little water in the site area and is usually less productive than the other formations.

The station’s liquid waste processing system is designed so that radioactive liquid waste can be processed adequately prior to release to the environment as described in Section 11.2.

1.2.1.3 Meteorology

Located approximately 290 miles to the northwest of the Gulf of Mexico, the CPNPP site usually experiences a continental climate with marked temperature extremes both diurnally and

seasonally. Maritime tropical air masses almost completely dominate the weather in summer. During the winter, outbreaks of polar continental air are the most common frontal activity, while pacific maritime cold fronts are more frequent in the spring and fall. Wide variations in precipitation amounts occur from year to year, including both drought and persistent rains (occasionally induced by land-weakened, but rain-filled tropical cyclones from the Gulf of Mexico).

Tornado average return is about once in 320 years for the station site.

The accident dilution factors at the site are similar to those specified by Regulatory Guide 1.4 for tentative use in site evaluations. The highest frequency of poorer diffusion conditions generally occur with winds blowing toward the northwest, north-north-west, and north sectors. Some amelioration of the conditions in these sectors will be provided by the warmed waters of the SCR and by reduced topographic variation. The routine dilution factors were evaluated according to Regulatory Guide 1.111.

1.2.1.4 Environmental Radiation Monitoring

Pre-operational baseline radiological monitoring has been performed to determine the average background radiation level.

Conditions of radioactive releases are expected to be infrequent and thus contribute little dose to humans. Of primary concern are doses attributable to I-131 uptake and the submersion dose from noble gases. The primary emphasis of the operational environmental monitoring program will be to measure whole body dose from gaseous effluent and onsite sources, I-131 in air, and radionuclides (especially I-131) in milk. Radionuclides will also be measured in airborne particulate, surface water, well water, broadleaf vegetation, food products, fish, and milk. Frequency of data collection and location of measurements have been evaluated to maximize the data relating to the dose in humans.

1.2.2 PLANT DESCRIPTION

1.2.2.1 Design Criteria

The design of the CPNPP complies with Appendix A of 10 CFR Part 50, General Design Criteria for Nuclear Power Plants.

1.2.2.2 Nuclear Steam Supply System

The Nuclear Steam Supply system (NSSS) consists of a Westinghouse pressurized water reactor (PWR) and supporting auxiliary systems. The nuclear, mechanical, and thermal-hydraulic design of the reactor core is similar to the design of other Westinghouse units under construction. The rated thermal output of Unit 1 and Unit 2 is 3458 megawatt thermal (MWt). Heat balances, showing the major parameters of the plant for the original design rated power condition and maximum expected power condition and that provide bounding thermal/ hydraulic conditions for the core power uprates to 3458 MWt, are shown in Section 10.1.

Nominal performance of the NSSS based on 0 percent makeup is as follows:

		Unit 1[(a)]	Unit 2
1.	Thermal output of NSSS, MWt	3475	3474
2.	Thermal output of reactor core, MWt	3458	3458
3.	Steam flow from NSSS, lb/hr	15,334,487	15,359,775
4.	Steam pressure at a steam generator outlet, psia	967	995
5.	Maximum moisture content, percent	0.10	0.25
6.	Assumed feedwater temperature at steam generator inlet, °F	441.6 (HB) 443 (BE)	441.5

a) Based on nominal performance after 1RF12 [1 and 2].

1.2.2.2.1 Reactor Core

The reactor core is a multi-regions core composed of slightly enriched uranium dioxide pellets enclosed in pressurized, cold worked, sealed Zircaloy tubes. The fuel tubes are grouped and supported in fuel assemblies of the canless type. The basic fuel assembly consists of the control rod guide thimbles attached to the grids and the top and bottom nozzles. The fuel rods are held by the grids in the assembly to provide for very stiff support.

The initial loading of fuel into the core is designed so that fuel assemblies with the highest enrichment are placed in the outer region of the core while the two groups of fuel assemblies with lower enrichment are selectively arranged in the central region. During refueling operations, a portion of the fuel is discharged, and new fuel is loaded into the core. The fuel in the reactor core is arranged to achieve an acceptable power distribution.

Control rod assemblies are inserted into the guide thimbles of the fuel assemblies. The absorber sections of the control rods are fabricated from silver-indium-cadmium and sealed in stainless steel tubes. Neutron control for slow transients is provided by means of boric acid in solution in the Reactor Coolant System (RCS).

Each control rod cluster is attached to a spider connector and drive shaft. The drive mechanisms for the control rod assemblies are equipped with magnetic latches which are controlled by three magnetic coils and the latches are designed so that upon loss of power to the coils, the rod cluster control assembly (RCCA) is released and falls by gravity into the reactor core, effecting a shutdown of the reactor.

The reactor core rated thermal power for Unit 1 prior to 1RF09 is 3411 MWt; this results in a NSSS thermal power of approximately 3427 MWt with the additional 16 Mwt (approximate) of energy input to the RCS by nonreactor sources such as pump heat.

The reactor core thermal power for Unit 1 (after 1RF09) and Unit 2 is 3458 Mwt; this results in a NSSS thermal power of approximately 3474 Mwt with the additional 16 Mwt (approximate) of energy input to the RCS by nonreactor sources such as pump heat.

1.2.2.2.2 Reactor Coolant System

The Reactor Coolant System (RCS) consists of four parallel, similar, heat transfer loops, each consisting of a reactor coolant pump and steam generator, connected to the reactor vessel. In addition, the system includes a pressurizer, pressurizer relief tank, connecting piping, and the instrumentation necessary for operational control and protection.

The RCS transfers the heat developed in the reactor core to the steam generators, where steam is generated to drive the plant turbine- generator. Borated, demineralized light water is used as the heat transfer medium for the RCS and is circulated at a flow rate and temperature consistent with achieving the desired thermal-hydraulic performance for the reactor core. The water of the RCS also serves as neutron moderator, reflector, and solvent for the neutron absorber.

The reactor coolant pumps are Westinghouse vertical, single stage, centrifugal pumps of the shaft-seal type. The power supply systems for the pumps are designed to provide for adequate coolant flow to the reactor core under all required conditions.

The steam generators are Westinghouse vertical U-tube units containing Inconel tubes and equipped with integral moisture separation equipment to reduce the moisture content of the steam to 0.10 percent for Unit 1 and to 0.25 percent or less for Unit 2.

All reactor coolant piping as well as all pressure-containing and heat transfer surfaces in contact with the reactor water is stainless steel clad expect for the fuel tubes and steam generator tubing which are Zircaloy and Inconel, respectively. The reactor core internals, including the control rod drive shafts, are primarily stainless steel.

The electrically heated pressurizer, which is connected to one of the four parallel reactor coolant loops (RCLs), is designed to perform the following functions:

1. To maintain the pressure of the RCS during normal operation

2. To limit the pressure variations during plant loading transients

3. To maintain the RCS pressure within the design limits during abnormal occurrences.

1.2.2.3 Engineered Safety Features

The engineered safety features (ESF) systems are designed to limit the potential radiation exposure to the public as well as to plant personnel in the event of a postulated accidental release of radioactive fission products from the reactor system, particularly as the result of a loss-of-coolant accident (LOCA). These ESF function to localize, control, mitigate, and terminate all such postulated accidents to ensure that the guidelines of 10 CFR Part 100 for exposure limits are not exceeded.

The following is a list of ESF:

1. Containment

2. Containment Spray System

3. Containment spray chemical additive subsystem

4. Containment Isolation System

5. Combustible Gas Control Systems

6. Emergency Core Cooling System (ECCS)

7. Control Room habitability systems

8. Residual Heat Removal (RHR) System

Each of the ESF systems is missile-protected and designed to withstand all normal and accident loads including the Safe Shutdown Earthquake (SSE).

1.2.2.3.1 Containment

The containment is a steel-lined, reinforced concrete structure which consists of a vertical cylinder with a hemispherical dome supported on a foundation mat with a reactor cavity pit. The interior steel liner is constructed with carbon steel plate for leaktightness.

The Containment Building completely encloses the reactor and the RCS. An interior structure within the Containment Building supports and provides shielding for the reactor and other components of the NSSS.

The containment is designed to withstand the pressures and temperatures resulting from a spectrum of LOCAs and secondary system breaks.

1.2.2.3.2 Containment Spray System

The Containment Spray System, including the containment spray chemical additive subsystem, is designed to meet the following criteria:

1. To ensure that the containment pressure and temperature do not exceed the design parameters for all accidents including LOCAs

2. To ensure that offsite radiological consequences are within the limits of 10 CFR Part 100 by reducing the fission product concentration with containment

The Containment Spray System initially supplies the containment atmosphere with borated water drawn from the Refueling Water Storage Tank (RWST). When the water level in the RWST reach the low-level set point, water is drawn from the Containment sump and recirculated through the Containment spray heat exchangers to provide for the continued cooling of the containment atmosphere.

1.2.2.3.3 Containment Spray Chemical Additive Subsystem

The containment spray chemical additive subsystem is designed to insure that the concentration of the iodines within the Containment, following all postulated accidents, is reduced to limit the offsite radiological consequences.

The desired reduction in containment iodine concentration is accomplished by the injection of sodium hydroxide from the containment spray chemical additive subsystem into the containment spray water; this chemically-treated water absorbs the fission product iodines from the containment atmosphere and retains them in solution in the containment sump.

The containment spray chemical additive subsystem, together with the balance of the Containment Spray System, is designed as follows:

1. To be fully redundant

2. To meet the single failure criterion

3. To withstand all normal and accident loads

4. To be fully missile-protected

1.2.2.3.4 Containment Isolation System

In the event of postulated accidents, the Containment Isolation System is designed to minimize the leakage of radioactive materials through fluid lines penetrating Containment.

This design objective is achieved by the use of double isolation barriers. The use of double isolation barriers ensures that no single failure of any active or passive component renders the Containment Isolation System partially or wholly inoperable. The isolation valves are checked regularly during normal unit operation and are designed to assume a fail-safe position.

The Containment Isolation System ensures that the offsite radiological consequences of a main steam line rupture or LOCA are within the guidelines of 10 CFR Part 100.

1.2.2.3.5 Combustible Gas Control Systems

Combustible gas control systems are not required to be Engineered Safety Feature Systems.

The hydrogen purge system, a non-safety system, is designed to meet seismic category II requirements. This system purges the containment atmosphere through filters which reduce radioactive releases. See Section 6.2.5 for details.

1.2.2.3.6 Emergency Core Cooling System

The ECCS, with active and passive subsystems, is designed to perform the following functions:

1. To inject borated water into the RCS following a LOCA to minimize core-damage, metal-water reactions, and fission-product releases

2. To ensure adequate shutdown margin regardless of temperature

3. To provide for long-term postaccident cooling of the reactor core by recirculating borated water from the containment sump

1.2.2.3.7 Control Room Habitability Systems

The Control Room habitability systems are designed to ensure that the Control Room is habitable for a period not less than 30 days following any LOCA.

The Control Room air-conditioning system has a recirculation mode designed to maintain Control Room ambient conditions suitable for personnel occupancy during accident conditions. A set of emergency filtration units removes airborne activity from outside air during emergency pressurization and filtration modes of operation.

Communication and domestic facilities are provided to meet personnel needs during an extended stay in the Control Room area.

1.2.2.3.8 Residual Heat Removal System

The RHR System serves as a part of the ECCS during both the low pressure injection and recirculation phases following a LOCA. The RHR System is designed to provide an adequate supply of water for cooling of the reactor core; this is accomplished by the RHR pumps delivering water from the RWST to the RCLs. When the supply of refueling water is depleted, recirculation of containment sump water through a heat exchanger is initiated and maintained to ensure continued core cooling.

1.2.2.4 Plant Instrumentation and Control System

Instrumentation and controls are provided to monitor and maintain plant parameters within the prescribed operating ranges.

Reactor control is provided by the following:

1. Temperature coefficients of reactivity

2. Control rod cluster motion

3. Injection of neutron absorbing chemical shim in the form of boric acid

The control rod clusters provide for load-follow transients as well as for startup and shutdown requirements. The chemical shim is inserted during cold shutdown, partially removed during startup, and further adjusted during the lifetime of the core to compensate for such effects as fuel consumption and accumulation of fission products which act to decrease the excess reactivity of the core.

The reactor control system permits the plant to accept 10 percent step-load increases and ramp load increases of 5 percent per minute over the load-range of 15 to 100 percent of full power. Step-and ramp-load reductions of the same magnitude are also possible over the range of 15 to 100 percent of full power.

The non-nuclear-safety-related process and containment instrumentation measure temperatures, pressure, flows, and levels in the steam and auxiliary systems and in the Containment. Process variables required on a continuous basis for startup, operation, and shutdown of the unit are indicated, recorded, and controlled from the Control Room. The quantity and types of process instrumentation provided ensure safe and orderly operation of all systems and processes over the full operating range of the plant.

The nuclear-safety-related instrumentation and control systems provide automatic protection and exercise proper control to ensure safe reactor operation and to provide initiating signals to mitigate the consequences of design basis accidents (DBAs). Supervision of both nuclear and turbine generator plants is accomplished from the Control Room.

1.2.2.5 Power Conversion and Electrical Systems

The electrical systems transmit the output of the generator units to the utility system and provide power for plant auxiliary loads. Independent and redundant Class 1E standby power systems function during a DBA to ensure operation of necessary safety-related systems.

The main generator for each unit is rated 1410 MVA at 0.90 power factor, 22 kV, 60 Hz, three-phase, 1800 rpm. Power output from each generator is fed to its respective main step-up transformer bank through the isolated phase bus system. Generator voltage is stepped up to 345 kV and transmitted through overhead transmission lines to the 345 kV Switchyard where distribution to the utility system is accomplished. Seven 345 kV transmission lines connect the Switchyard to other switching stations in the Transmission Operator’s transmission system. The AC station power is distributed through the 6900 V, 480 V, and 118 V uninterruptible AC auxiliary bus systems to the unit loads. The DC load requirements are satisfied by 125-V, 125⁄250-V, and 24⁄48-V systems.

During normal operation, the main generators supply power to all the auxiliary loads except for the loads connected to the emergency buses.

These loads are normally energized from the offsite power systems. Startup and shutdown power is derived from two independent offsite power circuits. One circuit is connected to the 345 kV Switchyard, and the second feeder is connected to the 138 kV system. Each high voltage circuit is transformed through startup transformers to 6900 V.

Under LOCA and loss-of-offsite power conditions, power to the safety-related loads is achieved through the standby diesel generator system. A total of four 100 percent diesel generators, two per unit, is provided. Each diesel generator is assigned to a specific safeguard bus. One diesel generator and its associated bus and loads can satisfy the safety load requirements for one unit. There is no sharing of diesel generators.

Each unit has two independent Class 1E 125-VDC systems to provide DC and uninterruptible AC power to essential plant instruments and controls. An independent 125/250-VDC system is provided for each unit to supply non-Class 1E power and control loads.

1.2.2.6 Fuel Handling and Storage System

The Fuel Handling System is designed to permit the handling of spent fuel under water from the time it leaves the reactor vessel during refueling until it is placed in a cask for offsite shipment.

The transfer of spent fuel under water provides both a transparent radiation shield and a reliable cooling source for the removal of residual and decay heat.

The Fuel Handling System is located in two separate areas. The first area is comprised of the refueling cavity inside the Containment Building, which is flooded during the refueling operations; the second area is the Fuel Building, which includes two spent fuel pools; a cask pit and connecting fuel transfer canal, and which is external to the Containment Building and accessible to authorized personnel. The two areas of the Fuel Handling System are connected by the Fuel Transfer System, which moves the fuel through an opening in the Containment. The Fuel Handling System provides for the safe handling of RCCA under all conditions and for the required assembly, disassembly, and storage of reactor internals. This system includes a refueling machine located inside the Containment above the refueling cavity Fuel Transfer System (which includes a fuel transfer tube), a fuel handling crane above the fuel storage racks area, the RCCA changing fixture, and lifting devices (which are used for handling the reactor vessel head and internals).

The new fuel assemblies can be stored in racks in the new fuel pit, in racks in the spent fuels pools, or in the in-containment storage racks. In each of the locations, the new fuel is separated by sufficient distance to preclude criticality. Spent fuel is placed in storage racks in the spent fuel pools where it will remain for a sufficient decay and cooling period before shipment in a cask to a fuel reprocessing facility or a storage facility.

1.2.2.7 Cooling Water Systems

Two separate closed-loop cooling water systems are provided to facilitate heat removal from ESF, safety-related, and non-safety- related equipment. These are the Component Cooling Water System (CCWS) and the Turbine Plant Cooling Water (TPCW) System. Cooling for the CCWS is provided by the Station Service Water System (SSWS) and the heat is ultimately rejected to the Safe Shutdown Impoundment (SSI). Cooling for the TPCW System is provided by the Circulating Water System and this resulting heat is ultimately rejected to the Squaw Creek Reservoir (SCR).

The design criteria for the CCWS are as follows:

1. To remove residual heat from the RCS by means of the RHR System during plant shutdown

2. To cool the letdown flow to the CVCS during power operation

3. To dissipate waste heat from containment and auxiliary components

4. To remove ESF heat loads after an accident

The CCWS transfers heat to the SSWS via the component cooling water heat exchangers.

The CCWS consists of two separate and independent full capacity, safeguards-related, redundant trains of pumps and heat exchangers to remove heat from the engineering safeguards components and a nonredundant, safety-related loop with an ANS non-safety-class-related portion. Corrosion inhibiting demineralized water is circulated through the CCWS. The CCWS is maintained at a higher pressure than the SSWS to prevent inleakage of potentially corrosive

station service water fluids. The CCWS provides an intermediate barrier between the RCS and the service water system to preclude direct leakage of radioactive material to the SSI.

An uninterrupted supply of water for the service water system is ensured by the SSI, a seismic Category I structure. Makeup water for the SSI is provided via a shallow canal connecting it with the SCR and can be provided via a bleed-off from the Circulating Water System.

The design criterion for the TPCW System is to remove waste heat from various Turbine Building auxiliaries.

The TPCW System passes its heat load via the TPCW heat exchanger to the Circulating Water System.

Cooling water for the main condensers is provided by the Circulating Water System. The Circulating Water System Intake Structure is located north of the plant on the SCR. The heated water of the Circulating Water System is discharged to the SCR via a discharge tunnel at a point southeast of the plant.

1.2.2.8 Auxiliary Systems

The auxiliary systems are designed to perform the following functions:

1. To supply RCS water requirements
2. To purify reactor coolant water
3. To introduce chemicals to inhibit corrosion
4. To introduce and remove chemicals for reactivity control
5. To cool system components
6. To remove residual heat during a portion of the reactor cooling period and when the reactor is shut down
7. To cool the spent fuel pool water
8. To permit sampling of reactor coolant
9. To provide for safety injection
10. To vent and drain the RCS and the auxiliary systems
11. To provide containment ventilation and cooling
12. To provide plant fire protection

The principal auxiliary systems are the following:

1. Chemical and Volume Control System (CVCS)

2. Sampling systems

3. Compressed air systems

4. Plant ventilation systems

5. Station Service Water System (SSWS)

6. Plant Fire Protection System

7. Spent Fuel Pool Cooling and Cleanup System

1.2.2.8.1 Chemical and Volume Control System

Performance of the following functions will establish the design criteria of the CVCS:

1. Purification of reactor coolant fluid

2. Corrosion control

3. Regulation of reactor coolant inventory

4. Reactivity shim

5. Seal water injection for reactor coolant pumps

During power operation, a continuous feed-and-bleed system is maintained to and from the RCS. The bypassed fluid is depressurized, cooled, purified, and stored by a series of valves, heat exchangers, demineralizers, and tanks. Furthermore, the amount of reactor coolant is automatically adjusted to compensate for changes in volume as a result of coolant temperature changes. The CVCS provides reactivity control by varying the boron concentration in the reactor coolant.

Water for the reactor coolant pump shaft seals is supplied from the charging pump.

The centrifugal charging pumps associated with the CVCS also serve as the high-head pumps for the ECCS. In the event of a LOCA, the CVCS is isolated except for the charging pumps, which inject borated water into the reactor core.

1.2.2.8.2 Sampling Systems

The CPNPP is equipped with three sampling systems: the Primary Sampling System, the Secondary Sampling System and the Post Accident Sampling System (PASS). The Primary Sampling System serves the RCS and its auxiliary systems while the Secondary Sampling System serves the feedwater and main steam systems. The PASS no longer functions, as described in FSAR Section II.B.3. These systems provide a determination of both the chemical and radiological makeup of various plant fluids. Samples drawn from radioactive sources are passed through sample coolers or delay coils, or both, as required.

1.2.2.8.3 Compressed Air Systems

Each of the two CPNPP units are equipped with oil-free air compressors, which discharge filtered and dried compressed air into the Instrument Air System. There are two instrument air compressors for each unit and two common instrument air compressors which can be aligned to either unit. An oil-flooded common compressor supplies both units with unfiltered compressed air into a separate Service Air System.

The Service Air System provides compressed air for routine maintenance at various stations throughout the plant.

The Instrument Air System provides compressed air, which is dried and filtered, for all air-operated instruments and valves.

1.2.2.8.4 Plant Ventilation System

To facilitate the independent control of the atmosphere in various plant areas, separate ventilation systems have been provided. The following major areas are served by separate ventilation system:

1. Containment Building.

2. Auxiliary, Safeguards, and Fuel Building.

3. Turbine Building.

4. Diesel Generator Building.

5. Control Room.

6. Uninterruptible Power Supply and Distribution Room.

In addition, a Containment Purge System and a Containment Preaccess Filtration System are provided for the containment atmosphere.

1.2.2.8.5 Station Service Water System

The SSWS removes heat from the CCWS to meet the cooling requirements of the plant as follows:

1. During normal operations

2. Following shutdown

3. During and after all postulated LOCAs

The SSWS is assured of a constant supply of water by the SSI Dam which is a seismic Category I structure founded on bedrock. The SSI maintains the necessary volume of water required by NRC Regulatory Guide 1.27. Makeup water is provided via a shallow canal to the SCR and can be provided via a bleed-off from the Circulating Water System.

The SSWS of each of the units is completely independent and redundant. Each unit has two fully independent trains, either of which can supply the required cooling waterflow. The pumps and heat exchangers of each train can be aligned with the other train in the event of a component failure.

1.2.2.8.6 Plant Fire Protection System

The Fire Protection system provides means for detecting, alarming, and extinguishing fires. The system is divided into two basic subsystems: the Fire Detection System and the fire extinguishing system. The Fire Detection System is a plantwide instrumentation system provided to detect fires in various areas of the plant and to alert the Control Room operators of a fire and its location. The fire extinguishing system includes such fire fighting equipment as sprinkler systems (wet pipe, deluge and preaction), water spray, standpipe and hose stations, Halon Systems, and portable extinguishers. The Fire Protection System is not required to ensure the integrity of the reactor coolant pressure boundary (RCPB), the capability to shut down the reactor, and the capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures as detailed in 10 CFR Part 100.

All fire protection piping in Category I structures is classified Class 5 as described in Section 3.2.2.

The station fire main system, including the associated pumps, piping, and valves, is shared by the two CPNPP units.

Noncombustible and fire-resistant materials are selected where practical for use throughout the CPNPP facility, particularly in controlled-access portions of the plant such as the Containment and Control Room.

1. Fire Detection System

   A Fire Detection System is provided throughout the plant. When a fire is detected, the respective zone and fire indication appears on the local zone panel and the main fire detection panel in the Control Room. An alarm indicating lamp illuminates in the base of the ionization detectors indicating the actuated detector, for other types of detectors a lamp illuminates at the local zone panel. The majority of detectors are placed overhead in their respective areas. Also, detectors located in areas protected by halon and automatic open head water spray systems actuate the fixed systems. Detectors sound an alarm condition via the Control Room fire detection panel.

   The Fire Detection System uses fire, smoke, and heat detection devices located throughout the entire plant; they include the following:

   a. Ionization smoke detectors

      Ionization detectors are of the two-chamber-type design. The first is a reference chamber to compensate against the sensitivity changes due to temperature, barometric pressure, and humidity variations. The second chamber is a sensing chamber open to the outside elements through a protective screening which permits combustion products to enter while preventing insects and foreign matter from entering and causing false alarms.

b. Thermal detectors

Spot-type thermal detectors are of the fixed-temperature, rate compensation type.

Continuous strip thermistor heat detectors are used to monitor the temperature of charcoal adsorber beds of the atmosphere cleanup units, and other areas where accurate measurement of temperatures for fire detection is required. The strip thermistors are of the negative coefficient of resistance type.

c. Flame detectors

Flame detectors are of the ultraviolet (UV) radiation sensing type. The detectors respond to the UV frequency of radiation given off by a fire. The UV flame detectors are installed with high ceilings or specific pieces of equipment which contain highly flammable materials.

The detectors are strategically positioned throughout the facility to detect fires, annunciate alarms in the Control Room and indicate the location of the fire on the Control Room fire detection panel and local zone panel.

The detection system is electrically supervised. Class A supervision is used in the cable spreading rooms. As a minimum, class B supervision is used in the remainder of the plant.

2. Fire Extinguishing System

The fire extinguishing system uses portable extinguishers, in conjunction with hose stations and fixed suppression systems, as primary and secondary means of suppression. Water is supplied for the standpipes and suppression systems from two dedicated above ground storage tanks via an underground piping distribution system and water supply lines for each building and transformer branch from the underground loop; every branch has a post indicator gate valve for isolation of the branch or building. The main loop is divided into sections by post indicator valves to allow isolation of the loop in case of a line break. There are three 50 percent capacity fire pumps to supply water to the system. One is an electric motor driven pump and the other two pumps are diesel engine driven. Water is supplied to the underground fire loop by the lead pump, the electric motor-driven pump, when the jockey pump cannot maintain the system pressure above a predetermined set point.

A siamese fire department connection is provided for emergency fill of the system by a fire truck or a portable auxiliary pump. This fill is used as a backup to the pumps. As required by National Fire Protection Association (NFPA) No. 24, a check valve and a ball drip valve are provided for the connection of the siamese to the main loop. The siamese connection is located adjacent to the Service Water Intake Structure.

The Safeguards, Fuel Handling, and Auxiliary buildings have internal loops to supply suppression and standpipes systems. These loops have multiple connections to the underground loop. Valves are available for isolation of sections of the loops as well as isolation of the internal loop from the underground loop. Each suppression and standpipe

system has a shutoff valve to facilitate work on the system. Approved control valves are located in the respective system in accordance with applicable NFPA standards.

The Turbine Buildings have an internal loop to supply standpipes. This internal loop has multiple connections to the underground loop in Unit 1 and Unit 2. Crosstie lines are provided between Unit 1 and Unit 2 Turbine Buildings to facilitate isolation of sections of either loop. Valves are provided in accordance with NFPA No. 14 to control the waterflow and isolate the system. The water spray and automatic sprinkler systems are connected to the outside loop via isolation valves located in the fire protection valve rooms, which are accessible from inside and outside the Turbine Buildings, as required, to control the waterflow to the suppression systems.

The suppression systems for the diesel generator day tanks are supplied from the main loop independent of each other. Each system has a deluge valve, a cutoff valve, and a detection system. Actuation of one system does not affect operation of the other diesel generator; each diesel generator compartment is provided with a watertight door to prevent flooding of the adjacent areas. The systems are actuated automatically based on detection of a fire or manually adjacent to the respective area. The systems can only be shut off manually at the valve.

The fire pump house structure is protected by an automatic wet-pipe sprinkler system. Water flow and valve tamper alarms are provided at the pump house location and in the Control Room.

The deluge water spray systems for the atmosphere cleanup units, except the containment preaccess units, are supplied by the interior building supply loop. The preaccess units are supplied by the Demineralized Water System. Should demineralized water be unavailable, the operator can manually route fire protection water through the demineralized water piping. Actuation of one system will not affect the operation of an adjacent atmosphere cleanup unit.

The halon system for each cable spreading room consists of a detection system, storage cylinders, manifold and header assembly, control valves, piping, nozzles, and local control panel. Each system is designed with two charges of halon. Halon is released automatically after receipt of a fire signal from detectors located in the cable spreading room. The Unit computer rooms are each provided with a manually actuated halon system, and ionization smoke detection provides control room personnel notification of a fire.

1.2.2.8.7 Spent Fuel Pool Cooling and Cleanup System

The Spent Fuel Pool Cooling and Cleanup System serves the spent fuel pools of both units.

The cooling portion of this system has two trains consisting of a pump, heat exchanger, and other associated equipment.

The purification portion of this system consists of two trains containing a filter and a demineralizer which can be operated in parallel with either of the two cooling trains.

The skimmer portion of this system consists of a single skimmer train and is shared between both pools.

1.2.2.9 Waste Processing Systems

The waste processing systems (WPS) are designed to process liquid, gaseous, and solid waste while achieving the lowest reasonable radioactive release to the environment available through current technology. Liquid and gaseous wastes to be recycled within the plant are first segregated from those to be processed or shipped offsite.

Segregation of wastes is consistently maintained in the subsystems to ensure proper handling.

The Liquid Waste Processing System (LWPS) is designed to perform the following functions:

1. To collect reactor grade water
2. To process reactor grade water
3. To recycle reactor grade water
4. To collect floor drains and laundry waste
5. To process floor drains and laundry waste
6. To recycle or discharge processed floor drain and laundry waste
7. To remove radioactive constituents
8. To concentrate the removed radioactive constituents
9. To process concentrated radioactive constituents for solidification and shipment offsite

In addition, all liquid wastes are sampled and activity levels recorded prior to release. All processed liquid effluents from the RCS are subjected to purification by the CVCS ion exchanger in addition to the components of the WPS. The limits established by 10 CFR Part 20 are met.

The Gaseous Waste Processing System (GWPS) is designed to perform the following functions:

1. To reduce fission product gas concentrations in the RCS during normal operation
2. To contain indefinitely the fission product gases removed from the RCS
3. To collect gases generated by other systems
4. To maintain a low level of hydrogen gas in the collected gases
5. To discharge radioactive effluents after monitoring for radioactivity via a controlled path to ensure that the expected offsite doses are as low as reasonably achievable (ALARA)

The waste gases generated during plant operations including anticipated operational occurrences are collected and processed and are stored in waste gas decay tanks.

The Solid Waste Management System is designed:

1. To provide a means of encapsulating or compacting radioactive solid wastes generated by reactor plant operations

2. To provide adequate equipment and storage area shielding for the protection of operating personnel pending shipment of waste to disposal facilities

3. To measure and record the radiation levels of the solid waste processed for shipment from the site to disposal facilities

4. To provide a 3- to 6-month storage capacity for the processed wastes depending upon plant operation.

Solid wastes are compacted into containers for offsite disposal.

The WPS, with the exception of the equipment associated with the reactor coolant drain tanks, are completely shared. The reactor coolant drain tanks and associated equipment are located inside their respective Containment structures.

1.2.2.10 Safe Shutdown Impoundment

The SSI is an enclosed body of water formed from a cove of the SCR and is retained by a seismic Category I dam. It is designed and constructed to withstand the most severe postulated natural phenomena. The water level of the SSI is maintained by a spillway between the SSI and the reservoir behind the Squaw Creek Dam.

Since the Squaw Creek Dam is not a seismic Category I structure, it is assumed that ground motion from the SSE results in catastrophic, total, and instantaneous drawdown of the water level on the downstream side of the SSI Dam. The spillway limits the low water level in the SSI to 769 ft 6 in, at which point the volume of water contained is approximately 300 acre-feet.

The SSI is designed to serve as the ultimate heat sink of the CPNPP and acts to dissipate heat rejected by the SSWS during postaccident shutdown and normal cooldown conditions. It has been sized to provide adequate cooling capacity for the CPNPP in accordance with the requirements of NRC Regulatory Guide 1.27.

The materials used in construction of the SSI Dam include limestone rock from excavation at the plant site, clay from a borrow area located upstream from the Squaw Creek embankment, and a granular filter zone material.

1.2.2.11 Shared Structures, Systems, and Components

1.2.2.11.1 Shared Structures

The following structures are shared by both units of the CPNPP:

1. Auxiliary Building, including Control Room

2. Fuel Building

3. Service Water Intake Structure

4. Circulating Water Intake Structure

5. Circulating Water Discharge Structure

1.2.2.11.2 Shared Systems

The following systems are shared (or have shared components) by both units of the CPNPP:

1. Chemical and Volume Control Systems (CVCS)

2. Boron Recycle System (BRS)

3. Compressed Air Systems (CASs)

4. Station Service Water System (SSWS)

5. Waste Processing Systems (WPS)

6. Fire Protection Systems

7. Hydrogen Purge System

8. Turbine Building ventilation system

9. Control Room ventilation system

10. Primary Plant ventilation system

11. UPS and Distribution Room Ventilation System

1.2.2.11.3 Shared Components

The following components are shared by both units of the CPNPP:

1. Fuel handling equipment (in Fuel Building only)

2. Startup transformers

3. 480-V motor control centers feeding to the common services systems (mechanical) load and lighting

4. Control Room panels where common services controls are located

1.2.2.12 General Arrangements

Figure 1.2-1 through Figure 1.2-46 provide sufficient detail of major structures and equipment to give an understanding of the general layout of the plant. Plan and elevation drawings are provided for the following structures:

1. Containment and Safeguards Buildings (Unit 1)

2. Containment and Safeguards Buildings (Unit 2)

3. Turbine Building (Unit 1)

4. Turbine Building (Unit 2)

5. Auxiliary and Electrical Control Building

6. Fuel Building

7. Circulating Water Intake Structure

8. Service Water Intake Structure

These figures are based on plant plan and elevation drawings. As such, the figures provide additional detail beyond what is necessary for general arrangements. These figures will be updated as necessary to provide a reasonable understanding of the general arrangement of major plant structures and equipment. The additional detail on these drawings is not updated.

1.2.2.13 References

1. TXU Letter CPSES-200401793, Transmittal of Contract Information - Best Estimate Feedwater Temperature, July 20, 2004.

2. Design Specification No. 418A23, Revision 2, Comanche Peak Nuclear Power Plant Unit 1, Delta 76 Replacement Steam Generator, September 2006.

1.2.3 OLD STEAM GENERATOR STORAGE FACILITY

The Old Steam Generator Storage Facility (OSGSF), shown in Figure 1.2-1, is a reinforced concrete structure supported on a reinforced concrete footing. The OSGSF consists of precast concrete wall closure panels and a reinforced concrete roof slab supported by structural steel beams. The OSGSF provides a secure long-term on-site storage facility for the four Unit 1 Old Steam Generators and Old Reactor Vessel Heads (and associated Control Rod Drive Mechanisms) for Units 1 and 2.

1.2.4 INDEPENDENT SPENT FUEL STORAGE INSTALLATION

The CPSES site contains an Independent Spent Fuel Storage Installation (ISFSI) as shown on Figure 1.2-1. The ISFSI consists of a concrete pad with space for 84 natural convection air-cooled, HI-STORM shielded dry spent fuel storage casks, each capable of storing 32 spent nuclear fuel assemblies in a welded multiple purpose container. The ISFSI is inside a separate security protected area.

1.2.5 BEYOND DESIGN BASIS

1.2.5.1 NRC Order EA-12-049 Beyond Design Basis External Events

On March 12, 2012, the NRC issued Order EA-12-049, "Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." Strategies,

details, and programmatic controls for mitigating beyond-design-basis external events are contained in site specific program documents. The CPNPP site contains a FLEX Storage Building as shown on Figure 1.2-1. The FLEX Storage Building protects equipment credited for NRC Order EA-12-049. Modifications to a Structure, System, or Component (SSC) required by the strategies of NRC Order EA-12-049 and are reflected in the FSAR flow diagrams as required.

1.2.5.2 NRC Order EA-12-051 – Spent Fuel Pool Instrumentation

On March 12, 2012, the NRC issued Order EA-12-051, “Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation.” Details and programmatic controls are contained in site specific program documents. The instrument display for the wide range spent fuel pool instrumentation is installed in compliance with NRC Order EA-12-051 and is readily accessible during postulated events and allows for SFP level information to be promptly available to decision makers. As appropriate, Sections 9.1.3.2 and 9.1.3.5 and Tables 17A-1 and 17A-2 refer to the wide range Spent Fuel Pool Instrumentation installed in accordance with the NRC Order.

1.3 COMPARISON TABLES

1.3.1 DELETED.

1.3.2 COMPARISON OF FINAL AND PRELIMINARY DESIGNS

Table 1.3-2 details the significant design changes that have been made since the submittal of the PSAR.

The FSAR is complete and does not rely on information contained in the PSAR. The original intent of this table was to provide a comparison with the PSAR when the FSAR was initially submitted for NRC Staff review. The information in this table is considered historical and will not be updated.

TABLE 1.3-1
THIS TABLE HAS BEEN DELETED

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 1 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
I. Structures		
Category I Structures (other than containment)	3.8	Leak chase system behind liner of outdoor Category I tanks has been eliminated.
		The requirement for roof blow out panels above the main steam lines in the Safeguards Building has been deleted.
Control Room	3.11B	Limiting environmental conditions have been reduced to 80°F and 60 percent relative humidity.
	6.4 3.11B	Positive pressure of 1/2 inch water gauge changed to 0.1 inch water gauge during an accident.
Containment Systems	3.8	The containment external pressure design has been changed from a 3 psi differential to a 5 psi differential pressure.
		The containment internal structure through liner anchors was eliminated.
		The containment dome liner has been increased from 3/8 inch thickness to 1/2 inch.
		The containment liner paint has been changed.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 2 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
	3.9	The break flow in the reactor cavity analysis is limited to 144 in^2 by pipe whip restraints instead of the previous 150 in^2. (See Section 3.9N.1.4.6 for application of leak-before-break to GDC-4.)
		Cathodic protection not required for containment liner, reinforced steel and other such steel encased in concrete.
		Containment penetration sleeves changed from A-333-70, Grade 6 to:
		1. SA-333, Grade 6 for sleeve sizes 20 in. and smaller
		2. SA-516, Grade 70 or SA-537, Class 2 to sleeve sizes 20 in. and larger
		Inside weld no longer utilized on cold pipe penetration.
		Sleeve with inside weld and guard pipe on hot pipe penetration replaced with sleeve without inside welds or guard pipe.
	3.11B	Maximum operational temperature increased to 120°F.
	6.2.1	The reactor cavity analysis was redone using new support criteria and restraint design.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 3 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
	6.2.4	Changes in signals used to actuate the containment isolation system to reflect changes in WNES protection system.
		Addition of bellows expansion joints to the valve isolation tanks.
	6.2.5	The containment liner paint has been changed from a primer and top coat that was zinc free to inorganic zinc as a primer in phenolic topcoat.
		The use of aluminum and zinc inside containment is now permitted.
		Remote thermal conductivity hydrogen analyzers are replaced by in-containment electrochemical sensors and microprocessor based analyzers located in the control room.
		The containment free volume has been changed from 2.9×10^6 cubic feet to 2.985×10^6 cubic feet
	6.5	Containment sump pH limits changed from 9.0 to 8.6 and 9.3 to 9.5.
Missile Shield	3.5	The CRDM roll away missile shield is constructed of steel instead of reinforced concrete.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 4 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
Safe Shutdown Impoundment	9.2.5	The presence of fractures in the SSI limestone foundation material was determined to be acceptable if the fractures occur above elevation 769.5 (spillway level), and if the fractures would not cause piping of core material.
		Clarification of the term “unweathered” to mean material that is firm, hard, and of appropriate strength parameters; the presence of slight oxidation resulting in some color change may not be an indication of weathering.
Shielding	12.1	Deleted the provisions for:
		1. Local alarms at entries to Zone IV areas
		2. Local and remote alarms at entries to Zone V areas has been deleted.
		The minimum density for ordinary concrete has been changed from 2.33 g/cc to 2.26 g/cc
		The secondary shield wall no longer surrounds the pressurizer and the thickness has been increased to 2 ft 9 in.
Tornado Characteristics	3.5	Tornado Missile Characteristics have been changed.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 5 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
Piping Systems, Handling Equipment and Tornado Venting Components	3.2 and Appendix 17A	Portions of systems or components are designed as Seismic Category II components.
Non-nuclear Safety Piping Systems or Components	3.2 and Appendix 17A	Portions of systems or components are designed as Class 5 components.
Auxiliary Feedwater System	3.6B	The system is identified as high energy fluid system.
II. Reactor Systems		
Fuel	4.2	The reactors are fueled with 17 x 17 fuel assemblies in lieu of 15 x 15 fuel assemblies.
Reactor internals	3.1, 7.7	The use of part length control rods has been removed from the CPNPP design.
	4.5.2	The reactor internals have been modified to accept 17 x 17 fuel assemblies.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 6 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
RCS pressure boundary	5.2	Flux core welding on stainless steel piping components fabricated in the shop are permitted. The allowable heat input range is 15 to 100 KJ/in. The use of the following as valve materials is now permitted for valves 2.5 in. and larger: bodies: SA 351 grade CF8 and CF8M bonnets: SA 351 grade CF8M with nickel plating or stellite hardfacing closure bolting: SA 564 Type 630 and SA 193 grade B6 closure nuts: SA 193 grade B6 and SA 194 grade 8M The use of the following as valve materials is now permitted for valves 2.0 in. and smaller: bodies: SA-351 Gr. CF8M SA-182 F 316

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 7 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
		bonnets: SA-182 F 316 discs: A-567 Gr. 1 (Stellite 21) stems: SA-564 Type 416 (Non-pressure retaining applications)
		The lower heat input range limit for welding processes of austenitic stainless steel have been deleted, and the use of automatic gas tungsten arc-cold wire processes is allowed. The maximum allowable heat input for this process is 45 KJ/in.
	7.6	An RCS cold overpressure control system is employed to provide for the mitigation of potential cold overpressurization transients, utilizing existing power operated relief valves with modifications to their actuation logic.
Steam Generators	5.4.3	CPNPP utilizes model D5 steam generators in Unit 2. Thermal sleeves in reactor coolant loop branch nozzles have been deleted.
RHR systems	3.6	The RHR system is no longer identified as a high-energy fluid system located outside the containment.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 8 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
Safety Injection System	3.1	Change in SIS signal from coincident low pressurizer pressure and water level to low pressurizer pressure.
Reactor Coolant and Whip Restraint	3.1 3.6 3.9N 5.4	The leak-before-break technology has been applied to exclude from the design basis the dynamic effects of postulate ruptures in the reactor coolant loop piping.
III. <u>Electrical Systems:</u>		
Reactor Trip System	7.2	The reactor trip on low feedwater flow has been replaced by a low-low steam generator level trip.
		The RTD bypass line T hot and T cold measurements have been replaced by an N-16 power monitor and an inline T cold measurement CPNPP utilities 4 section power range neutron detector assemblies.
Engineered Safety Feature Systems	7.3	An improved steamline break protection system has been incorporated where safety injection and steamline isolation are initiated from low compensated steam line pressure.
CCW, SSW	7.3	Recirculation valves are now flow controlled, rather than pressure controlled

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 9 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
Post-Accident Monitoring	7.5	SSW and CCW system parameters are not considered post-accident monitors
Hot Shutdown Panels	7.4	Indicators on the hot shutdown panel are no longer considered "Post accident monitors" and are treated as non-Class IE.
Electrical systems	8.1	Non-safety-related loads removed from Class 1E batteries and reassigned to ± 125-V non-Class 1E batteries.
		A static switch has been added to the BOP static uninterrupt. Power supply system inverter to accommodate the 120 V supply.
		138 kV DeCordova line previously was directly fed from DeCordova substation. Now it is transferred through switching station located near DeCordova SES.
		Motor operated disconnect switch is added to the 138 kV line at CPNPP to isolate the startup transformer XST1 for maintenance.
		The condition of diesel generator trip on bus-fault is removed. Now diesel generator does not trip on bus fault condition. However, will trip on overspeed.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 10 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
		Some events which trip diesel generator excluding accident condition, are added and deleted as follows:
		1. Bus fault signal to trip the generator breaker is deleted and following signal are included to trip the diesel generator.
		2. Lube oil high temperature
		3. Generator over current
		Diesel generator trips due to following events, during “no accident” conditions have been added
		1. Generator Negative Sequence
		2. Generator Ground
		3. Generator Field Ground Trip
		Diesel generator rating modified from a 2000 hour rating to a 2 hour short term rating
		Plant computer removed from DC safeguards bus and added to 125/250 V bus. Both DC safeguard batteries are sized identically.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 11 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
		Back-up (Alternate) 120 V ac instrument power supply to the 118 V Class IE uninterruptible as bus is changed from 120 V single phase chassie emergency Lighting System to the 120 V ac supply from Class IE MCC via a 480/120 volt single phase Class 1E bypass transformer.
		Static switch is added in each BOP SUP system to allow automatic transfer from inverter to back-up (alternate) 120 V ac power source.
		The air circuit breakers are molded case type and fusible switches are provided on some switchboard feeders (instead of circuit breakers) for coordination purposes.
		Unit substation transformer was changed from 1500 kVA to 2000⁄1666 kVA.
		The backup supply for the 120-V NSSS instrument buses was originally taken from the 120-V single-phase emergency lighting system. These buses are now fed from the Class 1E motor control centers via a 480/120V single-phase Class 1E bypass transformer.
		Electric penetration centerline spacing changed from 2 ft 6 in. to 2 ft 2 in.
		Total integrated dose that electrical equipment is subjected to is increased to 2.0 x 10^8 rads (1.5 gamma and 0.5 beta).

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 12 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
		Added ±24 volt dc system for the turbine generator systems
IV. Mechanical Water Systems:		
Component Cooling	9.2	The following equipment is no longer served by the CCWS:
		1. Safety injection pump seal cooler
		2. Centrifugal charging pump seal cooler
		3. SGBS heat exchanger
		The following equipment is now served by the CCWS:
		1. Instrument air aftercoolers
		2. Chilled water system condensers
		3. Control room air-conditioning condensers
		4. Pump added for component cooling water drain tank in safeguards building
		5. Control room alarm added if makeup water added to surge tank

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 13 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
		The CCWS heat exchangers will utilize Cu-Ni tubes instead of stainless steel.
		Component Cooling Water pump normal supply temperature is increased to 115^{o}F.
Condensate Storage Facility	9.2.6	Storage capacity increased from 480,000 gallons to 500,000 gallons.
		Secondary system water storage decreased from 240,000 gallons to 224,000 gallons.
		Reserve auxiliary feedwater capacity increased from 240,000 gallons to 276,000 gallons.
Containment Spray System	3.2	Containment spray system nozzles will not bear an “N” stamp
		Change from one spray header to seven.
	6.5	Minimum spray fall height changed from 117 feet to 115 feet 9 inches.
		Eductor calibrated flow changed from 37.5 gpm to 45 gpm.
		Containment spray delivery lag time changed from 40 seconds to 60 seconds.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 14 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
		Containment sprayed volume changed from 2.528 x 10^6 cubic feet to 1.725 x 10^6 cubic feet. (From 87% to 57.8%)
Piping systems	3.6	The pipe whip analyses are now performed by the ANSYS computer program of Swanson Analysis System, Inc.
	3.9	The addition of stress limits for seismic Category I piping.
Potable and sanitary water system	9.2.4	Sewage plant effluent is discharged to Squaw Creek Reservoir instead of the evaporation ponds.
		Domestic water storage tank is designed to ASME B&PV Code Section III Code Class 3 requirements.
		Capacity of the sewage treatment plant is increased from 5000 gpd (normal operation) to 10,000 gpd (normal operation) and to 30,000 gpd during the construction stage.
		Capacity of the hypochlorinator has been increased.
Station Service Water System	9.2.1	The following changes have been made:
		1. The SSI study resulted in an increase of the accident inlet temperature of the service water to 105°F

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 15 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
		2. Revision of Service Water Intake structure
		3. Service water pump design temperature increased from 95°F to 120°F
		4. Traveling screen spray piping changed from carbon steel to copper alloy
		5. The SSWS no longer removes heat from the control room air-conditioning system
		6. The SSWS has been added as a backup water supply to the Auxiliary Feedwater System
		7. The non-safety-related train of the SSWS has been deleted
		8. Automatic strainers have been deleted.
		9. Piping is constructed of either stainless steel (or other corrosion resistant material) or is plasite 7122 lined carbon steel as indicated in the appropriate drawings and/or specifications.
Valves: Feedwater Isolation Valves	6.2.4	The feedwater isolation valve will no longer fail closed upon loss of power. Closure will be upon energizing redundant solenoid valves.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 16 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
Valves: General	3.1 6.2.4	Change from air-operated valves failing closed to air and solenoid-operated valves failing in the direction of greatest safety.
Materials	6.1B	The control of delta ferrite to reduce the susceptibility of stainless steel welds to hot cracking is no longer considered for ANS Safety Class 3 components.
		The requirement that the total leachable chloride and fluoride content of clean elastomers and plastics placed over all openings in components fabricated from austenitic stainless steel be limited to 15 and 10 ppm, respectively, has been deleted.
V. <u>Fuel Storage and Handling Systems:</u>		
Fuel storage and handling system	9.1	The following changes were made to the spent fuel storage handling system system:
		1. An increase in total spent fuel storage space from 400 to 1166 spent fuel assemblies (1116 in spent fuel pools/25 in each Containment)
		2. A decrease in center-to-center spacing from 21 to 16 in.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 17 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
		3. An increase in Keff from 0.90 to 0.95 for spent fuel assemblies if immersed in unborated water.
		Purification loop was added to the refueling cavity.
		The number of dry storage racks has been increased from 129 to 132.
		An increase in Keff from 0.90 to 0.98 for new fuel assemblies if flooded with unborated water.
		The dry cask loading concept is eliminated.
		The design of the spent fuel pool cooling heat exchangers is changed from horizontal to vertical.
VI. <u>Auxiliary Systems:</u>		
Auxiliary Feedwater System	9.2.1	The SSWS has been added as a backup water supply.
	10.4.9	Manually controlled heating systems have been changed to automatic systems
		The Auxiliary Feedwater is supplied to the secondary side of the steam generator through a separate upper Auxiliary Feedwater nozzle.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 18 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
Condensers	10.4.1	Design basis for auxiliary condensers was revised.
		Instrumentation for main condenser was modified to include high differential pressure alarm and temperature recorder in the control room.
		Isolation valves were added to the auxiliary condenser and turbine plant heat exchanger with change from a motor operator to a gear operator.
		The number of condensate pumps in the condenser hotwells has been changed from three to two half-capacity pumps.
Vacuum pumps	10.4.2	The number of mechanical vacuum pumps was changed from two to three. During startup, discharge is to the atmosphere; during normal operation, discharge is through the charcoal filter system.
Circulating water system	10.4.5	Design basis was revised.
		Pressure-differential alarm on the screen is annunciated in control room.
		Butterfly valves on the turbine plant cooling water heat exchangers were added.
		Circulating water pipes are made from coated carbon steel instead of concrete or plastic.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 19 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
Condensate Cleanup System	10.4.6	Backwash recovery and powdered resin handling added to system design
Feedwater heaters	10.4.7	Separate external drain coolers have been added to the 6A and 6B heaters.
Steam Generator Blowdown System	10.4.8	Treatment capacity of the system has been increased from 50 to 640 gpm.
		Blowdown cooled by condensate of condensate/blowdown instead of component cooling water
		Blowdown now recycled to heater drain tank at high temperature
		The processing of spent resin has been changed from regeneration to flushing into the storage tank prior to drumming.
		Change in bed processing as a result of elimination of the regeneration mode.
		SGBS heat exchanger has been changed from ANS Safety Class 3 to NNS.
Fire Protection System	9.5.1	The Fire Protection System has been completely upgraded to address current NRC Regulatory Positions.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 20 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
Lighting systems	9.5.3	Lighting system powered from localized motor control centers in lieu of a central power substation.
		Instrument room and primary plant egress routes have been added to the list of areas provided with DC emergency lighting.
		The AC Essential Lighting System and DC Emergency Lighting System are reclassified as non-Class 1E.
Diesel Generator Fuel Oil Day Tank	9.5.4	Fuel oil supply increased to 2160 gallons from 3 hours
The Diesel Generator Fuel Oil Storage and Transfer System	9.5.4	The diesel fuel oil storage tank is equipped with:
		1. A fill line with a shutoff valve.
		2. A perforated fill line which runs to within 2 feet of the bottom of the tank.
		3. A dirt and water collector.
		4. Hold down straps embedded in a concrete foundation.
		5. A return line from the fuel oil day tank.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 21 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
Diesel Generator Combustion Air Intake and Exhaust System	9.5.8	Exhaust relief valve discharge changed to vertical.
Main Steam Supply System	10.2	Design temperature reduced to 541.5°F from 544.6°F.
		A vibration trip and alarm have been added.
		A MSR high level trip and alarm have been added.
	10.3	The main steam relief valves are relocated upstream from the safety valves to gain accessibility to these valves.
		The main steam isolation valve materials have been changed.
		Each steam line of auxiliary feedwater pump turbine is provided with an air-operated stop valve instead of motorized stop check valve.
		Phosphate was deleted from use and condensate polishing added.
		Design pressure changed to 1200 psig.
		Safety class piping extended to the first moment restraint beyond the Main Steam Stop Valves.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 22 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
		Power operated relief valves now set to open at 1130 psia.
		The Main Steam Stop Valve integral bypass valve has been upgraded to code Class 1 from Code Class 2
		Lowest and highest safety valve set pressures changed to 1185 and 1235 psig.
Steam Generators	10.3	Steam generator safety valves rated to pass 105 percent rather than 110 percent of flow.
Compressed Air System	9.3.1	Air accumulators are upgraded to ANS Safety class 3 and designed to ASME B&PV Code Section III Class 3 Requirements.
VII. Ventilation Systems:		
Containment Ventilation Systems	6.2.6	The hydrogen purge system filter efficiencies have been increased from 90 to 95%.
	9.4	CRDM cooling is accomplished by two 100-percent CRDM exhaust fans per containment instead of three 50-percent exhaust fans.
		The following changes have been made in the neutron detector well cooling system:

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 23 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
		1. Use of chilled water instead of component cooling water as the cooling medium of the neutron detector well cooling system
		2. A reduction in airflow from 24,000 ft^3 per containment to 13,100 ft^3 per containment for the neutron detector well cooling system due to the increase in the temperature gradient across the cooling coils
		Heating, ventilating, and air-conditioning (HVAC) dampers are manufactured in accordance with ANS Safety Class 3, 10 CFR Part 50 Appendix B, and manufacturers' standards rather than ASME II.
		To provide for adequate cooling during accident conditions, centrifugal chillers are used for the emergency fan coil units instead of service water.
		Increase size of containment coolers to absorb heat load from the CRDM.
		Only the containment purge exhaust ductwork is classified ANS Safety Class 3.
Other ventilation systems		
	9.4.1	Roof-mounted fans changed to in-duct fans for improved missile protection
		Reduction in outside air intake quantity for control room

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 24 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
		Control room pressurization capacity increased from 150 cfm to 800 cfm.
		Control room air-conditioning units increased to 100 percent redundancy from 50 percent redundancy.
		Greater than 10 percent of the total air quantity is directed through the control room emergency filtration units.
		Four nuclear safety related vane-axial fans are utilized in each diesel generator room instead of one.
	9.4.1	The concept of lead system and standby system is deleted. Emergency recirculation will activate both Train A and Train B components.
	9.4.2	Auxiliary safeguards buildings ventilation supply distribution systems are now classified as seismic Category I
	9.4.3	Auxiliary building ventilation supply distribution system classified as seismic Category I
		Electrical area ventilation system contains only two 50-percent-capacity fans.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 25 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
		Uncontrolled access area ventilation system contains two 50-percent-capacity fans.
		Battery rooms have in-duct fans instead of roof-mounted fans.
		Office and service area ventilation systems have 50-percent redundancy; these systems are not required to satisfy the single-failure criterion and are nonessential to the safe shutdown of the reactor.
	General	Auxiliary, safeguards, fuel-handling, and containment purge supply and exhaust are incorporated into primary plant ventilation system.
		Summer design condition of diesel generator building changed from 104°F to 122°F
		Filter bed thickness increased from 2 inches to 4 inches.
		Air inlet design temperature to the hydrogen purge exhaust unit changed from 120°F to 250°F.
		Instrument air accumulators are now provided for the control room HVAC system.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 26 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
VIII. Steam & Power Conversion Systems:		
Component and sub-system design	5.4	The steam generators for Unit 2 have been changed from D4's to D5's
Steam and power conversion system	10.1	The steam dump system to the condenser form the steam generator system is not a safety-related feature included in the steam and power conversion system.
	10.3	The Main Steam Isolation Valve (MSIV) Bypass Valve were converted form automatic to manual. The hydraulic actuactors were deleted and handwheels installed. The valves are capable of being locked in position.
Turbine-generator	10.2	Added Occupational Safety and Health Act (OSHA) to codes and standards.
		The worst case accident, a failure of the cast stage of the low pressure turbine rotor, is analyzed.
		The following have been added to the list of events that initiate a turbine trip:
		1. Reactor trip
		2. Steam generator high-high level

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 27 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
		3. Safety injection
		4. Generator trip
		5. Moisture separator high level (each MSR)
		6. Excessive vibration during speed operation from 900 rpm until unit is synchronized.
		The following have been deleted from the list of events that initiate a turbine trip
		1. Low flow of stator coolant
		The following have been added to the list of events that initiate a generator trip:
		1. Loss of lube oil pressure
		2. Low flow of stator coolant

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 28 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
IX. Waste Processing Systems:		
Liquid Waste Processing System	11.2	The following equipment has been added to the LWPS: 1. Laundry reverse osmosis system 2. Laundry holdup and monitor tanks 3. Laundry holdup and monitor tank pump 4. 10,000 gallon floor drain tank 2 5. 30,000 gallon floor drain tank 3
Solid Waste Processing System (SWPS)	11.4	Utilizes an ATCOR proprietary cement solidification system per ATCOR Topical Report No. ATC-132A.
X. Sampling & Monitoring Systems:		
Process Sampling System	9.3.2	Phosphate analyzers replaced by sodium ion analyzers. System changed to non-nuclear safety related and non-seismic down-stream from the external containment isolation valves.
	9.3.2, II.B.3	Inclusion of Post Accident Sampling System.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 29 of 30)

(See Note 1)

Systems or Components	CPNPP/FSAR Section	Changes
Containment Hydrogen Monitoring System	6.2.5	Remote thermal conductivity analyzers replaced by in-containment electrochemical sensors and microprocessor-based analyzers located in the control room.
Steam generator liquid sample monitors	11.5.2	Steam generator liquid sample monitors reduced from four to one to simplify design
Radiation Monitoring System	11.5	Changed from Analog to digital, microprocessor based system. Process monitors have been added to liquid waste processing and auxiliary condensate systems and to safeguards, auxiliary and fuel building vent ducts. Area monitors have been added to the fuel building to form a criticality alarm system.
		The auxiliary vent stack is no longer capable of being monitored by the containment air monitor
		Radiation monitors have been modified and have been added for accident monitoring.
	12.32	Change from analog system to digital microprocessor based system
		Radiation monitors have been added for accident monitoring.

TABLE 1.3-2
DESIGN CHANGES SINCE PSAR SUBMITTAL

(Sheet 30 of 30)

(See Note 1)

	Systems or Components	CPNPP/FSAR Section	Changes
XI.	Boron Recycle and Radioactive Waste Processing Systems		
1.	Boron Recycle	3.2	The code, code class, safety class, and seismic classification Table 17A-1 of system components were revised.
2.	Liquid Waste Processing System	3.2 Table 17A-1 Appendix 1A(B)	Same as for XI, item 1.
3.	Gaseous Waste Processing System	3.2 Table 17A-1 Appendix 1A(B)	Same as for XI, item 1.

NOTE 1: The FSAR is complete and does not rely on information contained in the PSAR. The original intent of this table was to provide a comparison with the PSAR when the FSAR was initially submitted for NRC Staff review. The information in this table is considered historical and will not be updated.

1.4 IDENTIFICATION OF AGENTS AND CONTRACTORS

1.4.1 OWNERS AND APPLICANTS - TXU GENERATION COMPANY LP (TXU POWER)

TXU Electric Generation Company LP, is a subsidiary of TXU Energy Company LLC (TXU Power) which is a subsidiary of TXU Corporation (TXU).

TXU Power is a deregulated part of TXU Corporation and includes business activities engaged in power production. TXU Power is a top competitive generator of electricity in the U. S., with substantial electrical generating capacity in coal, natural gas and nuclear.

The power generated at CPNPP is sold at market prices through power purchase and sale agreements coordinated with TXU Energy-Trading.

TXU Power has over 55 years of experience in the design, construction and operation of electric generating plants.

1.4.2 OPERATOR - TXU POWER

A charter was filed in the State of Texas, November 13, 1952, for the Industrial Generating Company "to manufacture and supply light, heat and electrical power, or either of them, in this state." The name was changed in April of 1973 to Texas Utilities Generating Company (TUGCO). Effective January 1, 1984, TUCO reorganized several of its subsidiaries through the formation of a new corporate entity named Texas Utilities Electric Company (TUEC). The reorganization was effected through a consolidation of DP&L, TESCO and TP&L. Further, plant operation functions and personnel of TUGCO were transferred to TUEC. Effective January 16, 1987, TUEC adopted a new corporate signature "TU Electric" and discontinued the use of the acrynom "TUGCO" for its generating division. The TUGCO generating division became the Generating Division of TU Electric. Also in 1987, Texas Utilities Services, Inc. (TUSI) became known as TU Services.

In a 1991 reorganization DP&L, TP&L, TESCO and the Generating Division were reorganized into six functional Divisions: Operations; Operations Support and Marketing; Production; Engineering and Bulk Power; Finance, Accounting and Regulation; and Corporate Services. In a 1997 reorganization, TU Electric's six functional divisions were reorganized into Business Units: Generation; Transmission; and Distribution. In 1999, Texas Utilities Company was renamed TXU Corporation.

In a 2002 reorganization, TXU Electric, a subsidiary of TXU Corporation, was reorganized in order to comply with Texas law requiring the restructuring of the electric utility industry.

Operations, engineering and construction activities for CPNPP are currently the responsibility of TXU Electric Generation Company LP, a subsidiary of TXU Energy Company LLC (TXU Power).

TXU Power currently owns substantial generating capacity in coal, natural gas and nuclear.

TXU Power has been designated by the Applicants as their Agent with the overall responsibility for the design, construction and operation of CPNPP.

1.4.3 ENGINEERING ORGANIZATION - TXU POWER

TXU Power has been designated by the Applicants to coordinate the design and construction of CPNPP.

TXU Power also furnishes engineering and other technical services at cost to the Applicants.

The engineering functions of TXU Power for CPSES were in Texas Utilities Services Inc. (TUSI) prior to 1984. In January 1, 1984 all engineering functions in TUSI were reorganized into TUGCO. TUGCO/TUSI was given responsibility in 1969 to direct the design and construction activities of all lignite generating units in the TUGCO system. In 1972 an agreement to coordinate the design, quality assurance, and construction supervision of the TUCO system's nuclear generating units was made between Owners and TUGCO/TUSI.

In October of 1991, engineering and construction activities for CPSES became the responsibility of the TU Electric Production Division. Within this division the Nuclear Production Group was delegated the responsibility for CPSES.

In 1997 operation, engineering and construction activities for CPSES became the responsibility of the TU Electric Generation Business Unit, Generation Division. Within this division the Nuclear Generation Group has been delegated the responsibility for CPSES.

In 1999, operation, engineering and construction activities for CPSES became the responsibility of the TXU Electric Generation Business Unit, Generation Division. Within this division the Nuclear Generation Group was delegated the responsibility for CPSES.

In 2002, operation, engineering and construction activity for CPSES became the responsibility of TXU Electric Generation Company LP, a subsidiary of TXU Energy Company LLC (TXU Power).

1.4.4 ARCHITECT-ENGINEER -

Gibbs & Hill, Inc. was the original architect-engineer responsible for the design and engineering of CPSES.

TXU Power gradually assumed more responsibility for the design and engineering of CPSES. This transition took place over several years and in an orderly and controlled manner. At the present time, TXU Power – Nuclear Generation Group is the engineering organization ultimately responsible for the design and engineering of CPSES. Portions of this design and engineering may be contracted to engineering services contractors working under a TXU Power approved Quality Assurance program.

Some of the engineering services contractors used at CPSES include:

- Stone and Webster Engineering Corporation (SWEC) - provided engineering services including design and hardware validation in various technical disciplines such as mechanical, electrical, instrumentation and control, large and small bore pipe supports.

- Impell - provided engineering services including design and hardware validation in selected areas such as fire protection, equipment qualification, safety-related cable tray hangers and non-safety related conduit supports.

- Ebasco - provided engineering services including design and hardware validation in selected areas such as HVAC; safety-related conduit supports, cable tray and hangers and non-safety related conduit supports not within Impell scope; and the System Interaction Program.

1.4.5 NUCLEAR STEAM SUPPLY SYSTEM MANUFACTURER - WESTINGHOUSE

Westinghouse Electric Corporation experience in nuclear plants for the electric utility industry is demonstrated by the pressurized water reactor plants that Westinghouse has designed, developed and manufactured. Table 1.4-1 lists all Westinghouse Pressurized Water Reactor plants to date, including those plants currently under construction or on order.

Westinghouse Electric Corporation has long held a position of leadership in the electrical manufacturing industry. Traditionally, this leadership has been based on technological development of both standard and new products, reliability and product quality. Nowhere is this traditional leadership displayed more vividly than in nuclear power. Through early participation in basic research and basic engineering development, Westinghouse has established a broad technological foundation in nuclear power application. This has been followed by a continuing program of sound technological development which enables Westinghouse to offer to the electric utility industry a reliable and safe source of power from the atom.

The experience of Westinghouse in nuclear activity is evident in numerous Nuclear power projects - completed, soon to go into operation or being developed.

1.4.6 EARTH SCIENCES ENGINEER - DAMES & MOORE

Dames & Moore has been designated as the subcontractor responsible for the earth sciences work at CPSES.

The partnership of Dames & Moore was founded in 1938 in Los Angeles, California. Since then, the firm has grown to more than 1500 employees in 42 offices in the United States and in 15 foreign countries. The varied experience and special knowledge of the firm’s partners and technical employees enable them to solve earth science and environmental engineering problems.

Their personnel have a diversified background in the fields of meteorology, marine geology, oceanography, coastal and off-shore engineering, air and water pollution, ecology, engineering geology, soil and rock mechanics and dynamics, foundation engineering, geophysics, engineering seismology, engineering hydrology, mineral exploration, and systems management.

Dames & Moore has served more than 8500 clients in over 100 countries, with over 30,000 investigations of various types.

Since 1965, Dames & Moore has made significant technical contributions to ER’s and SAR’s for more than 39 nuclear power stations, constructed, under construction, or planned in the United States. They have provided expert testimony to the Nuclear Regulatory Commission, the Advisory Commission on Reactor Safeguards, and various other regulatory agencies.

1.4.7 CONSTRUCTOR - BROWN & ROOT, INC.

Brown & Root, Inc. has been designated as constructor of CPSES. Brown & Root is an engineering and construction company headquartered in Houston, Texas.

The firm's operations are world-wide, with major engineering and construction offices in several nations, and project offices throughout the free world.

The company was founded by Herman Brown in 1919 as a partnership with Dan Root. George Brown, the past Chairman of the Board, joined the firm in 1923, and in 1929 the firm was incorporated and restyled to its present form, Brown and Root, Inc. In 1962, the majority of the stock was purchased by Halliburton Company. The firm operates now as a wholly owned subsidiary of Halliburton Company, retaining its identity and autonomy as Brown & Root, Inc. Brown & Root, Inc. has more than 65,000 employees around the world, with a large percentage located in the Southwest.

Brown & Root, Inc., has long been active in the field of power generation and to date has installed, or has under contract, central power stations with a combined capacity in excess of 40,000 MWe. Brown & Root, Inc. is currently constructing 2-1150 MWe PWR and has completed construction of 2-821 MWe BWR units.

1.4.8 SUBSURFACE AND SOILS INVESTIGATION - MASON-JOHNSTON & ASSOCIATES

Mason-Johnston & Associates has been designated as subcontractor to perform soil mechanics and foundation engineering studies at CPSES.

The firm of Mason-Johnston & Associates is primarily a professional service organization engaged in the fields of engineering geology, soil mechanics and foundation engineering. The firm provides field exploration, both land and marine, laboratory testing and soils and geological professional studies.

Mason-Johnston & Associates has been engaged in the fields of soil mechanics, engineering geology, and foundation engineering in connection with multi-purpose projects varying from missile bases, dams, multi-story buildings, bridges, tunnels, pipelines and power plants. The activities of the firm also include subsurface exploration by vertical and multi-angle core borings; bore-holder color photography; resistivity and seismic traverses; laboratory determinations of the properties of earth materials; and engineering geology, soil mechanics, and foundation engineering studies. The firm's activities have included projects in most of the United States as well as in the countries of France, Surinam, Venezuela, and the Territory of Puerto Rico.

1.4.9 RESERVOIR DESIGN - FREESE AND NICHOLS

Freese and Nichols was responsible for design of the Squaw Creek Reservoir system and the Safe Shutdown Impoundment at CPSES.

Through a direct continuity of partnerships and subsequent incorporation, Freese and Nichols has been in professional engineering practice since 1894 and dams and water supply systems are among its primary areas of specialization. The firm now employs a staff of approximately 130 people.

Over 60 dams designed by Freese and Nichols have been constructed or are currently being built in Texas. Several of these projects are providing condenser cooling water for electric generating plants, including four plants in the TXU Power system.

1.4.10 OPERATIONS QUALITY ASSURANCE AND ADMINISTRATIVE CONTROL - EDS NUCLEAR INCORPORATED

EDS Nuclear Incorporated was retained as a consultant for QA services to assist in the development of QA programs and to provide operations administrative support services.

Founded in 1969, with home offices in San Francisco, EDS Nuclear is engaged in providing specialized technical and management support services in connection with the design, construction and operation of nuclear power facilities. In 1984, EDS Nuclear Incorporated was bought by Combustion Engineering and renamed Impell Corporation. The company provides analyses, reports, and services which assure safe operation of nuclear facilities to owners of such facilities and for their principal contractors and regulatory agencies involved. The clients of Impell include public utility companies, architect-engineers, constructors, and equipment suppliers, who, in the aggregate, constitute all phases of a nuclear power plant project.

1.4.11 DIVISION OF RESPONSIBILITY

1.4.11.1 Design Stage

As indicated in Subsections 1.4.3 through 1.4.10, the design and construction of CPSES is coordinated and supervised by TXU Power. All parties (TXU Power, Gibbs & Hill, Westinghouse, Dames & Moore, Mason-Johnston, Freese and Nichols, EDS Nuclear and Brown & Root) have participated in the preliminary planning of CPSES as well as the preparation of the FSAR with TXU Power coordinating the effort. A review of the design bases and philosophies of the design for CPSES was conducted by all the above.

1.4.11.2 Procurement of Safety-Related Equipment

1.4.11.2.1 Westinghouse Scope of Supply

Westinghouse procures all items in their scope of supply. The equipment bidders' lists were approved by TXU Power. For further information, refer to Chapter 17.

1.4.11.2.2 Scope of TXU Power's Services

During design and construction TXU Power acts in procurement matters to insure that adequate information is provided to inform the bidders of all requirements for the requested equipment including but not limited to workmanship, material, documentation and shipping requirements. TXU Power is responsible for procurement of other safety-related equipment. TXU Power prepares the inquiries, sends them out for bids in accordance with the approved bidder's list, reviews the bids and prepares the requisition. After final approval by TXU Power, the purchase order is issued.

1.4.11.3 Construction

All construction activities at the site are under the supervision of TXU Power, with independent testing agencies contracted as necessary to perform special testing and to provide expertise in the interpretation of results.

1.4.11.4 Operation

TXU Power has the responsibility for the operation of CPSES including the preoperational testing and initial startup. TXU Power procures both safety-related and non-safety related equipment, spare parts and supplies to insure the safe, efficient and reliable operation of CPSES. All safety-related procurement is accomplished per the requirements of the TXU Power Quality Assurance Program.

1.4.11.5 Startup Assistance

Startup assistance will be provided by Impell Corporation.

TABLE 1.4-1
WESTINGHOUSE PRESSURIZED WATER REACTOR NUCLEAR POWER PLANTS

(Sheet 1 of 12)

Plant	Owner Utility	Location	Scheduled Commercial Operation	MWe Net	Number of Loops
Shippingport	Duquesne Light Company; Energy Research & Development Administration	Pennsylvania	1957	90	2
Yankee-Rowe	Yankee Atomic Electric Company	Massachusetts	1961	175	2
Trino Vercellese Enrico (Fermi)	Ente Nazionale per L' Energia Elettrica (ENEL)	Italy	1965	260	2
Chooz (Ardennes)	Societe d'Energie Nucleaire Franco-Belge des Ardennes (SENA)	France	1967	305	2
San Onofre No. 1	Southern California Edison Co.; San Diego Gas and Electric Co.	California	1968	450	2
Haddam Neck (Connecticut Yankee)	Connecticut Yankee Atomic Power Company	Connecticut	1968	575	2
Jose Cabrera - Zorita	Union Electrica, S. A.	Spain	1969	153	1
Beznau No. 1	Nordostschweizerische Kraftwerke AG (NOK)	Switzerland	1969	350	2
Robert Emmett Ginna	Rochester Gas and Electric Corporation	New York	1970	490	2
Mihama No. 1	The Kansai Electric Power Company, Inc.	Japan	1970	320	2

TABLE 1.4-1
WESTINGHOUSE PRESSURIZED WATER REACTOR NUCLEAR POWER PLANTS

(Sheet 2 of 12)

Plant	Owner Utility	Location	Scheduled Commercial Operation	MWe Net	Number of Loops
Point Beach No. 1	Wisconsin Electric Power Co.; Wisconsin Michigan Power Co.	Wisconsin	1970	497	2
H. B. Robinson No. 2	Carolina Power and Light Co.	South Carolina	1971	707	3
Beznau No. 2	Nordostschweizerische Kraftwerke AG (NOK)	Switzerland	1972	350	2
Point Beach No. 2	Wisconsin Electric Power Co.; Wisconsin Michigan Power Co.	Wisconsin	1972	497	2
Surry No. 1	Virginia Electric and Power Co.	Virginia	1972	822	3
Turkey Point No. 3	Florida Power and Light Co.	Florida	1972	745	3
Indian Point No. 2	Consolidated Edison Company of New York, Inc.	New York	1973	873	4
Prairie Island No. 1	Northern States Power Company	Minnesota	1973	530	2
Turkey Point No. 4	Florida Power and Light Co.	Florida	1973	745	3
Surry No. 2	Virginia Electric and Power Co.	Virginia	1973	822	3
Zion No. 1	Commonwealth Edison Company	Illinois	1973	1050	4

TABLE 1.4-1
WESTINGHOUSE PRESSURIZED WATER REACTOR NUCLEAR POWER PLANTS

(Sheet 3 of 12)

Plant	Owner Utility	Location	Scheduled Commercial Operation	MWe Net	Number of Loops
Kewaunee	Wisconsin Public Service Corp.; Wisconsin Power and Light Co.; Madison Gas and Electric Co.	Wisconsin	1974	560	2
Prairie Island No. 2	Northern States Power Company	Minnesota	1974	530	2
Takahama No. 1	The Kansai Electric Power Company, Inc.	Japan	1974	781	3
Zion No. 2	Commonwealth Edison Company	Illinois	1974	1050	4
Doel No. 1	Indivision Doel	Belguim	1975	390	2
Doel No. 2	Indivision Doel	Belguim	1975	390	2
Donald C. Cook No. 1	Indiana and Michigan Electric Company (AEP)	Michigan	1975	1090	4
Ringhals No. 2	Statens Vattenfallsverk (SSPB)	Sweden	1975	822	3
Trojan	Portland General Electric Co.; Eugene Water and Electric Board; Pacific Power and Light Company	Oregon	1975	1130	4
Indian Point No. 3	Power Authority of the State of New York	New York	1976	965	4

TABLE 1.4-1
WESTINGHOUSE PRESSURIZED WATER REACTOR NUCLEAR POWER PLANTS

(Sheet 4 of 12)

Plant	Owner Utility	Location	Scheduled Commercial Operation	MWe Net	Number of Loops
Salem No. 1	Public Service Electric and Gas Company; Philadelphia Electric Co.; Atlantic Electric Co.; Delmarva Power and Light Co.	New Jersey	1976	1090	4
Almaraz No. 1	Union Electrica, S. A.; Compania Sevillana de Electricidad, S. A.; Hidroelectrica Espanola, S. A.	Spain	1977	902	3
Beaver Valley No. 1	Duquesne Light Company; Ohio Edison Company; Pennsylvania Power Company	Pennsylvania	1977	852	3
Diablo Canyon No. 1	Pacific Gas and Electric Co.	California	1977	1084	4
Joseph M. Farley No. 1	Alabama Power Company	Alabama	1977	829	3
Ko-Ri No. 1	Korea Electric Company	Korea	1977	564	2
North Anna No. 1	Virginia Electric and Power Co.	Virginia	1977	898	3
Ringhals No. 3	Statens Vattenfallsvert (SSPB)	Sweden	1977	900	3
Lemoniz No. 1	Iberduero, S. A.	Spain	1978	902	3

TABLE 1.4-1
WESTINGHOUSE PRESSURIZED WATER REACTOR NUCLEAR POWER PLANTS

(Sheet 5 of 12)

Plant	Owner Utility	Location	Scheduled Commercial Operation	MWe Net	Number of Loops
Almaraz No. 2	Union Electrica, S. A.; Compania Sevillana de Electricidad, S. A.; Hidroelectrica Espanola, S. A.	Spain	1978	902	3
Diablo Canyon No. 2	Pacific Gas and Electric Co.	California	1978	1106	4
North Anna No. 2	Virginia Electric and Power Co.	Virginia	1978	898	3
Ohi No. 1	The Kansai Electric Power Company, Inc.	Japan	1978	1122	4
Ohi No. 2	The Kansai Electric Power Company, Inc.	Japan	1978	1122	4
Sequoyah No. 1	Tennessee Valley Authority	Tennessee	1978	1148	4
Angra dos Reis No. 1	Furnas-Centrais Eletricas, S. A.	Brazil	1978	626	2
Donald C. Cook No. 2	Indiana and Michigan Electric Company (AEP)	Michigan	1978	1060	4
Asco No. 1	Fuerzas Electricas de Cataluna, S. A. (FECSA);	Spain	1979	902	3
Asco No. 2	Fuerzas Electricas de Cataluna, S. A. (FECSA); Empresa Nacional Hidroelectrica del Ribagorzana, S. A. (ENHER); Fuerzas Hidroelectricas del Segre, S. A.; Hidroelectrica de Cataluna, S. A.	Spain	1979	902	3

TABLE 1.4-1
WESTINGHOUSE PRESSURIZED WATER REACTOR NUCLEAR POWER PLANTS

(Sheet 6 of 12)

Plant	Owner Utility	Location	Scheduled Commercial Operation	MWe Net	Number of Loops
Lemoniz No. 2	Iberduero, S. A.	Spain	1979	902	3
Sequoyah No. 2	Tennessee Valley Authority	Tennessee	1979	1148	4
Watts Bar No. 1	Tennessee Valley Authority	Tennessee	1979	1177	4
William B. McGuire No. 1	Duke Power Company	North Carolina	1979	1180	4
Joseph M. Farley No. 2	Alabama Power Company	Alabama	1979	829	3
Krsko	Savske Elektrarne, Ljubljana, Slovenia; Elektroprivreda, Zagreb, Croatia	Yugoslavia	1979	615	2
Ringhals No. 4	Statens Vattenfallsvert (SSPB)	Sweden	1979	900	3
Salam No. 2	Public Service Electric and Gas Company; Philadelphia Electric Co.; Atlantic Electric Co.; Delmarva Power and Light Co.	New Jersey	1979	1115	4
Virgil C. Summer	South Carolina Electric and Gas Company	South Carolina	1980	900	3
Watts Bar No. 2	Tennessee Valley Authority	Tennessee	1980	1177	4
William B. McGuire	Duke Power Company	North Carolina	1980	1180	4

TABLE 1.4-1
WESTINGHOUSE PRESSURIZED WATER REACTOR NUCLEAR POWER PLANTS

(Sheet 7 of 12)

Plant	Owner Utility	Location	Scheduled Commercial Operation	MWe Net	Number of Loops
Comanche Peak No. 1	Texas Utilities Electric Co.	Texas	1985	1150	4
South Texas Project Unit No. 1	Houston Lighting and Power Co.; Central Power and Light Co.; City Public Service of San Antonio; City of Austin, Texas	Texas	1980	1250	4
Byron No. 1	Commonwealth Edison Company	Illinois	1981	1120	4
Seabrook No. 1	Public Service Company of New Hampshire; United Illuminating Company	New Hampshire	1981	1200	4
Braidwood No. 1	Commonwealth Edison Company	Illinois	1981	1120	4
Catawba No. 1	Duke Power Company	South Carolina	1981	1153	4
Beaver Valley No. 2	Duquesne Light Company; Ohio Edison Company; Pennsylvania Power Co.; Cleveland Electric Illuminating Company; Toledo Edison Company	Pennsylvania	1982	852	3
Callaway No. 1	SNUPPS - Union Electric Co.	Missouri	1982	1150	4
Ko-Ri No. 2	Korea Electric Company	Korea	1982	605	2

TABLE 1.4-1
WESTINGHOUSE PRESSURIZED WATER REACTOR NUCLEAR POWER PLANTS

(Sheet 8 of 12)

Plant	Owner Utility	Location	Scheduled Commercial Operation	MWe Net	Number of Loops
Braidwood No. 2	Commonwealth Edison Company	Illinois	1982	1120	4
Byron No. 2	Commonwealth Edison Company	Illinois	1982	1120	4
Comanche Peak No. 2	Texas Utilities Electric Co.	Texas	1986	1150	4
Vandellos No. 2	Fuerzas Electricas de Cataluna, S. A. (FECSA); Empresa Nacional Hidroelectrica del Ribagorzana, S. A. (ENHER); Fuerzas Hidroelectricas del Segre S. A.; Hidroelectrica de Cataluna, S. A.	Spain	1982	900	3
Marble Hill No.1	Public Service Company of Indiana, Inc.; Wabash Valley Power Association	Indiana	1982	1130	4
Millstone No. 3	Northeast Nuclear Energy Co.	Connecticut	1982	1156	4
South Texas Project Unit No. 2	Houston Lighting and Power Co.; Central Power and Light Co.; City Public Service of San Antonio; City of Austin, Texas	Texas	1982	1250	4
Wolf Creek Unit No. 1	SNUPPS - Kansas Gas and Electric Company; Kansas City Power and Light Company	Kansas	1982	1150	4

TABLE 1.4-1
WESTINGHOUSE PRESSURIZED WATER REACTOR NUCLEAR POWER PLANTS

(Sheet 9 of 12)

Plant	Owner Utility	Location	Scheduled Commercial Operation	MWe Net	Number of Loops
Napot Point No. 1	National Power Corporation	Philippines	1982	620	2
Sayago No. 1	Iberduero, S. A.	Spain	1982	1000	3
Catawba No. 2	Duke Power Company	South Carolina	1983	1153	4
Seabrook No. 2	Public Service Company of New Hampshire; United Illuminating Company	New Hampshire	1983	1200	4
Maanshan No. 1	Taiwan Power Company	Taiwan	1983	907	3
Alvin W. Vogtle No. 1	Georgia Power Company; Oglethorpe Electric Membership Corp.; Municipal Electric Authority of Georgia; City of Dalton, Georgia	Georgia	1983	1113	4
Fort Calhoun No. 2	Omaha Public Power District; Nebraska Public Power District	Nebraska	1983	1136	4
Jamesport No. 1	Long Island Lighting Company; New York State Electric and Gas Corp.	New York	1984	1150	4
Maanshan No. 2	Taiwan Power Company	Taiwan	1984	907	3

TABLE 1.4-1
WESTINGHOUSE PRESSURIZED WATER REACTOR NUCLEAR POWER PLANTS

Plant	Owner Utility	Location	Scheduled Commercial Operation	MWe Net	Number of Loops
Alvin W. Vogtle No. 2	Georgia Power Company; Oglethorpe Electric Membership Corp.; Municipal Electric Authority of Georgia; City of Dalton, Georgia	Georgia	1984	1113	4
Marble Hill No. 2	Public Service Company of Indiana, Inc.; Wabash Valley Power Association	Indiana	1984	1130	4
Shearon Harris No. 1	Carolina Power and Light Co.	North Carolina	1984	900	3
Sterling	SNUPPS - Rochester Gas and Electric Corporation; Central Hudson Gas and Electric Corporation; Niagara Mohawk Power Corporation; Orange and Rockland Utilities, Inc.	New York	1984	1150	4
Sundesert No. 1	San Diego Gas and Electric Co.	California	1984	950	3
Tyrone No. 1	SNUPPS - Northern States Power Company	Wisconsin	1984	1150	4
NEP-1	New England Power Company	-	1984	1150	4
Atlantic No. 1 (O.P.S.)	Public Service Electric and Gas Company; Atlantic Electric Co.; Jersey Central Power and Light Company	New Jersey	1985	1150	4

TABLE 1.4-1
WESTINGHOUSE PRESSURIZED WATER REACTOR NUCLEAR POWER PLANTS

(Sheet 11 of 12)

Plant	Owner Utility	Location	Scheduled Commercial Operation	MWe Net	Number of Loops
Jamesport No. 2	Long Island Lighting Company; New York State Electric and Gas Corp.	New York	1986	1150	4
NEP-2	New England Power Company	-	1986	1150	4
Shearon Harris No. 2	Carolina Power and Light Co.	North Carolina	1986	900	3
Sundesert No. 2	San Diego Gas and Electric Co.	California	1986	950	3
Calloway No. 2	SNUPPS - Union Electric Company	Missouri	1987	1150	4
Koshkonong No. 1	Wisconsin Electric Power Co.; Madison Gas and Electric Co.; Wisconsin Power and Light Co.; Wisconsin Public Service Corp.	Wisconsin	1987	900	3
Atlantic No. 2 (O.P.S.)	Public Service Electric and Gas Company; Atlantic Electric Co.; Jersey Central Power and Light Company	New Jersey	1987	1150	4
Shearon Harris No. 4	Carolina Power and Light Co.	North Carolina	1988	900	3

TABLE 1.4-1
WESTINGHOUSE PRESSURIZED WATER REACTOR NUCLEAR POWER PLANTS

(Sheet 12 of 12)

Plant	Owner Utility	Location	Scheduled Commercial Operation	MWe Net	Number of Loops
Koshkonong No. 2	Wisconsin Electric Power Co.; Madison Gas and Electric Co.; Wisconsin Power and Light Co.; Wisconsin Public Service Corp.	Wisconsin	1989	900	3
Unit No. 4	Iberduero, S. A.	Spain	1980's	1000	3
Shearon Harris No. 3	Carolina Power and Light Co.	North Carolina	1990	900	3
Unassigned No. 1 (O.P.S.)	Public Service Electric and Gas Company; Atlantic Electric Company	New Jersey	1990	1150	4
Unassigned No. 2 (O.P.S.)	Public Service Electric and Gas Company; Atlantic Electric Company	New Jersey	1992	1150	4
NORCO	Puerto Rico Water Resources Authority	Puerto Rico	-	583	2
Unit No. 1	Central Maine Power Company	Maine	-	1200	4
South Dade No. 1	Florida Power and Light Co.	Florida	-	1150	4
South Dade No. 2	Florida Power and Light Co.	Florida	-	1150	4

1.5 REQUIREMENTS FOR FURTHER TECHNICAL INFORMATION

The activities described in Section 1.5 will be maintained as historical information and will not be updated.

Reference [1] presents descriptions of the safety-related research and development programs which are being carried out for, or by, or in conjunction with, Westinghouse Nuclear Energy Systems, and which are applicable to Westinghouse Pressurized Water Reactors (PWRs).

For each program still in progress the safety-related program is first introduced, followed, where appropriate, by background information. There is, then, a description of the program which relates the program objectives to the problem and presents pertinent recent results. Finally, a back up position may be given for programs (generally experimental rather than analytical) which have not yet reached a stage where it is reasonably certain that the results confirm the expectation. The back up position is one that might be used if the results are unfavorable; it is not necessarily the only course that might be taken.

The term "research and development", as used in this report, is the same as that used by the NRC in 10CFR50.2, that is:

(n) 'Research and development' means (1) theoretical analysis, exploration or experimentation; or (2) the extension of investigative findings and theories of a scientific nature into practical application for experimental and demonstration purposes including the experimental production and testing of models, devices, equipment, materials, and processes.

The technical information generated by these research and development programs will be used either to demonstrate the safety of the design and more sharply define margins of conservatism, or will lead to design improvements.

1.5.1 BLOWDOWN HEAT TRANSFER TESTING

The Nuclear Regulatory Commission (NRC) acceptance criteria for Emergency Core Cooling Systems (ECCS) for light-water power reactors was issued in Section 50.46 of 10CFR50 on December 28, 1973. It defines the basis and conservative assumptions to be used in the evaluation of the performance of the ECCS. Westinghouse believes that some of the conservatism of the criteria is associated with the manner in which transient departure from nucleate boiling (DNB) phenomena are treated in the evaluation models. Transient critical heat flux data presented at the 1972 specialists meeting of the Committee on Reactor Safety Technology (CREST) indicated that the time to DNB can be delayed under transient conditions. To demonstrate the conservatism of the ECCS evaluation models, Westinghouse initiated a program to experimentally simulate the blowdown phase of a loss of coolant accident (LOCA). This testing is part of the Electric Power Research Institute (EPRI) sponsored Blowdown Heat Transfer Program, which was started early in 1976. Testing was completed in 1979. A DNB correlation will be developed by Westinghouse from these test results for use in the ECCS analyses.

1.5.1.1 Objective

The objective of the Blowdown Heat Transfer Test was to determine the time that DNB occurs under LOCA conditions. This information will be used to confirm the existing, or develop a new

Westinghouse transient DNB correlation. The steady state DNB data obtained from 15 x 15 and 17 x 17 test programs can be used to assure that the geometrical differences between the two fuel arrays can be correctly treated in the transient correlations.

1.5.1.2 Program

The program was divided into two phases. The Phase I tests started from steady state conditions, with sufficient power to maintain nucleate boiling throughout the bundle. Controlled ramps of decreasing test section pressure or flow initiated DNB. By applying a series of controlled conditions, investigation of the DNB was studied over a range of qualities and flows, and at pressures relevant to a PWR blowdown.

Phase I provided separate-effects data to permit heat transfer correlation development.

Typical parameters used for Phase I testing are shown in Table 1.5-1.

Phase II simulates PWR behavior during a LOCA to permit definition of the time delay associated with onset of DNB. Tests in this phase covered the large double ended guillotine cold leg break. All tests in Phase II were also started after establishment of typical steady state operating conditions. The fluid transient was then initiated, and the rod power decay programmed in such a manner as to simulate the actual heat input of fuel rods. The test was terminated when the heater rod temperatures reach a predetermined limit.

Typical parameters used for Phase II testing are shown in Table 1.5-2.

1.5.1.3 Test Description

The experimental program was conducted in the J-Loop at the Westinghouse Forest Hills Facility with a full length 5 x 5 rod bundle simulating a section of a 15 x 15 assembly to determine DNB occurrence under LOCA conditions.

The heater rod bundles used in this program were internally-heated rods, capable of a maximum power of 18.8 kW/ft, with a total power of 135 kW (for extended periods) over the 12 foot heated length of the rod. Heat was generated internally by means of a varying cross-sectional resistor which approximates a chopped cosine power distribution. Each rod was adequately instrumented with a total of 12 clad thermocouples.

1.5.1.4 Results

The experiments in the DDNB Facility resulted in cladding temperature and fluid properties measured as a function of time throughout the blowdown range from 0 to 20 seconds.

Facility modifications and installation of the initial test bundle were completed. A series of shakedown tests in the J-Loop were performed. These tests provided data for instrumentation calibration and check-out, and provided information regarding facility control and performance. Initial program tests were performed during the first half of 1975. Under the sponsorship of EPRI, testing was reinitiated during 1976 on the same test bundle. The testing was terminated in November and plans were made for a new test bundle and further testing during 1978-79. These tests were completed in December of 1979. A DNB correlation will be developed from these test results for use in the Westinghouse ECCS analyses.

REFERENCES

1. Eggleston, F. T., “Safety-Related Research and Development for Westinghouse Pressurized Water Reactors, Program Summaries,” WCAP-8768, latest revision.

TABLE 1.5-1
DELAYED DEPARTURE FROM NUCLEATE BOILING PHASE I TEST PARAMETERS

Parameters	Nominal Value
Initial Steady State Conditions	
Pressure	1250 to 2250 psia
Test section mass velocity	12 to 2.5 x 10^6 lb/hr-ft^2
Core inlet temperature	550 to 600°F
Maximum heat flux	306,000 to 531,000 Btu/hr-ft^2
Transient Ramp Conditions	
Pressure decrease	0 to 350 psi/sec and subcooled depressurization from 2250 psia
Flow decrease	0 to 100%/sec
Inlet enthalpy	Constant

TABLE 1.5-2
DELAYED DEPARTURE FROM NUCLEATE BOILING PHASE II TEST PARAMETERS

Parameters	Nominal Value
Initial Steady State Conditions	
Pressure	2250 psia
Test section mass velocity	2.5 x 10^6 lb/hr-ft^2
Inlet temperature	545°F
Maximum heat flux	531,000 Btu/hr-ft^2
Transient Conditions	
Simulated break	Double ended cold leg guillotine breaks

1.6 MATERIAL INCORPORATED BY REFERENCE

Table 1.6-1 lists documents which provide information additional to that provided in this FSAR and have been filed separately with the Nuclear Regulatory Commission (NRC) in support of the CPNPP operating licenses. A change to any of the documents listed in this table is considered to be a change to the FSAR and is subject to the same processing requirements. It should be noted, however, that for documents with revisions and/or dates, only the specific revisions and/or dates listed are considered to be part of the FSAR. Later revisions to these documents are not part of the FSAR unless they are incorporated into this table (except for the Technical Requirements Manual (including TRM Bases) and Technical Specifications Bases).

Table 1.6-2 lists many of the topical reports and other licensing documents which were provided to the NRC in support of the CPNPP operating licenses as additional background and/or reference material for the FSAR. Material in this table is not considered to be “incorporated by reference” and changes to these documents are not considered to changes to the FSAR. Table 1.6-2 is historical and is not updated.

Documents listed in Table 1.6-2 (or are referenced elsewhere in the FSAR but are not listed in Table 1.6-1) are provided for information (e.g., references listed at the end of each FSAR section) or are documents to which CPNPP is committed (e.g., Regulatory Guides, Codes and Standards). Compliance with committed documents is required but the documents are not considered to be part of the FSAR.

TABLE 1.6-1
DOCUMENTS INCORPORATED BY REFERENCE

(Sheet 1 of 5)

Report	Reference Section(s)
"An Evaluation of the Rod Ejection Accident in Westinghouse Pressurized Water Reactors Using Spatial Kinetics Methods," WCAP-7588, Revision 1-A, January 1975	15.4
"Overpressure Protection for Westinghouse Pressurized Water Reactors," WCAP-7769, October 1971	5.2
"Pipe Breaks for the LOCA Analysis of the Westinghouse Primary Coolant Loop," WCAP-8082-P-A (Proprietary) and WCAP-8172-A (Non-Proprietary), January 1975 (Non-Proprietary), January 1975	3.6B
WCAP-10698-P-A, "SGTR Analysis Methodology to Determine the Margin to Steam Generator Overfill," August 1987.	5.2, 6.2, 15.1, 15.2, 15.3, 15.4, 15.5, 15.6
WCAP-14882-P-A, "RETRAN-02 Modeling and Qualification for Westinghouse Pressurized Water Reactor Non-LOCA Safety Analyses," April 1999.	
"VIPRE-01 Modeling and Qualification for Pressurized Water Reactor Non-LOCA Thermal-Hydraulic Safety Analysis," WCAP-14565-P-A, October 1999.	4.4, 15.1, 15.3, 15.4
"Fuel Densification Experimental Results and Model for Reactor Application," WCAP-8218-P-A (Proprietary) and WCAP-8219-A (Non-Proprietary), March 1975.	4.1, 4.2, 4.3, 4.4
"Westinghouse Mass and Energy Release Data For Containment Design," WCAP-8264-P-A, Rev. 1 July 2004 (Proprietary) and WCAP-8312-A, Revision 2, August 1975 (Non-Proprietary).	6.2
"Westinghouse Anticipated Transients Without Trip Analysis," WCAP-8330, August 1974	4.3, 4.6 15.1, 15.2 15.8
"Environmental Qualification of Westinghouse Class 1E Equipment," WCAP-8587, Rev. 6, March 1983	3.10N, 3.11N

TABLE 1.6-1
DOCUMENTS INCORPORATED BY REFERENCE

(Sheet 2 of 5)

Report	Reference Section(s)
"General Method of Developing Multi-frequency Biaxial Test Inputs for Bistables," WCAP-8624 (Proprietary) September 1975 and WCAP-8695 (Non-Proprietary) August 1975.	3.10N
Response to Station Blackout Rule", TXX-92447 October 1, 1992	8B
TP-03143, "Missile Analysis Methodology for GE Nuclear Steam Turbine Rotors by the SWPC," July 31, 2003.	3.5, 10.2
Technical Requirements Manual (TRM) for Comanche Peak Nuclear Power Plant Units 1 and 2	All Sections
Technical Specification Bases for Comanche Peak Nuclear Power Plant Units 1 and 2	All Sections
Foster, J.P., et. al., "Westinghouse Improved Performance Analysis and Design Model (PAD 4.0)," WCAP-15063-P-A, Revision 1, with Errata (Proprietary) and WCAP-15064-NP-A, Revision 1, with Errata (Non-Proprietary), July 2000.	4.2, 4.3, 4.4, 15.1
Davidson, S.L., Ryan, T. L., "VANTAGE+ Fuel Assembly Reference Core Report," WCAP-12610-P-A and Appendices, April 1995.	4.2, 4.3, 4.4, 15.1
Weiner, R. A., et. al., "Improved Fuel Performance Models for Westinghouse Fuel Rod Design and Safety Evaluations," WCAP-10851-P-A (Proprietary) and WCAP-11873-A (Non-Proprietary), August 1988.	4.2
Kersting, P. J., et. al., "Assessment of Clad Flattening and Densification Power Spike Factor Elimination in Westinghouse Nuclear Fuel," WCAP-13589-A, March 1995.	4.2
WCAP-13060-P-A, "Westinghouse Fuel Assembly Reconstitution Methodology," July 1993 (Technical Specification 5.6.5b Item 18).	4

TABLE 1.6-1
DOCUMENTS INCORPORATED BY REFERENCE

(Sheet 3 of 5)

Report	Reference Section(s)
WCAP-10444-P-A, "Reference Core Report VANTAGE 5, Fuel Assembly," September 1985 (Technical Specification 5.6.5b Item 16).	4.2, 4.3, 4.4, 15.1
Scherder, W. J. (ed.), et al. "Reactor Core Response to Excessive Secondary Steam Releases," WCAP-9226-P-A, Revision 1, February 1998.	4.4, 15.1
"Addendum 1 to WCAP-12488-A, Revision to Design Criteria," WCAP-12488-A, Addendum 1-A, Revision 1, January 2002.	4.2
Davidson, S. L. (ed.), et al., "Extended Burnup Evaluation of Westinghouse Fuel," WCAP-10125-P-A, December 1985.	4.2
WCAP-14040-NP-A, "Methodology used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves."	5.2.2.11
Design Basis Document, DBD-ME-006, "Control of Heavy Loads at Nuclear Plants"	9.1.4
"RETRAN-02 Modeling and Qualification for Westinghouse Pressurized Water Reactor Non-LOCA Safety Analyses," WCAP-14882-P-A, April 1999.	5.2, 15.1, 15.2, 15.3, 15.4, 15.5, 15.6
"Revised Thermal Design Procedure," WCAP-11397-P-A, April 1989.	4.2, 4.3, 4.4, 15.0, 15.1, 15.2, 15.3, 15.4, 15.6
"TWINKLE - A Multi-dimensional Neutron Kinetics Computer Code," WCAP-7979-P-A, January 1975.	15.0, 15.1, 15.4
"FACTRAN - A FORTRAN-IV Code for Thermal Transients in a UO2 Fuel Rod," WCAP-7908-A, December 1989.	15.4
"LOFTRAN Code Description," WCAP-7907-P-A, April 1984.	15.4
"Methodology for the Analysis of the Dropped Rod Event," WCAP-11394-P-A, January 1990.	4.2, 4.3, 4.4, 15.1, 15.4

TABLE 1.6-1
DOCUMENTS INCORPORATED BY REFERENCE

(Sheet 4 of 5)

Report	Reference Section(s)
"ANC: A Westinghouse Advanced Nodal Computer Code," WCAP-10965-P-A, September 1986.	15.4
WCAP-10079-P-A (Proprietary) and WCAP-10080-A (Non-proprietary), 1985. Meyer, P. E., "NOTRUMP, A Nodal Transient Small Break and General Network Code."	15.6
Report Reference Section(s) WCAP-10054-P-A, Addendum 2, Revision 1 (Proprietary), 1995. Thompson, C.M., et al, "Addendum to the Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code: Safety Injection into the Broken Loop and COSI Condensation Model."	15.6
WCAP-10054-P-A (Proprietary) and WCAP-10081-A (Non-proprietary), 1985. Lee, N. Rupprecht, S. D., Schwarz, W. R, and Tauche, W. D., "Westinghouse Small ECCS Evaluation Model Using the NOTRUMP Code."	15.6
Bajorek, S.M., et. al., 1998, "Code Qualification Document for Best-Estimate LOCA Analysis," WCAP-12945-P-A, Volume 1, Revision 2 and Volumes 2 through 5, Revision 1.	15.6
WCAP-16009-P-A, "Realistic Large-Break LOCA Evaluation Methodology Using the Automated Statistical Treatment of Uncertainty Method (ASTRUM)", (Proprietary), January 2005.	15.6
WCAP-8745, "Design Bases for the Thermal Overpower ΔT Trip Functions," September 1986.	15.1
WCAP-10325-P-A, (Proprietary) and WCAP-10326-A, (Nonproprietary), "Westinghouse LOCA Mass and Energy Release Model for Containment Design, March 1979 Version," May 1983.	6.2
WCAP-8264, Rev. 1, August 1975 and WCAP-8312, Rev. 2, "Topical Report Westinghouse Mass and Energy Release Data Containment Design."	6.2

TABLE 1.6-1
DOCUMENTS INCORPORATED BY REFERENCE

(Sheet 5 of 5)

Report	Reference Section(s)
WCAP-8822 and WCAP-8860, "Mass and Energy Releases Following a Steam Line Rupture," September 1976; WCAP-8822 and WCAP-8860, "Supplement 1 - Calculations of Steam Superheat in Mass/Energy Releases Following a Steam Line Rupture," September 1986; WCAP-8822 and WCAP-8860, "Supplement 2 - Impact of Steam Superheat in Mass/Energy Releases Following a Steam Line Rupture for Dry and Subatmospheric Containment Designs," September 1986.	6.2
WCAP-9272, "Westinghouse Reload Safety Evaluation Methodology," July 1985.	4.2, 4.3, 4.4, 15.1
RXE-94-001-A, "Safety Analysis of the Postulated Inadvertent Boron Dilution Event in Modes 3, 4, and 5," February 1994.	15.1
Skaritka, J., (ed.), "Fuel Rod Bow Evaluation," WCAP-8691, Rev. 1 (Proprietary) and WCAP-8692, Rev. 1 (Non-Proprietary), July 1979.	

TABLE 1.6-2 (HISTORICAL)
DOCUMENTS PROVIDED AS ADDITIONAL REFERENCE INFORMATION

(Sheet 1 of 12)

Report	Reference Section(s)
"The Doppler Effect for a Non-Uniform Temperature Distribution in Reactor Fuel Elements," WCAP-2048, July 1962	4.3
"Single Phase Local Boiling and Bulk Boiling Pressure Drop Correlations," WCAP-2850 (Proprietary), April 1966 and WCAP-7916 (Non-Proprietary), June 1972	4.4
"In-Pile Measurement of UO_2 Thermal Conductivity," WCAP-2923, 1966	4.4
"Hydraulic Tests of the San Onofre Reactor Model," WCAP-3269-8, June 1964	4.4
"LEOPARD - A Spectrum Dependent Non-Spatial Depletion Code for the IBM - 7094," WCAP-3269-26, September 1963	4.3, 15.0, 15.4
"Saxton Core II Fuel Performance Evaluation," WCAP-3385-56, Part II, "Evaluation of Mass Spectrometric and Radio-chemical Analyses of Irradiated Saxton Plutonium Fuel," July 1970	4.3, 4.4
"Xenon-Induced Spatial Instabilities in Large PWRs," WCAP-3680-20, (EURAEC-1974) March 1968	4.3
"Control Procedures for Xenon-Induced X-Y Instabilities in Large PWR's" WCAP-3680-21, (EURAEC-2111) February 1969	4.3
"Xenon-Induced Spatial Instabilities in Three-Dimensions," WCAP-3680-22, (EURAEC-2116) September 1969	4.3
"Pressurized Water Reactor pH - Reactivity Effect Final Report," WCAP-3696-8, (EURAEC-2074) October 1968	4.3
"PUO_2 - UO_2 Fueled Critical Experiments," WCAP-3726-1, July 1967	4.3
"Melting Point of Irradiated UO_2," WCAP-6065, February 1965	4.2, 4.4

TABLE 1.6-2 (HISTORICAL)
DOCUMENTS PROVIDED AS ADDITIONAL REFERENCE INFORMATION

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Report	Reference Section(s)
"Burnup Physics of Heterogeneous Reactor Lattices," WCAP-6069, June 1965	4.4
"LASER - A depletion Program for Lattice Calculations Based on MUFT and THERMOS," WCAP-6073, April 1966	4.3
"Supplementary Report on Evaluation of Mass Spectrometric and Radio-chemical Analyses of Yankee Core I Spent Fuel, Including Isotopes of Elements Thorium Through Curium," WCAP-6086, August 1969	4.3
"Subchannel Thermal Anaylsis of Rod Bundle Cores," WCAP-7015, Revision 1, January 1969	4.4
"The PANDA Code," WCAP-7048-P-A (Proprietary) and WCAP-7757-A (Non-Proprietary), January 1975	4.3
"Evaluation of Protective Coatings for use in Reactor Containment," WCAP-7198-L (Proprietary), April 1969 and WCAP-7825 (Non-Proprietary), December 1971	6.1N
"The TURTLE 24.0 Diffusion Depletion Code," WCAP-7213-P-A (Proprietary) and WCAP-7758-A (Non-Proprietary), January 1975	4.3, 15.0 15.4
"Evaluation of Nuclear Hot Channel Factor Uncertainties," WCAP-7308-L (Proprietary) and WCAP-7810 (Non-Proprietary), December 1971	4.3
"Application of the THINC Program to PWR Design," WCAP-7359-L (Proprietary), August 1969 and WCAP-7838 (Non-Proprietary), January 1972	4.4
"Sensitized Stainless Steel in Westinghouse PWR Nuclear Steam Supply Systems," WCAP-7477-L (Proprietary), March 1970 and WCAP-7735 (Non-Proprietary), August 1971	5.2
"Solid State Logic Protection System Description," WCAP-7488-L (Proprietary), March 1971 and WCAP-7672 (Non-Proprietary), May 1971.	7.2, 7.3

TABLE 1.6-2 (HISTORICAL)
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Report	Reference Section(s)
"Radiological Consequences of a Fuel Handling Accident," WCAP-7518-L (Proprietary) and WCAP-7828 (Non-Proprietary), June 1970	15.7
"Seismic Vibration Testing with Sine Beats," WCAP-7558, October 1971	3.10N
"Dynamic Fracture Toughness Properties of Heavy Section A533 Grade B Class 1 Steel Plate," WCAP-7623, December 1970	5.4
"Interchannel Thermal Mixing with Mixing Vane Grids," WCAP-7667-P-A (Proprietary) and WCAP-7755-A (Non-Proprietary), January 1975	4.4
"DNB Tests Results for New Mixing Vane Grids (R)," WCAP-7695-P-A (Proprietary) and WCAP-7958-A (Non-Proprietary), January 1975	4.4
"DNB Test Results for R Grid Thimble Cold Wall Cells," WCAP-7695-Addendum 1-P-A (Proprietary) and WCAP-7958-Addendum 1-A (Non-Proprietary), January 1975	4.4
"Testing of Engineering Safety Features Actuation System," WCAP-7705, Revision 2, January 1976.	7.3
"An Evaluation of Solid State Logic Reactor Protection in Anticipated Transients," WCAP-7706-L (Proprietary) and WCAP-7706 (Non-Proprietary), February 1973	4.6, 7.1, 7.2
"Electric Hydrogen Recombiner for PWR Containments," WCAP-7709-L, Supplements 1 through 7 (Proprietary) and WCAP-7820, Supplements 1 through 7 (Non-Proprietary), 1971 through 1977	3.11N, 6.2
"A Comprehensive Space-Time Dependent Anaylsis of Loss of Coolant (SATAN-IV Digital Code)," WCAP-7750, August 1971	3.6B

TABLE 1.6-2 (HISTORICAL)
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Report	Reference Section(s)
"Behavior of Austenitic Stainless Steel in Post Hypothetical Loss of Coolant Accident Environment," WCAP-7798-L (Proprietary) and WCAP-7803 (Non-Proprietary), January 1972	6.1N
"Nuclear Fuel Division Quality Assurance Program Plan," WCAP-7800, Revision 4-A, April 1975	4.2, 17
"Nuclear Design of Westinghouse Pressurized Water Reactors with Burnable Poison Rods," WCAP-7806, December 1971	4.3
"Power Distribution Control of Westinghouse Pressurized Water Reactors," WCAP-7811, December 1971	4.3
"Evaluation of Steam Generator Tube, Tubesheet and Divider Plate Under Combined LOCA Plus SSE Conditions," WCAP-7832, December 1973	5.4
"Inlet Orificing of Open PWR Cores," WCAP-7836, January 1972	4.4
"Methods of Determining the Probability of a Turbine Missile Hitting a Particular Plant Region," Topical Report WCAP-7861, February 1972.	3.5
"Neutron Shielding Pads," WCAP-7870, May 1972	3.9N
"LOFTRAN Code Description," WCAP-7907, June 1972	5.2, 15.0 15.1, 15.2 15.3, 15.4 15.5, 15.6
"FACTRAN - A FORTRAN-IV Code for Thermal Transients in a UO_2 Fuel Rod," WCAP-7908, June 1972	15.0, 15.2 15.3, 15.4
"MARVEL, A Digital Computer Code for Transient Analysis of a Multiloop PWR System," WCAP-7909, June 1972	6.2
"Power Peaking Factors," WCAP-7912-P-A (Proprietary) and WCAP-7912-A (Non-Proprietary), January 1975	4.3, 4.4

TABLE 1.6-2 (HISTORICAL)
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Report	Reference Section(s)
"Process Instrumentation for Westinghouse Nuclear Steam Supply Systems," WCAP-7913, January 1973.	7.2, 7.3
"Damping Values of Nuclear Power Plant Components," WCAP-7921-AR, May 1974	1A(N), 3.7N
"Basis for Heatup and Cooldown Limit Curves," WCAP-7924-A, April 1975	5.3
"Effect of Axial Spacing on Interchannel Thermal Mixing with the R Mixing Vane Grid," WCAP-7941-P-A (Proprietary) and WCAP-7959-A (Non-Proprietary), January 1975	4.4
"THINC-IV An Improved Program for Thermal- Hydraulic Analysis of Rod Bundle Cores," WCAP-7956, June 1973	4.4
"Axial Xenon Transient Tests at the Rochester Gas and Electric Reactor," WCAP-7964, June 1971	4.3
"TWINKLE - A Multi-Dimensional Neutron Kinetics Computer Code," WCAP-7979-P-A (Proprietary) and WCAP-8028-A (Non-Proprietary), January 1975	15.0, 15.4
"Application of the THINC-IV Program to PWR Design," WCAP-8054 (Proprietary) and WCAP-8195 (Non-Proprietary), October 1973	4.4
A Summary Analysis of the April 30 Incident at the San Onofre Nuclear Generating Station Unit 1," WCAP-8099, April 1973	3.9N
"Reactor Coolant Pump Integrity in LOCA," WCAP-8163, September 1973	1A(N), 5.4
"Calculation Model for Core Reflooding After a Loss of Coolant Accident (WREFLOOD Code)," WCAP-8170 (Proprietary) and WCAP-8171 (Non-Proprietary), June 1974	15.6
"Operational Experience with Westinghouse Cores," WCAP-8183, Revision 6, June 1977	4.2, 11.1

TABLE 1.6-2 (HISTORICAL)
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Report	Reference Section(s)
"WFLASH, A FORTRAN-IV Computer Program for Simulation of Transients in a Multi-Loop PWR," WCAP-8200, Revision 2 (Proprietary) and WCAP-8261, Revision 1 (Non-Proprietary), July 1974	15.6
"Safety Analysis of the 17x17 Fuel Assembly for Combined Seismic and Loss of Coolant Accident," WCAP-8236 (Proprietary), December 1973 and WCAP-8288 (Non-Proprietary), January 1974	3.7N, 4.2
"Safety Analysis of the 8-Grid 17x17 Fuel Assembly for Combined Seismic and Loss of Coolant Accident," WCAP-8236, Addendum 1(Proprietary), March 1974 and WCAP-8288, Addendum 1 (Non-Proprietary), April 1974	3.7N
"Documentation of Selected Westinghouse Structural Analysis Computer Codes," WCAP-8252, Revision 1, July 1977	3.6B, 3.9N
"Source Term Data for Westinghouse Pressurized Water Reactors," WCAP-8253, Amendment 1, July 1975	11.1, 12.3
"Nuclear Instrumentation System," WCAP-8255 January 1974.	7.2, 7.7
"Hydraulic Flow Test of the 17x17 Fuel Assembly," WCAP-8278 (Proprietary) and WCAP-8279 (Non-Proprietary), February 1974	4.2, 4.4
"The Effect of 17x17 Fuel Assembly Geometry on Interchannel Thermal Mixing," WCAP-8298-P-A (Proprietary) and WCAP-8299-A (Non-Proprietary), January 1975	4.4
"LOCTA-IV Program" Loss of Coolant Transient Analysis," WCAP-8301 (Proprietary) and WCAP-8305 (Non-Proprietary), June 1974	15.0, 15.6
"SATAN-IV Program: Comprehensive Space-Time Dependent Analysis of Loss of Coolant," WCAP-8302 (Proprietary) and WCAP-8306 (Non-Proprietary), June 1974	15.0, 15.6

TABLE 1.6-2 (HISTORICAL)
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Report	Reference Section(s)
"Prediction of the Flow-Induced Vibration of Reactor Internals by Scale Model Tests," WCAP-8303-P-A (Proprietary) and WCAP-8317-A (Non-Proprietary), July 1975	3.9N
"Control of Delta Ferrite in Austenitic Stainless Steel Weldments," WCAP-8324-A, June 1975	1A(N), 5.2
"Containment Pressure Analysis Code (COCO)," WCAP-8327 (Proprietary) and WCAP-8326 (Non-Proprietary), June 1974	15.6
"Westinghouse ECCS Evaluation Model- Summary," WCAP-8339, July 1974	6.2, 15.6
"Westinghouse ECCS – Plant Sensitivity Studies," WCAP-8340 (Proprietary) and WCAP-8356 (Non-Proprietary), July 1974	15.6
"Westinghouse ECCS Evaluation Model Sensitivity Studies," WCAP-8341 (Proprietary) and WCAP-8342 (Non-Proprietary), July 1974	15.6
"Effects of Fuel Densification Power Spikes on Clad Thermal Transients," WCAP-8359, July 1974	4.3
"Westinghouse Nuclear Energy Systems Division Quality Assurance Plan," WCAP-8370, Revision 8A, September 1977	1A(N), 17
"Revised Clad Flattening Model," WCAP-8377 (Proprietary) and WCAP-8381 (Non-Proprietary), July 1974	4.2
"Power Distribution Control and Load Follow Procedures," WCAP-8385 (Proprietary) and WCAP-8403 (Non-Proprietary), September 1974	4.3, 4.4
"An Evaluation of Loss of Flow Accidents Caused by Power System Frequency Transients in Westinghouse PWRs," WCAP-8424, Revision 1, June 1975	15.3

TABLE 1.6-2 (HISTORICAL)
DOCUMENTS PROVIDED AS ADDITIONAL REFERENCE INFORMATION

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Report	Reference Section(s)
"17x17 Drive Line Components Tests - Phase IB, II, III, D-Loop Drop and Deflection," WCAP-8446 (Proprietary) and WCAP-8449 (Non-Proprietary), December 1974	3.9N
"Analysis of Data from the Zion (Unit 1) THINC Verification Test," WCAP-8453-A, May 1976	4.4
"Westinghouse ECCS Evaluation Model - Supplementary Information," WCAP-8471 (Proprietary) and WCAP-8472 (Non-Proprietary), April 1975	15.6
"Incore Power Distribution Determination in Westinghouse Pressurized Water Reactors," WCAP-8498, July 1975	4.3
"UHI Plant Internals Vibration Measurement Program and Pre and Post Hot Functional Examinations," WCAP-8516-P (Proprietary) and WCAP-8517 (Non-Proprietary), April 1975	3.9N
"Critical Heat Flux Testing of 17x17 Fuel Assembly Geometry with 22 Inch Grid Spacing," WCAP-8536 (Proprietary) and WCAP-8537 (Non-Proprietary), May 1975	4.4
"The Application of Preheat Temperatures after Welding Pressure Vessel Steels," WCAP-8577, February 1976	1A(N)
"Failure Mode and Effects Anaylsis (FMEA) of the Engineered Safeguard Features Actuation System," WCAP-8584 (Proprietary) and WCAP-8760 (Non-Proprietary), Revision 1, February 1980.	4.6, 7.3
"Westinghouse ECCS Evaluation Model - October 1975 Version," WCAP-8622 (Proprietary) and WCAP-8623 (Non-Proprietary), November 1975	15.6
"Experimental Verification of West Fuel Storage Criticality Analyses," WCAP-8682 (Proprietary) and WCAP-8683 (Non-Proprietary), December 1975	4.3

TABLE 1.6-2 (HISTORICAL)
DOCUMENTS PROVIDED AS ADDITIONAL REFERENCE INFORMATION

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Report	Reference Section(s)
"Fuel Rod Bowing," WCAP-8691 (Proprietary) and WCAP-8692 (Non-Proprietary), Revision 1, July 1979 as supplemented by NS-EPR-2515, October 9, 1981 and NS-EPR-2572, March 16, 1982	4.2
"Delta Ferrite in Production Austenitic Stainless Steel Weldments," WCAP-8693, January 1976	1A(N), 5.2
"MULTIFLEX - A FORTRAN-IV Computer Program for Analyzing Thermal-Hydraulic-Structure System Dynamics," WCAP-8708 (Proprietary) and WCAP-8709 (Non-Proprietary), February 1976	3.9N
"Improved Analytical Models Used in Westinghouse Fuel Rod Design Computations," WCAP-8720 (Proprietary) and WCAP-8785 (Non-Proprietary), October 1976	4.2
"Safety-Related Research and Development for Westinghouse Pressurized Water Reactors, Program Summaries," WCAP-8768, latest revision	1.5, 4.2 4.3
"Verification of Neutron Pad and 17x17 Guide Tube Designs by Preoperational Tests on the Trojan 1 Power Plant," WCAP-8780, May 1976	3.9N
"Mass and Energy Releases Following a Steam Line Rupture," WCAP-8822 (Proprietary) and WCAP-8860 (Non-Proprietary), September 1976.	6.2
"Hybrid B_4C Absorber Control Rod Evaluation Report," WCAP-8846-A, October 1977	4.2, 15.3
"7300 Series Process Control System Noise Tests," WCAP-8892-A, April 1977	7.1
"Bench March Problem Solutions Employed for Verification of WECAN Computer Program," WCAP-8929, June 1977.	3.9N

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Report	Reference Section(s)
"Safety Analysis for the Revised Fuel Rod Internal Pressure Design Basis," WCAP-8963 (Proprietary), November 1976 and WCAP-8964 (Non-Proprietary), August 1977	4.2
"Dropped Rod Methodology for Negative Flux Rate Trip Plants", WCAP-10297-A (Proprietary)	15.4
"Evaluation of Mispositioned ECCS Valves," WCAP-8966 (Proprietary), September, 1977	6.3
"Westinghouse Emergency Core Cooling System Small Break October 1975 Model," WCAP-8970 (Proprietary) and WCAP-8971 (Non-Proprietary), April, 1977.	15.6
"Failure Mode and Effects Analysis (FMEA) of the Solid State full Length Rod Control System," WCAP-8976, September 1977	4.6
"Westinghouse Emergency Core Cooling System Evaluation Model for Analyzing Large LOCA's During Operation with One Loop Out of Service for Plants Without Loop Isolation Valves," WCAP-9166, February 1978	15.6
"Properties of Fuel and Core Component Materials," WCAP-9179 (Proprietary), September 1977	4.2
"N-16 Power Measuring System," WCAP-9190 (Proprietary) and WCAP-9191 (Non-Proprietary), December 1977	7.2
"Westinghouse ECCS Evaluation Model, February 1978 Version," WCAP-9220-P-A (Proprietary Version), WCAP-9221-P-A (Non-Proprietary Version), February 1978	15.6
"Westinghouse Emergency Core Cooling System Evaluation Model" – Modified October 1975 Version, WCAP-9168 (Proprietary) and WCAP-9169 (Non-Proprietary), September 1977	

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Report	Reference Section(s)
"Combination of Safe Shutdown Earthquake Loss of Coolant Accident Responses for Faulted Condition Evaluation of Nuclear Power Plants," WCAP-9279 (Non-Proprietary), March 1978	3.9N
"Integrity of the Primary Piping Systems of Westinghouse Nuclear Power Plants During Postulated Seismic Events," WCAP-9283 (Non-Proprietary), March 1978	3.9N
"Technical Bases for Eliminating Large Primary Loop Pipe Ruptures as the Structural Design Bases for Comanche Peak Units 1 and 2" WCAP-10527 (Proprietary) and WCAP-10528 (Non-Proprietary), April 1984	3.6B
"Evaluation Of Surveillance Frequencies And Out Of Service Times For The Reactor Protection Instrumentation System" WCAP-10271-P-A, May 1986	16.2
"Evaluation Of Surveillance Frequencies And Out Of Service Times For The Reactor Protection Instrumentation System" Supplement 1 WCAP-10271, Supplement 1-P-A, May 1986	16.2
"Evaluation Of Surveillance Frequencies And Out Of Service Times For The Engineered Safety Features Actuation System" WCAP-10271, Supplement 2, Revision 1, March 1987	16.2
"Reactor Trip Breaker Maintenance/Surveillance Optimization Program" WCAP-11312, April 1987	16.2
WCAP-8708-PA (Proprietary), WCAP-8709 (Non-Proprietary), "MULTIFLEX A FORTRAN Computer Program for Analyzing Thermal-Hydraulic Structure System Dynamics, "Takeuchi, K., et al., September 1977.	3.6B, 3.9N
WCAP-15029-P-A (Proprietary), WCAP-15030-NP-A, (Non-Proprietary) "Westinghouse Methodology for Evaluating the Acceptability of Baffle-Former-Barrel Bolting Distribution Under Faulted Load Conditions," E.R. Schwirian, et al., January 1999.	3.6B, 3.9N

TABLE 1.6-2 (HISTORICAL)
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Report	Reference Section(s)
WCAP-15245 (Proprietary), WCAP-15246 (Non-Proprietary), "Control Rod Insertion Following a Cold Leg LBLOCA, D.C. Cook Units 1 and 2," J.A. Barsic, et al., February 28, 1999.	3.6B, 3.9N
WCAP-11004-P (Proprietary), WCAP-11005 (Non-Proprietary), "Comparison of Data for Beaver Valley Power Station Unit 2 with WCAP-9735 Data, Prepared for NRC Review in Conjunction with Review of WCAP-9735, Docket No. 50-412," D.R. Bhandari, et al., November 1985.	3.6B, 3.9N
WCAP-11522 (Proprietary), WCAP-11523 (Non-Proprietary), "Response to NRC Questions on the LOCA Hydraulic Forces Analysis of the Beaver Valley Power Station Unit 2, Prepared for NRC Review in Conjunction with Review of WCAP-9735, Docket No. 50-412," D.C. Garner, et al., June 1987.	3.6B, 3.9N

1.7 ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS

A list of electrical, instrumentation, and control drawings is presented in Tables 1.7-1 and 1.7-2 for Unit 1 and Unit 2, respectively. These drawings include safety-related systems and non-safety-related systems which interact with the safety-related systems.

The fifth digit letter of the drawing number indicates type of drawing. E indicates Electrical drawing and M indicates Mechanical Instrumentation and Control (I&C) drawing.

The sixth digit numeral indicates Unit number. 1 indicates Unit 1 and 2 indicates Unit 2.

The revision and date indicated identify the drawing issue submitted to the NRC staff for review. Additional drawings or later revisions of these drawings will be provided upon request and the latest revision of all drawings are available for review on site.

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 1 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Schematics (Electrical)					
Main steam Reheat & Steam Dump System	2323-E1-0040	0[(a)]	H	01/08/80	
		00, 1-4, 17-28, 44-71, 92-95, 97	(b)	(b)	
Aux. & Main Steam System	2323-E1-0039	0[(a)]	J	01/08/80	
		00, 41-48, 58-61, 63, 64	(b)	(b)	
Steam generator feedwater	2323-E1-0038	0[(a)]	M	03/15/80	
		00, 3-11, 13, 15, 17, 19-30, 50, 51, 54-62, 64-99	(b)	(b)	
Auxiliary feedwater	2323-E1-0037	0[(a)]	S	10/07/80	
		00, 1-16, 19-22, 24-38, 40, 41, 42, 46, 48, 60-68	(b)	(b)	
Compressed air (Instrument Air)	2323-E1-0048	0[(a)]	I	03/13/80	
		00, 1, 4, 5, 7, 9, 12, 14, 16	(b)	(b)	

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 2 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Process sampling	2323-E1-0045	0[a] 01-14, 16, 17	E (b)	01/07/80 (b)	
Component cooling water	2323-E1-0050	2323_E1_0050 0[a] 00, 1, 3, 4, 6_19, 23, 26-29, 34-41, 43, 44, 47, 49, 50, 51, 53-55	M (b)	03/19/80 (b)	
Containment spray	2323-E1-0049	0[a] 00, 01-14, 18, 21	H (a)	02/07/80 (b)	
Reactor Building Safeguard Building sump pumps	2323-E1-0055	0[a] 00, 7, 8, 16-19	K (a)	01/28/80 (b)	
Demineralized water and reactor plant makeup	2323-E1-0044	0[a] 00, 6-9, 11, 12, 14, 16, 19	M (b)	07/15/80 (b)	
Containment ventilation	2323-E1-0059	0[a] 00, 1, 2, 13-16, 19-54, 58, 59, 62-70 85, 86, 89	L (b)	03/19/80 (b)	

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 3 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Safeguard and electrical area ventilation	2323-E1-0053	0[(a)] 12, 13, 14, 16-55, 62, 63, 65-76, 90, 91	K (b)	03/10/80 (b)	
Auxiliary building and fuel handling area ventilation	2323-E1-0056	0[(a)] 00, 1, 2, 7-11, 14-53, 55-62, 64-67	I (b)	02/20/80 (b)	
Turbine Gen. Aux. & Misc. Syst.	2323-E1-0060	0[(a)] 59	N (b)	03/06/80 (b)	
Chilled water ventilation	2323-E1-0054	0[(a)] 00, 2-5, 7-23	G (b)	03/19/80 (b)	
Primary plant ventilation	2323-E1-0036	0[(a)] 1-32, 49, 50, 58, 59, 71-96	I (b)	03/19/80 (b)	
Service water and intake structure ventilation	2323-E1-0043	0[(a)] 00,1-23, 25-27, 40 41	L (b)	02/08/80 (b)	

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

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System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
CVCS	2323-E1-0061	0[(a)] 00,1-6, 9, 10,14-20, 26-31, 36-41, 43-46, 65-69, 74-77, 80, 86	L (b)	03/18/80 (b)	
6.9 kV 3-line Normal Buses	2323-E1-0026	1, 2	2	12/13/79	
6.9 kV 3-line Safeguard Buses	2323-E1-0027	1, 2	3	10/15/79	
Safeguard 6.9-kV switchgear breakers	2323-E1-0031	0[(a)] 1-66	AA (b)	02/01/80 (b)	
Normal 6.9-kV switchgear breakers	2323-E1-0032	0[(a)] 1-72	AF (b)	02/28/80 (b)	
Safeguard 480-V switchgear breaker	2323-E1-0033	0[(a)] 1-42, 47-70	L (b)	01/30/80 (b)	
Normal 480-V switchgear breakers	2323-E1-0034	0[(a)] 1-43, 45-49, 51-57	K (b)	11/12/79 (b)	
Control Room and office Facil. HVAC	2323-E1-0035	0[(a)] 00, 1-30, 35-43, 46-53, 58-67, 69, 70, 71, 72-79, 88, 89, 92-97	S (b)	09/29/80 (b)	

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 5 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
BOP Misc. System (Part of 2323-E1-0035)	2323-E1-0069	0[(a)] 1-7	B (b)	09/12/80 (b)	
BOP & NSSS Misc. Systems	2323-E1-0071	0[(a)] 14, 15, 24, 46-65 67, 68	L (b)	03/20/80 (b)	
Safety injection	2323-E1-0062	0[(a)] 00, 1, 2, 5-75	H (b)	03/13/80 (b)	
RHR	2323-E1-0063	0[(a)] 00, 1-9	G (b)	03/27/80 (b)	
RCS	2323-E1-0064	0[(a)] 00, 1, 2, 9-12, 16, 21-25, 40-43	H (b)	02/26/80 (b)	
Waste Processing	2323-E1-0065	0[(a)] 00, 13-16	Q (b)	03/03/80 (b)	
6.9-kV Switchgear Miscellaneous	2323-E1-0030	0[(a)] 9, 10, 19, 21, 22, 24, 26, 30, 35-37, 39, 43, 45, 47, 49, 51-54, 75, 58, 59, 60, 62, 63	AD (b)	08/12/80 (b)	

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 6 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
BOP Misc. Systems DC Switchboard Battery Charger Inverter	2323-E1-0066	0[(a)]	Z	10/03/80	
		00, 22, 23, 24-29, 66, 78-81, 84, 87	(b)	(b)	
Diesel Generator and Monitor Lights	2323-E1-0067	0[(a)]	L	09/05/80	
		1-36, 39, 40, 41-50, 52-65, 77-90	(b)	(b)	
NSSS Misc. System	2323-E1-0070	0[(a)]	F	08/05/80	
		1-6, 8, 9, 21-26	(b)	(b)	
Annunciator	2323-E1-0076	1, 2, 3-7, 9, 10, 13-20, 28-40, 42	(b)	(b)	
Ventilation System	2323-E1-0057	0[(a)]	F	01/11/80	
		00, 12-23	(b)	(b)	
Radiation Monitoring System	2323-E1-0046	0[(a)]	G	04/03/80	
		62-65	(b)	(b)	
Main 3-Line Meter Diagram	2323-E1-0025	1, 2	2	01/22/80	
<u>Instrumentation and Control Diagram (ICD)</u>					
Legend	2323-M1-2200-01		2	06/08/79	

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
	2323-M1-2200-02		4	10/16/79	
	2323-M1-2200-03		2	06/08/79	
	2323-M1-2200-04		2	06/08/79	
	2323-M1-2200-05		2	06/08/79	
Main Steam Reheat and Steam Dump	2323-M1-2202-01		3	04/26/79	
	2323-M1-2202-02		4	12/14/79	
	2323-M1-2202-06		3	04/26/79	
	2323-M1-2202-07		3	04/26/79	
	2323-M1-2202-08		4	12/14/79	
	2323-M1-2202-10		3	04/26/79	
Steam Generator Feedwater	2323-M1-2203-02		3	07/03/79	
	2323-M1-2203-04		4	07/03/79	
	2323-M1-2203-05		3	07/03/79	
	2323-M1-2203-07		2	07/03/79	

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
	2323-M1-2203-08		2	07/03/79	
Auxiliary feedwater	2323-M1-2206-01		3	08/27/79	
	2323-M1-2206-02		4	04/22/80	
	2323-M1-2206-03		3	08/27/79	
	2323-M1-2206-04		3	08/27/79	
	2323-M1-2206-05		3	08/27/79	
	2323-M1-2206-06		3	08/27/79	
	2323-M1-2206-07		3	08/27/79	
	2323-M1-2206-08		3	08/27/79	
	2323-M1-2206-09		3	08/27/79	
	2323-M1-2206-10		2	08/27/79	
Diesel Generator Auxiliary	2323-M1-2215-01		4	09/11/79	
	2323-M1-2215-02		3	05/18/79	

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 9 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Compressed air	2323-M1-2216-03		4	11/06/79	
	2323-M1-2216-01		4	11/06/79	
Fire Protection	2323-M1-2225-01		3	07/13/79	Not Class 1
Process Sampling	2323-M1-2228-01		4	10/25/79	
	2323-M1-2228-02		4	10/25/79	
Component cooling water	2323-M1-2229-01		3	04/10/79	
	2323-M1-2229-02		3	04/10/79	
	2323-M1-2229-03		4	10/04/79	
	2323-M1-2229-04		3	04/10/79	
	2323-M1-2229-05		3	04/10/79	
	2323-M1-2229-06		4	03/17/80	
	2323-M1-2230-01		4	03/17/80	
	2323-M1-2230-02		5	03/17/80	
	2323-M1-2231-02		3	04/10/79	

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 10 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
	2323-M1-2231-03		3	04/10/79	
	2323-M1-2231-05		3	04/10/79	
	2323-M1-2231-07		3	04/10/79	
Containment spray	2323-M1-2232-01		3	04/12/79	
	2323-M1-2232-02		3	04/12/79	
	2323-M1-2232-03		4	12/13/79	
	2323-M1-2232-04		3	04/12/79	
	2323-M1-2232-05		3	04/12/79	
	2323-M1-2232-06		3	04/12/79	
Station Service Water	2323-M1-2233-01		3	05/02/79	
	2323-M1-2233-02		3	05/02/79	
	2323-M1-2233-04		4	12/27/79	Not Class 1
	2323-M1-2233-05		3	05/02/79	
	2323-M1-2233-06		3	05/02/79	

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 11 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
	2323-M1-2233-07		4	12/27/79	
	2323-M1-2233-08		4	12/27/79	
	2323-M1-2233-09		3	05/02/79	
	2323-M1-2234-01		3	05/02/79	Not Class 1
	2323-M1-2234-02		3	05/02/79	
Spent Fuel Pool Cooling and Cleanup	2323-M1-2235-01		3	02/09/79	Not Class 1
	2323-M1-2235-04		3	02/09/79	
Vents & Drains System	2323-M1-2236-01		3	02/01/79	
Safeguards and Auxiliary Building	2323-M1-2236-02		3	02/01/79	
Vents & Drains System Turbine and Fuel Handling Building	2323-M1-2237-02		3	02/26/79	Not Class 1
Vents & Drains System Containment Building	2323-M1-2238-02		4	02/08/79	
Steam Generator Blowdown Cleanup	2323-M1-2239-01		4	06/01/79	Not Class 1

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 12 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Demineralized and reactor makeup water	2323-M1-2241-03		3	02/08/79	
	2323-M1-2242-01		4	04/08/80	
Turbine Generator	2323-M1-2249-06		2	05/16/79	
Ventilation Containment	2323-M1-2300-04		3	02/07/79	
	2323-M1-2300-02		3	02/07/79	
	2323-M1-2300-01		3	02/07/79	
	2323-M1-2301-01		3	05/04/79	
	2323-M1-2301-02		4	05/04/79	
	2323-M1-2301-03		3	05/04/79	
	2323-M1-2301-04		3	05/04/79	
	2323-M1-2301-05		3	05/04/79	
	2323-M1-2301-06		3	05/04/79	
	2323-M1-2301-07		3	05/04/79	
	2323-M1-2301-08		4	05/04/79	

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 13 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
	2323-M1-2301-09		3	05/04/79	
	2323-M1-2301-10		3	05/04/79	
	2323-M1-2301-11		2	05/04/79	
Ventilation safeguards and electrical area	2323-M1-2302-05		3	01/26/79	
	2323-M1-2302-06		3	01/26/79	
	2323-M1-2302-07		3	01/26/79	
	2323-M1-2302-08		3	01/26/79	
	2323-M1-2302-09		3	01/26/79	
	2323-M1-2302-10		2	01/26/79	
Ventilation Auxiliary building and fuel handling area	2323-M1-2303-01		3	01/26/79	
	2323-M1-2303-05		3	01/26/79	
	2323-M1-2303-05A		1	01/26/79	
	2323-M1-2303-06		3	01/26/79	

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 14 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Control room air conditioning	2323-M1-2304-01		5	07/13/79	
	2323-M1-2304-02		5	07/13/79	
	2323-M1-2304-03		5	07/13/79	
	2323-M1-2304-04		5	07/13/79	
	2323-M1-2304-05		5	07/13-79	
	2323-M1-2304-06		5	07/13/79	
	2323-M1-2304-07		5	07/13/79	
	2323-M1-2304-08		5	07/13/79	
	2323-M1-2304-12		5	07/13/79	
	2323-M1-2304-13		5	07/13/79	
	2323-M1-2304-14		5	07/13/79	
Ventilation uncontrolled and miscellaneous areas	2323-M1-2305-04		3	03/09/79	
Ventilation chilled water	2323-M1-2307-01		3	02/09/79	
	2323-M1-2307-02		3	02/09/79	

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 15 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
	2323-M1-2307-03		3	02/09/79	Not Class 1
	2323-M1-2307-04		3	02/09/79	
	2323-M1-2307-05		3	02/09/79	
	2323-M1-2307-06		3	02/09/79	
Ventilation equipment primary plant	2323-M1-2309-02		4	05/21/79	
	2323-M1-2309-04		4	05/21/79	
	2323-M1-2309-01		2	05/21/79	
	2323-M1-2309-05		4	05/21/79	Not Class 1
Ventilation safety chilled water	2323-M1-2311-01		3	02/07/79	
	2323-M1-2311-02		3	02/07/79	
	2323-M1-2311-03		2	02/07/79	
Ventilation service water intake structure and misc. buildings	2323-M1-2312-01		3	05/16/79	
Ventilation UPS & Distribution Room	2323-M1-2313-01		CP1	07/20/84	
Reactor Coolant	2323-M1-2250-03		1	12/28/79	Not Class 1

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 16 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
	2323-M1-2251-07		1	08/11/81	
	2323-M1-2250-07A		1	08/11/81	
Boron Recycle	2323-M1-2259-02		1	11/19/79	Not Class 1
	2323-M1-2259-03		1	11/19/79	Not Class 1
Liquid Waste Processing Drain Channel A	2323-M1-2265-03		2	10/15/79	Not Class 1
Liquid Waste Processing Drain Channel B	2323-M1-2266-03		2	10/15/79	Not Class 1
	2323-M1-2266-04		2	10/15/79	Not Class 1
	2323-M1-2266-05		1	10/15/79	Not Class 1
Liquid Waste Processing Drain Channel C	2323-M1-2267-02		2	10/15/79	Not Class 1
	2323-M1-2267-03		2	10/15/79	Not Class 1
	2323-M1-2267-04		2	10/15/79	Not Class 1
	2323-M1-2267-05		2	10/15/79	Not Class 1

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 17 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Liquid Waste Processing Disposal System	2323-M1-2268-03		2	10/15/79	Not Class 1
	2323-M1-2268-04		2	10/15/79	Not Class 1
	2323-M1-2268-05		2	10/15/79	Not Class 1
	2323-M1-2268-06		2	10/15/79	Not Class 1
Waste Processing System(gas)	2323-M1-2270-05		1	10/15/79	Not Class 1
Others (Equipment Supplier Drawings)					
Process Control Block Diagram	8758D39	1[a] 2-14	3 [b]	--	
NIS Source Range Functional Block Diagram	5655D49	--	8	--	
NIS Intermediate Range Functional Block Diagram	5655D50	--	6	--	
NIS Power Range Functional Block Diagram	5655D51	--	9	--	
NIS Auxiliary Channels Functional Block Diagram	5655D52	--	6	--	

TABLE 1.7-1
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 1

(Sheet 18 of 18)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Solid State Protection System Functional Diagram	7247D05	1-16	(b)	--	
Pressurizer Heater Controller	413918	--	6	--	
Upgrade System Block Diagrams	9554085	1, 2	1	--	

a) Index Sheet

b) For Revision and Date see Individual Sheet

TABLE 1.7-2
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 2

(Sheet 1 of 13)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Schematics (Electrical)					
Main steam	2323-E2-0040	0[(a)] 01-04, 18-28 44-47, 53-63	B (b)	03/15/80 (b)	
Steam generator feedwater	2323-E2-0038	Later	Later	Later	
Auxiliary feedwater	2323-E2-0037	Later	Later	Later	
Compressed air (Instrument air)	2323-E2-0048	Later	Later	Later	
Process sampling	2323-E2-0045	0[(a)] 01-14, 16, 17	A	05/13/80 (b)	
Component cooling water	2323-E2-0050	0[(a)] 01, 03, 04, 06-19, 23, 26-29, 34-41, 43, 44, 47, 49-51, 53-55	C (b)	09/2/80 (b)	
Containment spray	2323-E2-0049	0[(a)] 01-14, 18, 21	B (b)	10/31/80 (b)	
Extraction steam	2323-E2-0051	Later	Later	Later	

TABLE 1.7-2
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 2

(Sheet 2 of 13)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Auxiliary & main steam	2323-E2-0039	0[a] 41-48, 58-60, 63, 64	B (b)	07/16/80 (b)	
Safeguards and reactor building sump pumps	2323-E2-0055	0[a] 07, 08, 16-19	B (b)	03/17/80 (b)	
Demineralized water and and reactor plant makeup	2323-E2-0044	0[a] 06, 08, 09, 11, 14	A (b)	06/17/80 (b)	
Containment ventilation	2323-E2-0059	Later	Later	Later	
Safeguard and electrical area ventilation	2323-E2-0053	0[a] 65-76, 90, 91	B (b)	09/09/80 (b)	
Auxiliary building and fuel handling area ventilation	2323-E2-0056	0[a] 55-59	A (b)	07/28/80 (b)	
Turbine generator aux. and misc. system	2323-E2-0060	0[a] 59	D (b)	05/28/80 (b)	
Chilled water ventilation	2323-E2-0054	Later	Later	Later	
6.9-kV 3-line normal buses	2323-E2-0026	Later	Later	Later	

TABLE 1.7-2
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 2

(Sheet 3 of 13)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Service water and intake structure ventilation	2323-E2-0043	0[(a)] 01, 02, 05, 06, 13-20, 25-27	C (b)	09/15/80 (b)	
Diesel generator and monitor lights	2323-E2-0067	Later	Later	Later	
Vent system	2323-E2-0057	0[(a)] 12-23	A (b)	09/15/80 (b)	
Annunciator	2323-E2-0076	Later	Later	Later	
Radiation monitoring	2323-E2-0046	Later	Later	Later	
CVCS	2323-E2-0061	0[(a)] 01-06, 9, 10, 14-20, 26-31, 36-41, 43-46, 65-69, 74-77, 80, 86	B (b)	10/06/80 (b)	
Safety injection	2323-E2-0062	Later	Later	Later	
RHR	2323-E2-0063	0[(a)] 01-09	A (b)	11/10/80 (b)	
RCS	2323-E2-0064	0[(a)] 01, 02, 09-12, 16, 21-25	C (b)	10/01/80 (b)	

TABLE 1.7-2
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 2

(Sheet 4 of 13)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Waste processing	2323-E2-0065	0[(a)] 13-16	B (b)	07/10/80 (b)	
6.9-kV switchgear miscellaneous	2323-E2-0030	Later	Later	Later	
Safeguard 6.9-kV switchgear breakers	2323-E2-0031	Later	Later	Later	
Normal 6.9-kV switchgear breakers	2323-E2-0032	0[(a)] 05-38, 41-62, 67-72	B (b)	09/03/80 (b)	
480-V Safeguard switchgear breakers	2323-E2-0033	0[(a)] 01-40, 47-70	A (b)	12/08/80 (b)	
480-V Normal switchgear breakers	2323-E2-0034	Later	Later	Later	
6.9-kV 3-line Safeguard buses	2323-E2-0027	Later	Later	Later	
BOP NSS Misc. Systems	2323-E2-0071	Later	Later	Later	
BOP Misc. System DC Switchboard Battery Charger and Inverter	2323-E2-0066	Later	Later	Later	
NSSS Misc. System	2323-E2-0070	Later	Later	Later	
Main 3-Line Metering Diagram	2323-E1-0025	Later	Later	Later	

TABLE 1.7-2
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 2

(Sheet 5 of 13)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Instrumentation and Control Diagrams (ICD)					
Legend	2323-M2-2200-01		1	07/20/79	
	2323-M2-2200-02		3	10/16/79	
	2323-M2-2200-03		1	07/20/79	
	2323-M2-2200-04		1	07/20/79	
	2323-M2-2200-05		1	07/20/79	
Main Steam Reheat and Steam Dump	2323-M2-2202-01		2	12/21/79	
	2323-M2-2202-02		2	12/21/79	
	2323-M2-2202-06		2	12/21/79	
	2323-M2-2202-07		2	12/21/79	
	2323-M2-2202-08		2	12/21/79	
	2323-M2-2202-10		2	12/21/79	
Steam generator feedwater	2323-M2-2203-02		1	12/28/79	
	2323-M2-2203-04		1	12/28/79	

TABLE 1.7-2
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 2

(Sheet 6 of 13)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
	2323-M2-2203-05		1	12/28/79	
	2323-M2-2203-07		1	12/28/79	
	2323-M2-2203-08		1	12/28/79	
Auxiliary feedwater	2323-M2-2206-01		1	08/27/79	
	2323-M2-2206-02		2	04/22/80	
	2323-M2-2206-03		1	08/27/79	
	2323-M2-2206-04		1	08/27/79	
	2323-M2-2206-05		1	08/27/79	
	2323-M2-2206-06		1	08/27/79	
	2323-M2-2206-07		1	08/27/79	
	2323-M2-2206-08		1	08/27/79	
	2323-M2-2206-09		1	08/27/79	
	2323-M2-2206-10		1	08/27/79	

TABLE 1.7-2
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 2

(Sheet 7 of 13)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Compressed air	2323-M2-2216-03		2	11/06/79	
	2323-M2-2216-01		2	11/06/79	
Condenser Vacuum and Waterbox Priming	2323-M2-2211-02		1	02/28/79	Not Class 1
Auxiliary Steam	2323-M2-2213-01		1	01/25/79	Not Class 1
Diesel Generator Auxiliary	2323-M2-2215-01		2	09/11/79	
	2323-M2-2215-02		1	05/18/79	
Fire protection	2323-M2-2225-01		1	08/30/79	Not Class 1
	2323-M2-2225-02		1	08/30/79	Not Class 1
Process sampling	2323-M2-2228-01		2	10/25/79	
	2323-M2-2228-02		2	10/25/79	
Spent fuel pool cooling and cleanup	2323-M2-2235-01		1	02/09/79	Not Class 1
Component cooling water	2323-M2-2229-01		1	04/10/79	
	2323-M2-2229-02		1	04/10/79	
	2323-M2-2229-03		2	10/04/79	

TABLE 1.7-2
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 2

(Sheet 8 of 13)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
	2323-M2-2229-04		1	04/10/79	
	2323-M2-2229-05		1	04/10/79	
	2323-M2-2229-06		2	03/17/80	
	2323-M2-2229-07		2	12/10/79	Not Class 1
	2323-M2-2230-01		2	03/17/80	
	2323-M2-2230-02		3	03/17/80	
	2323-M2-2231-01		1	04/10/79	Not Class 1
	2323-M2-2231-02		1	04/10/79	
	2323-M2-2231-03		1	04/10/79	
	2323-M2-2231-04		1	04/10/79	Not Class 1
	2323-M2-2231-05		1	04/10/79	
	2323-M2-2231-06		1	04/10/79	Not Class 1
	2323-M2-2231-07		1	04/10/79	

TABLE 1.7-2
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 2

(Sheet 9 of 13)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Containment spray	2323-M2-2232-01		1	04/12/79	
	2323-M2-2232-02		1	04/12/79	
	2323-M2-2232-03		2	12/13/79	
	2323-M2-2232-04		1	04/12/79	
	2323-M2-2232-05		1	04/12/79	
	2323-M2-2232-06		1	04/12/79	
	2323-M2-2232-07		2	07/24/79	Not Class 1
Station Service water	2323-M2-2233-01		1	05/02/79	
	2323-M2-2233-02		1	05/02/79	
	2323-M2-2233-03		1	05/02/79	Not Class 1
	2323-M2-2233-04		2	12/27/79	
	2323-M2-2233-05		1	05/02/79	
	2323-M2-2233-06		1	05/02/79	Not Class 1
	2323-M2-2233-07		1	05/02/79	

TABLE 1.7-2
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 2

(Sheet 10 of 13)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
	2323-M2-2234-02		1	05/02/79	
Vents and Drains System Safeguards and Auxiliary building	2323-M2-2236-01		1	02/01/79	
	2323-M2-2236-02		1	02/01/79	
Vents and Drains System Turbine and Fuel Handling Buildings	2323-M2-2237-02		2	03/26/80	Not Class 1
Vents and Drains System Containment building	2323-M2-2238-02		1	02/08/79	
Steam Generator Blowdown Cleanup	2323-M2-2239-01		2	06/01/79	Not Class 1
Demineralized and reactor makeup water	2323-M2-2241-01		1	02/08/79	
	2323-M2-2242-01		2	04/08/80	
Turbine Generator	2323-M2-2249-06		2	03/26/80	
Ventilation Containment	2323-M2-2300-01		1	02/07/79	
	2323-M2-2300-02		1	02/07/79	
	2323-M2-2300-04		1	02/07/79	

TABLE 1.7-2
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 2

(Sheet 11 of 13)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
	2323-M2-2301-01		1	05/04/79	
	2323-M2-2301-02		1	05/04/79	
	2323-M2-2301-03		1	05/04/79	
	2323-M2-2301-04		1	05/04/79	
	2323-M2-2301-05		1	05/04/79	
	2323-M2-2301-06		1	05/04/79	
	2323-M2-2301-07		1	05/04/79	
	2323-M2-2301-08		1	05/04/79	
Ventilation Safeguards and electrical area	2323-M2-2302-05		1	01/26/79	
	2323-M2-2302-06		1	01/26/79	
	2323-M2-2302-07		1	01/26/79	
	2323-M2-2302-08		1	01/26/79	
	2323-M2-2302-09		1	01/26/79	
	2323-M2-2302-10		1	01/26/79	

TABLE 1.7-2
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 2

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
Ventilation Auxiliary Building and fuel handling area	2323-M2-2303-01		1	01/26/79	
Ventilation Uncontrolled and miscellaneous areas	2323-M2-2305-02		1	03/09/79	
Ventilation Chilled water	2323-M2-2307-01		1	02/09/79	
	2323-M2-2307-02		1	02/09/79	
	2323-M2-2307-03		1	02/09/79	
Ventilation Equipment Primary plant	2323-M2-2309-01		1	05/21/79	Not Class 1
Ventilation Safety chilled water	2323-M2-2311-01		1	02/07/79	
	2323-M2-2311-02		1	02/07/79	
	2323-M2-2311-03		1	02/07/79	
<u>Others (Equipment Supplier Drawings)</u>					
Process Control Block Diagram	8758D39	1[(a)] 2-41	3 (b)	--	
NIS Source Range Functional Block Diagram	5655D49	--	8	--	

TABLE 1.7-2
CPNPP ELECTRICAL, INSTRUMENTATION, AND CONTROL DRAWINGS LIST FOR UNIT 2

(Sheet 13 of 13)

System or Title	Drawing No.	Sheet No.	Revision	Date	Remarks
NIS Intermediate Range Functional Block Diagram	5655D50	--	6	--	
NIS Power Range Functional Block Diagram	5655D51	--	9	--	
NIS Auxiliary Channels Functional Block Diagram	5655D52	--	6	--	
Solid State Protection System Functional Diagram	7247D05	1-16	(b)	--	
Pressurizer Heater Controller	413918	--	6	--	
Upgrade System Block Diagrams	9554D85	1, 2	1	--	

a) Index Sheet

b) For Revision and Date See Individual Sheet

APPENDIX 1A(N) - DISCUSSION OF REGULATORY GUIDES

This appendix discusses the CPNPP positions on, and compliance with, Division 1 regulatory guides as they apply to the Nuclear Steam Supply System scope of equipment and services. Appendix 1A(B) is provided separately for the balance of plant information.

Identification of specific issues of regulatory guides are provided in the discussions where appropriate.

Regulatory Guide 1.1

Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal System Pumps

Discussion

CPNPP complies with Safety Guide 1 (11/2/70) as discussed in Section 6.3.2.2.10.

Also refer to Appendix 1A(B) for further discussion.

Regulatory Guide 1.2

Thermal Shock to Reactor Pressure Vessels

Discussion

CPNPP follows all the recommendations of Safety Guide 2 (11/20/70). Regulatory Position C.1 is followed by Westinghouse's own analytical and experimental programs as well as by participation in the Heavy Section Steel Technology (HSST) program at the Oak Ridge National Laboratory.

Analytical techniques have been developed by Westinghouse to perform fracture evaluations of reactor vessels under thermal shock loadings.

Under the HSST program a number of 6 inch thick 39 inch outside diameter steel pressure vessels containing carefully prepared and sharpened surface cracks are being tested. Test conditions include both hydraulic internal pressure loadings and thermal shock loadings. The objective of this program is the validate analytical fracture mechanics techniques and demonstrate quantitatively the margin of safety inherent in reactor pressure vessels.

A number of vessels have been tested under hydraulic pressure loadings, and results have confirmed the validity of fracture analysis techniques. The results and implications of the hydraulic pressure tests are summarized in Oak Ridge National Laboratory report ORNL-TM-5090.

Three thermal shock experiments have been completed and are now being evaluated. Preliminary information indicates that the analytical techniques do agree favorably with experimental results.

Westinghouse is continuing to obtain fracture toughness data for reactor pressure vessel steels through internally funded programs as well as HSST sponsored work.

Fracture toughness testing of irradiated compact tension fracture toughness specimens has been completed. The complete post-irradiation data on 0.394, 2, and 4 inch thick specimens are now available from the HSST program. Both static and dynamic post-irradiation fracture toughness data have been obtained. Evaluation of the data obtained to date on material irradiated to fluences between 2.2 and 4.5 10^{19} n/cm^2 indicates that the reference toughness curve as contained in the American Society of Mechanical Engineers (ASME) Code, Section III, remains a conservative lower bound for toughness values for pressure vessel steels. Another fracture toughness program is now underway. This program involves the irradiation and testing of weld metal used in fabrication of operating pressure vessels of pre-1972 construction. These welds characteristically have high copper contents and low initial Charpy V-notch “shelf” energies. Results of this program are expected in 1977.

Details of progress and results obtained in the HSST program are available in the HSST program semiannual (quarterly beginning in 1974) progress reports, issued by Oak Ridge National Laboratory.

Regulatory Position C.2 is followed inasmuch as no significant changes have been made in approved core or reactor designs.

Regulatory Position C.3 is followed since the vessel design does not preclude the use of an engineering solution to assure adequate recovery of the fracture toughness properties of the vessel material.

If additional margin is needed, the reactor vessel can be annealed at any point in its service life. This solution is already feasible, in principle, and could be performed with the vessel in place.

Regulatory Guide 1.3

Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors

Discussion

This regulatory guide is not applicable to the Comanche Peak Nuclear Power Plant (CPNPP).

Regulatory Guide 1.4

Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.5

Assumptions Used for Evaluating Potential Radiological Consequences of a Steam Line Break Accident for Boiling Water Reactors

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.6

Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.7

Control of Combustible Gas Concentrations in Containment Following a Loss of Coolant Accident

Discussion

Based on a revision to 10CFR50.44, Regulatory Guide 1.7 no longer applies to CPNPP. See Section 6.2.5.

Regulatory Guide 1.8

Personnel Selection and Training

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.9

Selection of Diesel Generator Set Capacity for Standby Power Supplies

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.10

Mechanical (Cadweld) Splices in Reinforcing Bars of Category I Concrete Structures

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.11

Instrument Lines Penetrating Primary Reactor Containment

Discussion

CPNPP meets the recommendations of Safety Guide 11 (3/10/71) in accordance with the comments of Section 7.3.1.1.2.

Also refer to Appendix 1A(B) for further discussion.

Regulatory Guide 1.12

Instrumentation for Earthquakes

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.13

Spent Fuel Storage Facility Design Basis

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.14

Reactor Coolant Pump Flywheel Integrity

Discussion

The CPNPP design follows the recommendations of Revision 1 (8/75) of Regulatory Guide 1.14 except for the following:

1. Post-spin inspection

   Westinghouse has shown in Reference [4] that the flywheel would not fail at 290 percent of normal speed for a flywheel flaw of 1.15 inches or less in length. Results for a double ended guillotine break at the pump discharge with full separation of pipe ends assumed, show the maximum overspeed was to be less than 100 percent of normal speed. The maximum overspeed was calculated in Reference [4] to be about 280 percent of normal speed for the same postulated break, and an assumed instantaneous loss of power to the reactor coolant pump. In comparison with the overspeed presented above, the flywheel is tested at 125 percent of normal speed. Thus, the flywheel could withstand a speed up

to 2.3 times greater than the flywheel spin test speed 125 percent provided that no flaws greater than 1.15 inches are present. If the maximum speed were 125 percent of normal speed or less, the critical flaw size for failure would exceed 6 inches in length.

Nondestructive tests and critical dimension examinations are all performed before the spin tests. The inspection methods employed (described in Reference [4] provide assurance that flaws significantly smaller than the critical flaw size of 1.15 inches for 290 percent of normal speed would be detected. Flaws in the flywheel will be recorded in the pre-spin inspection program (see Reference [4]). Flaw growth attributable to the spin test (i.e., from a single reversal of stress, up to speed and back), under the most adverse conditions, is about three orders of magnitude smaller than what nondestructive inspection techniques are capable of detecting. For these reasons, Westinghouse performs no post- spin inspections and believes that pre-spin test inspections are adequate.

2. Interference fit stresses and excessive deformation

Much of Revision 1 to Regulatory Guide 1.14 deals with stresses in the flywheel resulting from the interference fit between the flywheel and the shaft. Because Westinghouse's design specifies a light interference fit between the flywheel and the shaft; at zero speed, the hoop stresses and radial stresses at the flywheel bore are negligible. Centering of the flywheel relative to the shaft is accomplished by means of keys and/or centering devices attached to the shaft, and at normal speed, the flywheel is not in contact with the shaft in the sense intended by Revision 1. Hence, the definition of "Excessive Deformation," as defined in Revision 1 of Regulatory Guide 1.14, is not applicable to the Westinghouse design since the enlargement of the bore and subsequent partial separation of the flywheel from the shaft does not cause unbalance of the flywheel. Extensive Westinghouse experience with reactor coolant pump flywheels installed in this fashion has verified the adequacy of the design.

Westinghouse's position is that combined primary stress levels, as defined in Revision 0 of Safety Guide 14 (C.2.a and C.2.c), are both conservative and proven and that no changes to these stress levels are necessary. Westinghouse designs to these stress limits and thus does not have permanent distortion of the flywheel bore at normal or spin test conditions.

3. Discussion B, cross rolling ratio of 1 to 3

Westinghouse's position is that specification of a cross rolling ratio is necessary since past evaluations have shown that ASME SA-533 Grade B Class 1 materials produced without this requirement have suitable toughness for typical flywheel applications. Proper material selection and specification of minimum material properties in the transverse direction adequately ensure flywheel integrity. An attempt to gain isotropy in the flywheel material by means of cross rolling is unnecessary since adequate margins of safety are provided by both flywheel material selection (ASME SA-533 Grade B Class 1) and by specifying minimum yield and tensile levels and toughness test values taken in the direction perpendicular to the maximum working direction of the material.

4. Regulatory Position C.1.a, relative to vacuum-melting and degassing process of the electroslag process

   The requirements for vacuum melting and degassing process or the electroslag process are not essential in meeting the balance of the Regulatory Position nor do they, in themselves, ensure compliance with the overall Regulatory Position. The initial Safety Guide 14 (10/27/71) stated that the "flywheel material should be produced by process that minimized flaws in the material and improves its fracture toughness properties." This is accomplished by using SA-533 material including vacuum treatment.

5. Regulatory Position C.2.b

   Westinghouse suggests that this paragraph be reworded as follows in order to remove the ambiguity of reference to an undefined overspeed transient.

   "Design speed should be 125 percent of normal speed or the speed to which the pump motor might be electrically driven by station turbine generator during anticipated transients, whichever is greater. Normal speed is defined as the synchronous speed of the alternating current drive motor at 60 hertz."

6. Inspection

   The reactor coolant pump flywheel inspection is in accordance with Technical Specification 5.5.7.

Regulatory Guide 1.15

Testing of Reinforcing Bars for Category I Concrete Structures

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.16

Reporting of Operating Information - Appendix A Technical Specifications

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.17

Protection of Nuclear Power Plants Against Industrial Sabotage

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.18

Structural Acceptance Test for Concrete Primary Reactor Containments

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.19

Nondestructive Examination of Primary Containment Liner Welds

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.20

Comprehensive Vibration Assessment Program for Reactor Internals During Preoperational and Initial Startup Testing

Discussion

The CPNPP position on Revision 2 (5/76) of Regulatory Guide 1.20 is discussed in Section 3.9N.2.4.

Regulatory Guide 1.21

Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.22

Periodic Testing of Protection System Actuation Functions

Discussion

CPNPP meets the recommendations of Safety Guide 22 (2/17/72) in accordance with the comments of Section 7.1.2.5.

Regulatory Guide 1.23

Onsite Meteorological Program

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.24

Assumptions Used for Evaluating the Potential Radiological Consequences of a Pressurized Water Reactor Radioactive Gas Storage Tank Failure

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.25

Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.26

Quality Group Classifications and Standards for Water, Steam and Radioactive-Waste-Containing Components of Nuclear Power Plants

Discussion

Quality group classification of fluid system equipment of the Westinghouse scope of supply for the CPNPP is as described in Section 3.2.

Nuclear Steam Supply System fluid system components important to safety are classified in accordance with the August 1970 Draft of American National Standard (ANSI) N18.2, "Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plant," except for the deviation described in Section 3.2.2. In addition, components of the accumulator subsystem and the refueling water subsystem are placed in a higher classification. The effect of this higher classification is to produce the same quality levels for all components as is achieved by the application of the 1973 version of N18.2, as finally accepted by ANSI.

Classification by this means is an alternate acceptable method of meeting the intent of Revision 3 (2/76) of Regulatory Guide 1.26. The method of classifying is in accordance with NRC stated policy on regulatory guides that "methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission."

Also refer to Appendix 1A(B) for further discussion.

Regulatory Guide 1.27

Ultimate Heat Sink for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.28

Quality Assurance Program Requirements (Design and Construction)

Discussion

The Westinghouse quality assurance program, including the Westinghouse position on Regulatory Guide 1.28, is presented in WCAP-8370 [5].

Also refer to Appendix 1A(B) for further discussion.

Regulatory Guide 1.29

Seismic Design Classification

Discussion

Seismic classification of fluid system equipment of Westinghouse scope of supply for the CPNPP is as described in Section 3.2.

The classification of components by safety class provides the means of establishing applicable aseismic design requirements of both components and system. At the time the CPNPP was designed, duplication by special seismic classification was unnecessary since ANSI N18.2, "Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants" was considered to establish seismic design requirements of systems having components classified as Safety Class 1, Safety Class 2, or Safety Class 3. Safety class fluid system components are designed to remain functional in the event of occurrence of the Design Basis Earthquake, defined in Section 2.1.5.4 of ANSI N18.2-1973 but now identified as the Safe Shutdown Earthquake by the NRC. The Reactor Protection System includes similar aseismic design features.

Classification by this means is an alternate acceptable method of meeting the intent of Revision 2 (2/76) of Regulatory Guide 1.29. The method of classifying is in accordance with NRC stated policy on regulatory guides that "methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission."

Also refer to Appendix 1A(B).

Regulatory Guide 1.30

Quality Assurance Requirements for the Installation, Inspection, and Testing of Instrumentation and Electric Equipment

Discussion

The design criteria Westinghouse applies to safety-related instrumentation and controls are consistent with ANSI N45.2.4-1972 (IEEE Standard 336-1971), “Installation, Inspection, and Testing Requirements of Instrumentation and Electrical Equipment During the Construction of Nuclear Power Generating Stations.” The major actions is complying with this standard fall within the scope of plant construction. Westinghouse functions in design and procurement of instrumentation and electrical equipment are supportive to the later fulfillment of the standard at the time of construction.

For those activities performed after September 1, 1972, Westinghouse follows the guidance of Safety Guide 30 (8/11/72). For those activities performed prior to September 1, 1972, the quality assurance procedures employed in the design of the CPNPP may vary in detail from the position of the regulatory guide, but meet its essential requirements.

Also refer to Appendix 1A(B).

Regulatory Guide 1.31

Control of Stainless Steel Welding

Discussion

The Westinghouse position concerning the control of delta ferrite in stainless steel welding is discussed in Section 5.2.3. The Westinghouse production weld verification program, as described in Reference [6], was approved as a satisfactory substitute for conformance with the NRC Interim Position on Revision 3 (4/78) of Regulatory Guide 1.31. The results of the verification program have been summarized and documented in Reference [7].

The welding of austenitic stainless steel is controlled to mitigate the occurrence of microfissuring or hot cracking in the weld. Although published data and experience have not confirmed that fissuring is detrimental to the quality of the weld, it is recognized that such fissuring is undesirable in a general sense. Also, it has been well documented in the technical literature that the presence of delta ferrite is one of the mechanisms for reducing the susceptibility of stainless steel welds to hot cracking. However, there are insufficient data to specify a minimum delta ferrite level below which the material will be prone to hot cracking. It is assumed that such a minimum lies somewhere between 0 and 3 percent delta ferrite.

The scope of these controls discussed herein encompasses welding processes used to join stainless steel parts in components designed, fabricated or stamped in accordance with ASME B&PV Code, Section III Class 1, 2, 3 and CS components. Delta ferrite control is appropriate for the above welding requirements except in the following cases where no filler metal is used (for example, in electron beam welding and in autogenous gas shielded tungsten arc welding), where stainless steel filler metal is used for weld metal cladding, explosive welding, and welding using fully austenitic welding materials.

The fabrication and installation specifications require welding procedure and welder qualification in accordance with Section III, and include the delta ferrite determinations for the austenitic stainless steel welding materials that are used for welding qualification testing and for production processing. Specifically, the undiluted weld deposits of the “starting” welding materials are

required to contain a minimum of 5 percent delta ferrite[a] as determined by chemical analysis and calculation using the appropriate weld metal constitution diagrams in Section III. When new welding procedure qualification tests are evaluated for these applications, including repair welding of raw materials, they are performed in accordance with Section III and Section IX. The results of all the destructive and non-destructive tests are reported in the procedure qualification record in addition to the information required by Section III.

The “starting” welding materials used for fabrication and installation welds of austenitic stainless steel materials and components meet the requirements of Section III. The austenitic stainless steel welding material conforms to ASME weld metal analysis A-7 (designated A-8 in the 1974 Edition of the ASME code), type 308 or 308L for all applications. Bare weld filler metal, including consumable inserts, used in inert gas welding processes conform to ASME SFA-5.9, and are procured to contain not less than 5 percent delta ferrite in the deposit according to Section III. Weld filler metal materials used in flux shielded welding processes conform to ASME SFA-5.4 or SFA-5.9 and are procured in a wire-flux combination to be capable of providing not less than 5 percent delta ferrite in the deposit according to Section III. Welding materials are tested using the welding energy inputs to be employed in production welding.

Combinations of approved heats and lots of “starting” welding materials are used for all welding processes. The welding quality assurance program includes identification and control of welding material by lots and heats as appropriate. All of the weld processing is monitored according to approved inspection programs which include review of “starting” materials, qualification records and welding parameters. Welding systems are also subject to quality assurance audit including calibration of gages and instruments, identification of “starting” and completed materials, welder and procedure qualifications, availability and use of approved welding and heat treating procedures, and documentary evidence of compliance with materials, welding parameters, and inspection requirements. Fabrication and installation welds are inspected using non-destructive examination methods according to Section III rules.

To assure the reliability of these controls, Westinghouse has performed a delta ferrite verification program, described in Reference [6]. The verification program has been approved as a valid approach to verify the Westinghouse hypothesis and is considered an acceptable alternative for conformance with the Interim Position on Regulatory Guide 1.31. The Regulatory Staff’s acceptance letter and topical report evaluation were received on December 30, 1974. The program results, which support the hypothesis presented in Reference [6], are summarized in Reference [7].

Welds made in accordance with the criteria discussed herein have continually resulted in sound production welds, which are free from detrimental fissuring and consistently conform to Section III non-destructive acceptance standards.

Also refer to Appendix 1A(B).

a. The equivalent Ferrite Number may be substituted for percent delta ferrite.

Regulatory Guide 1.32

Criteria for Safety-Related Electric Power Systems from Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.33

Quality Assurance Program Requirements (Operation)

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.34

Control of Electroslag Weld Properties

Discussion

Where electroslag welding is used in fabricating nuclear plant components the Westinghouse procurement procedure requires vendors to meet the guidelines of Regulatory Guide 1.34 (12/28/72).

Regulatory Guide 1.35

Inservice Inspection of Ungrouted Tendons in Prestressed Concrete Containment Structures

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.36

Nonmetallic Thermal Insulation for Austenitic Stainless Steel

Discussion

The Westinghouse practice meets the recommendations of Regulatory Guide 1.36 (2/23/73) but is more stringent in several respects as discussed below.

The nonmetallic thermal insulation used on the reactor coolant pressure boundary is specified to be made of compounded materials which yield low leachable chloride and/or fluoride concentrations. The compounded materials in the form of blocks, boards, cloths, tapes, adhesives, cements, etc., are silicated to provide protection of austenitic stainless steels against stress corrosion which may result from accidental wetting of the insulation by spillage, minor leakage or other contamination from the environmental atmosphere. Each lot of insulation materials provides a compatible combination for the reactor coolant pressure boundary.

The tests for qualification specified by this regulatory guide (ASTM- C-692-71 or RDT M12-IT) allow use of the tested insulation materials if no more than one of the metallic test samples crack. Westinghouse rejects the tested insulation material if any of the test samples crack.

The Westinghouse procedure is more specific than the procedures suggested by this regulatory guide, in that the Westinghouse specification requires determination of leachable chloride and fluoride ions from a sample of the insulating material. The procedures in this regulatory guide (ASTM-D-512 and ASTM-D-1179) do not differentiate between leachable and unleachable halogen ions.

In addition, Westinghouse experience indicates that only one of the three methods allowed under ASTM-D-512 and ASTM-D-1179 for chloride and fluoride analysis is sufficiently accurate for reactor applications. This is the “referee” method, which is used by Westinghouse. These requirements are defined in Westinghouse Process Specification PS-83336KA.

Also refer to Appendix 1A(B).

Regulatory Guide 1.37

Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water-Cooled Nuclear Power Plants

Discussion

This guide (dated March 16, 1973) endorses ANSI N45.2.1-1973, which applies to cleaning procedures at the construction site and is therefore not in the Westinghouse scope. Westinghouse procurement orders apply cleaning requirements during fabrication and packaging of safety-related components so that NSSS equipment is delivered to the site in a properly cleaned condition. A Westinghouse process specification provides detailed cleaning requirements for equipment manufacturers, and is included as a procurement requirement, where appropriate.

Also refer to Appendix 1A(B).

Regulatory Guide 1.38

Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Water-Cooled Nuclear Power Plants

Discussion

For the CPNPP whose application was docketed prior to April 1, 1973, the quality assurance procedures employed in the design and construction phases may vary in detail from the current position of Revision 1 (10/76) of the regulatory guide but meet its essential requirements in that they follow good business practices as defined in the applicable Westinghouse process specifications.

For activities initiated after January 1, 1975, for the CPNPP, Reference [5] is applicable. This plan follows the guidance of ANSI N45.2.2-1978 (Unit 1) ANSI N45.2.2-1972 (Unit 2) (which is recognized by Regulatory Guide 1.38) in the design, procurement, fabrication and shipment of

safety-related NSSS equipment. Measures are applied, as appropriate, to apply packaging requirements to procurement orders, to review supplier packaging procedures, to apply proper cleaning requirements, to apply proper marking and identification, to provide protection to equipment from physical or weather damage, to apply special handling precautions and to define storage requirements. A Westinghouse process specification incorporates detailed packaging and handling requirements for equipment manufacturers, and is included as a procurement requirement where appropriate.

Also refer to Appendix 1A(B).

Regulatory Guide 1.39

Housekeeping Requirements for Water-Cooled Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.40

Qualification Tests of Continuous-Duty Motors Installed Inside the Containment of Water-Cooled Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.41

Preoperational Testing of Redundant On-Site Electric Power Systems to Verify Proper Load Group Assignments

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.42

Interim Licensing Policy on As Low As Practicable for Gaseous Radioiodine Releases from Light-Water-Cooled Nuclear Power Reactors

Discussion

This regulatory guide was withdrawn March 22, 1976.

Regulatory Guide 1.43

Control of Stainless Steel Weld Cladding of Low-Alloy Steel Components

Discussion

The reactor vessel bottom head (Unit 1) and heads (Unit 2), shell courses, and torus sections were constructed of SA-533, Grade B, Class 1, plate material made to a fine grain practice. This material was clad by the shielded metal arc, one-wire submerged arc, and the 4-inch strip submerged arc processes; the shielded metal arc and one-wire submerged arc processes are considered to be low heat input methods of cladding.

Although the plate material is SA-533, Grade B, Class 1, made to fine grain practice and not subject to qualification restrictions by Regulatory Guide 1.43 (5/73), the 4-inch strip clad process was qualified.

1. Unit 1

   The shielded metal arc and the one-wire submerged arc processes (both considered low heat input) were used to clad the vessel flanges and the closure head, which was forged of SA-508, Class 3. These processes were also used to clad the primary nozzles which were constructed of SA-508, Class 2, forging material.

2. Unit 2

   The shielded metal arc and the one-wire submerged arc processes (both considered low heat input) were used to clad the closure head and vessel flanges and the primary nozzles which were constructed of SA-508, Class 2, forging material.

The reactor vessel fabricator monitors and records the weld parameters to verify conformance with the parameters established by the procedure qualification as recommended by Regulatory Position C.3.

Consequently, the reactor vessel is in full compliance with Regulatory Guide 1.43.

The Unit 1 steam generator parts which are clad are constructed of SA-508, Grade 3a steel. The Unit 2 steam generator and pressurizer parts which are clad are constructed of SA-533, Grade A, Class 2, and SA-508, Class 2, steels. These materials are made to fine grain practices and all welding is done with low heat input techniques.

Regulatory Guide 1.44

Control of the Use of Sensitized Stainless Steel

Discussion

The Westinghouse position on Regulatory Guide 1.44 (5/73) is discussed in part in Section 5.2.3.4.

Westinghouse compliance with the separate positions of the guide are as follows:

The use of processing, packaging and shipping controls, and preoperational cleaning to preclude adverse effects of exposure to contaminants on all stainless steel materials are in accordance with Regulatory Position C.1.

Austenitic stainless steel starting materials are utilized in the final heat treated conditions required by the respective ASME Code, Section II, material specification for the particular type or grade of alloy in accordance with Regulatory Position C.2.

The Westinghouse position concerning material inspection programs and Regulatory Position C.3 is discussed in Section 5.2.3.4.

Westinghouse meets the intent of Regulatory Position C.4 in the manner discussed in detail in Section 5.2.3.4. However, the guide's exception (a) to Regulatory Position C.4 established 200°F as the upper limit for dissolved oxygen concentration above 0.1 parts per million (ppm). This temperature limit should be increased to 250°F which provides for much quicker reduction of the oxygen concentration by reaction with hydrazine. Startup operations provide for adding hydrazine after the temperature is at about 225°F. Oxygen scavenging at this temperature is rapid and complete; below 200°F, considerable time can be encountered in the oxygen removal operations.

The Westinghouse position is that the significant chemistry control associated with the above limits on oxygen is the control of chloride and fluoride ion concentrations at less than 0.15 ppm each at all times. The guide's exception (b) to Regulatory Position C.4 is covered in the discussion of delta ferrite in Section 5.2.3.4.

Westinghouse complies with Regulatory Position C.5 in the manner discussed in Section 5.2.3.4. The guide's exception (a) to Regulatory Position C.5 is covered in Section 5.2.3.4 on delta ferrite.

Westinghouse complies with Regulatory Position C.6 in the manner discussed in Section 5.2.3.4.

Also refer to Appendix 1A(B).

Regulatory Guide 1.45

Reactor Coolant Pressure Boundary Leakage Detection Systems

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.46

Protection Against Pipe Whip Inside Containment

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.47

Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.48

Design Limits and Loading Combinations for Seismic Category I Fluid System Components

Discussion

Westinghouse supplied components are designed using the stress limits and loading combinations presented in Sections 3.9N.1 and 5.2 for Code Class 1 components and in Section 3.9N.3 for Code Class 2 and 3 components. The conservatism in these limits and the associated ASME design requirements precludes any component structural failure.

The operability of active Code Class 1, 2 and 3 valves and active Code Class 2 and 3 pumps (there are no active Class 1 pumps) will be verified by methods detailed in Sections 3.9N.1 and 5.2 for Code Class 1 components and in Section 3.9N.3 for Code Class 2 and 3 components.

The use of the above stated methods provides an acceptable alternate method to meeting the guidance of this regulatory guide dated May 1973.

Also refer to Appendix 1A(B).

Regulatory Guide 1.49

Power Levels of Nuclear Power Plants

Discussion

The CPNPP meets the recommendations of Revision 1 (12/73) of Regulatory Guide 1.49 since the projected initial power level is less than 3800 megawatts thermal (MWt) and analyses and evaluation are made at assumed core power levels less than the levels in this regulatory guide.

Regulatory Guide 1.50

Control of Preheat Temperature for Welding of Low-Alloy Steel

Discussion

Westinghouse considers that this regulatory guide (dated May 1973) applies to ASME Code, Section III, Class 1 components.

The Westinghouse practice for Class 1 components is in agreement with the recommendations of Regulatory Guide 1.50 except for Regulatory Positions C.1.b and C.1.c. For Class 2 and 3 components, Westinghouse does not apply any of Regulatory Guide 1.50 recommendations.

In the case of Regulatory Position C.1.b, the welding procedures are qualified within the preheat temperature ranges required by Section IX of the ASME Code. Westinghouse experience has shown excellent quality of welds using the ASME qualification procedures.

In the case of Regulatory Position C.2, the Westinghouse position is that this guide recommendation is both unnecessary and impractical. Code acceptance low-alloy steel welds have been and are being made under present Westinghouse specified procedures. It is not necessary to maintain the preheat temperature until a post-weld treatment has been performed as recommended by this regulatory guide, in the case of large components. In the case of reactor vessel main structural welds, the practice of maintaining preheat until the intermediate or final post-weld heat treatment has been followed by Westinghouse. In either case, the welds have shown high integrity. Westinghouse practices are documented in Reference [8], which has been accepted by the NRC.

Also refer to Appendix 1A(B).

Regulatory Guide 1.51

Inservice Inspection of ASME Code Class 2 and 3 Nuclear Power Plant Components

Discussion

This regulatory guide was withdrawn March 22, 1976.

Regulatory Guide 1.52

Design, Testing, and Maintenance Criteria for Engineered-Safety- Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.53

Application of the Single-Failure Criterion to Nuclear Power Plant Protection Systems

Discussion

Westinghouse furnished systems meet the recommendations of this regulatory guide (dated June 1973) in accordance with the comments of Section 7.1.2.7.

Also refer to Appendix 1A(B).

Regulatory Guide 1.54

Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants

Discussion

For the CPNPP, Westinghouse employs process specifications and the Westinghouse Quality Assurance Program, including quality assurance surveillance and auditing, to provide adequate confidence that coating work within Westinghouse scope will perform satisfactorily in service.

This regulatory guide (dated June 1973) recognizes ANSI N101.4-1972. Westinghouse uses alternate methods which have employed process specifications for protective coatings for several years. The Westinghouse process specifications cover the application of paint systems to structures and components in the reactor Containment which may come in contact with the fission product removal and/or Containment cooling spray. Regulatory Guide 1.54 provides that equipment covered with fabricated metal insulation does not require protective coatings, and thus, may not require the use of this Westinghouse process specification, e.g., steam generators. Applicable coating requirements are included in procurement orders.

Also refer to Appendix 1A(B).

Regulatory Guide 1.55

Concrete Placement in Category I Structures

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.56

Maintenance of Water Purity in Boiling Water Reactors

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.57

Design Limits and Loading Combinations for Metal Primary Reactor Containment System Components

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.58

Qualification of Nuclear Power Plant Inspection, Examination, and Testing Personnel

Discussion

For work within Westinghouse scope performed for the CPNPP, before January 1, 1975, the qualification of inspection, examination, and testing personnel was controlled by standard industry practice with the exception of nondestructive examination personnel, who were qualified in accordance with the requirements of SNT-TC-1A. The qualification of inspection, examination, and testing personnel was accomplished locally by Westinghouse suppliers through on-the-job training.

For activities initiated on the CPNPP after January 1, 1975, Westinghouse follows the guidance of this regulatory guide (dated August 1973) as defined in Reference [5] and as described below.

This guide recognizes ANSI N45.2.6-1973. Westinghouse policies and procedures for qualification of personnel engaged in inspection, examination and testing activities follow the guidance of this standard. Westinghouse uses demonstrated capability of performing the assigned tasks to predetermine standards or levels of proficiency as the primary basis for evaluating and certifying the personnel as an acceptable alternative to the specific years of education/experience.

Westinghouse applies the guidance of this standard to personnel who perform inspection, examination and testing activities including surveillance of these activities for safety-related equipment, materials and services in the Nuclear Energy Systems Division and at outside suppliers.

Also refer to Appendix 1A(B).

Regulatory Guide 1.59

Design Basis Floods for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.60

Design Response Spectra for Seismic Design of Nuclear Power Plants

Discussion

The design response spectra of Revision 1 (12/73) of Regulatory Guide 1.60 are acceptable to Westinghouse as long as the damping values discussed below under Regulatory Guide 1.61 are acceptable.

Also refer to Appendix 1A(B).

Regulatory Guide 1.61

Damping Values for Seismic Design of Nuclear Power Plants

Discussion

The damping values listed in Regulatory Guide 1.61 (dated October 1973) are acceptable to Westinghouse with the single exception of the large piping systems faulted condition value of 3 percent critical. Higher damping values when justified by documented test data have been provided for in Regulatory Position C.2. A conservative value of 4 percent critical has therefore been justified by testing for the Westinghouse reactor coolant loop configuration in Reference [9] and has been approved by the NRC Staff.

For piping systems analyzed by the response spectrum method, ASME Code Case N-411 damping values may be used in lieu of the damping values in this Regulatory Guide.

Also refer to Appendix 1A(B).

Regulatory Guide 1.62

Manual Initiation of Protective Actions

Discussion

Westinghouse furnished systems meet the recommendations of this regulatory guide (dated October 1973) in accordance with the comments of Section 7.3.2.2.7.

Regulatory Guide 1.63

Electric Penetration Assemblies in Containment Structures for Light- Water-Cooled Nuclear Power Plants

Discussion

The Reg. guide as well as IEEE Std. 317 are not applicable to the NSSS Scope of Supply.

Regulatory Guide 1.64

Quality Assurance Requirements for the Design of Nuclear Power Plants

Discussion

The Westinghouse commitment, as described in Chapter 17 of the CPNPP Preliminary Safety Analysis Report, was designed to meet the requirements of 10CFR50, Appendix B, which is an acceptable method for following the guidance of ANSI N45.2. For activity initiated by Westinghouse after January 1, 1975 for the CPNPP, the control measures described in Reference [5] are applicable. Reference [5] commits Westinghouse to meet the requirements of 10CFR50, Appendix B and follow the guidance of the NRC. Specifically, Westinghouse follows the guidance of ANSI/ASME NQA-1 for Unit 1 and ANSI N45.2.11-1974 for Unit 2, which is recognized by this standard in the design work for safety-related NSSS equipment. Westinghouse utilizes different but equivalent forms than those shown as samples in the standard. In regard to design verification, it is performed by individuals or groups other than those who performed the original design. However, in exceptional cases, when the designer's supervisor maintains a detailed expertise on the design, the supervisor will perform the design verification function, and document the reason for this action.

Also refer to Appendix 1A(B).

Regulatory Guide 1.65

Materials and Inspections for Reactor Vessel Closure Studs

Discussion

Westinghouse is in agreement with Regulatory Guide 1.65 (dated 10/73) except for material and tensile strength guidelines.

Westinghouse has specified both 45 ft-lb and 25 mils lateral expansion for control of fracture toughness determined by Charpy-V testing, required by the ASME Code, Section III, Summer 1973 Addenda and 10CFR50, Appendix G (July 17, 1973, Paragraph IV.A.4). These toughness requirements assure optimization of the stud bolt material tempering operation with the accompanying reduction of the tensile strength level when compared with previous ASME Code requirements.

The specification of both impact and maximum tensile strength as stated in the guide results in unnecessary hardship in procurement of material without any additional improvement in quality.

The closure stud bolting material is procured to a minimum yield strength of 130,000 psi and a minimum tensile strength of 145,000 psi. This strength level is compatible with the fracture toughness requirements of 10CFR50, Appendix G (July 17, 1973, Paragraph I.C), although higher strength level bolting materials are permitted by the code. Stress corrosion has not been observed in reactor vessel closure stud bolting manufactured from material of this strength level. Accelerated stress corrosion test data do exist for materials of 170,000 psi minimum yield strength exposed to marine water environments stressed to 75 percent of the yield strength (given in Reference 2 of the guide). These data are not considered applicable to Westinghouse reactor vessel closure stud bolting because of the specified yield strength differences and a less severe environment; this has been demonstrated by years of satisfactory service experience.

The ASME Code requirement for toughness for reactor vessel bolting has precluded the guide's additional recommendation for tensile strength limitation, since to obtain the required toughness levels, the tensile strength levels are reduced. Prior to 1972, the ASME Code required a 35 ft-lb toughness level which provided maximum tensile strength levels ranging from approximately 155 to 178 kpsi (Westinghouse review of limited data - 25 heats). After publication of the Summer 1973 Addenda to the ASME Code and 10CFR50, Appendix G, wherein the toughness requirements were modified to 45 ft-lb with 25 mils lateral expansion, all bolt material data reviewed on Westinghouse plants showed tensile strengths of less than 170 kpsi.

Additional protection against the possibility of incurring corrosion effects is assured by:

a. Decrease in level of tensile strength comparable with the requirement of fracture toughness as described above.

b. Design of the reactor vessel studs, nuts, and washers, allowing them to be completely removed during each refueling permitting visual and/or nondestructive inspection in parallel with refueling operations to assess protection against corrosion, as part of the inservice inspection program.

c. Design of the reactor vessel studs, nuts, and washers, providing protection against corrosion by allowing them to be completely removed during each refueling and placed in storage racks on the Containment operating deck, as required by Westinghouse refueling procedures. The stud holes in the reactor flange are sealed

with special plugs before removing the reactor closure. Thus, the bolting materials and stud holes are never exposed to the borated refueling cavity water.

Regulatory Guide 1.66

Nondestructive Examination of Tubular Products

Discussion

The guide (dated October 1973) states that “Nondestructive examination applied to tubular products used for components of the reactor coolant pressure boundary and other safety-related systems...should be capable of detecting unacceptable defects regardless of defect shape, orientation, or location in the product.” To accomplish this, the regulatory guide suggests the addition of angle beam scanning in two axial directions.

Westinghouse considers the regulatory position regarding angle beam scanning in the axial direction as technically unnecessary since any flaws which might be developed by the processes employed in tubular product manufacture are invariably oriented in the axial direction, and the probability of developing metallurgical flaws of other than axial orientation is virtually nil. Flaws of transverse or circumferential orientation which might be developed would normally be mechanically induced surface defects which should be detected by surface nondestructive examination procedures.

The primary pressure boundary and safety-related tubular products within the Westinghouse scope of supply and the nondestructive examinations applied are tabulated in Table 1A(N)-1. In all cases the volumetric nondestructive examination is designed to detect the flaws inherent to the manufacturing process or processes employed. In those few cases where compliance with the guide is not indicated, Westinghouse believes that the nondestructive examinations performed in the normal procurement of the tubular products covered by the guide achieve the same purpose as the guide.

The hardwater items identified in Table 1A(N)-1 as not being in compliance with Regulatory Guide 1.66 are constructed in accordance with the applicable ASME Code, Section III rules as a minimum.

However, the ASME Code, Section III rules do not require the suggested provisions of the regulatory guide for tubular products which do not fall within the size range of 2.5 to 6 inches, outside diameter.

Tubular products for core support structures function only as structural beams. For the CPNPP these tubular products were procured prior to the effectivity of Section NG of the ASME Code but were purchased using the guidelines of draft Section NG-2000.

Also refer to Appendix 1A(B).

Regulatory Guide 1.67

Installation of Overpressure Protection Devices

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.68

Initial Test Programs for Water-Cooled Reactor Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.68.1

Preoperational and Initial Startup Testing of Feedwater and Condensate Systems for Boiling Water Reactor Power Plants

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.68.2

Initial Startup Test Program to Demonstrate Remote Shutdown Capability for Water-Cooled Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.69

Concrete Radiation Shields for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.70

Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.71

Welder Qualification for Areas of Limited Accessibility

Discussion

Westinghouse practice does not require qualification or requalification of welders for areas of limited accessibility as described by the guide (dated December 1973) and has provided welds of high quality.

Westinghouse believes that limited accessibility qualification or requalification, which are additional to ASME Code, Section III and IX requirements, is an unduly restrictive requirement for shop fabrication, where the welders' physical position relative to the welds is controlled and does not present any significant problems. In addition, shop welds of limited accessibility are repetitive due to multiple production of similar components, and such welding is closely supervised.

For field application, the type of qualification should be considered on a case-by-case basis due to the great variety of circumstances encountered.

Also refer to Appendix 1A(B).

Regulatory Guide 1.72

Spray Pond Plastic Piping

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.73

Qualification Tests of Electric Valve Operators Installed Inside the Containment of Nuclear Power Plants

Discussion

For safety-related motor operated valves inside Containment, Westinghouse complies with the guidance of Regulatory Guide 1.73 (dated January 1974 with the exception that stem mounted limit switches are tested separately to the requirements of IEEE Standard 382-1972.

Also refer to Appendix 1A(B).

Regulatory Guide 1.74

Quality Assurance Terms and Definitions

Discussion

This regulatory guide (dated February 1974) recognizes ANSI N45.2.10- 1973. For the CPNPP, Westinghouse follows the guidance of this standard, utilizing consistent terms and definitions in the description of the Westinghouse Quality Assurance Program.

Also refer to Appendix 1A(B).

Regulatory Guide 1.75

Physical Independence of Electric Systems

Discussion

Westinghouse furnished systems meet the recommendations of Revision 1 (1/75) of this regulatory guide in accordance with the comments of Section 7.1.2.2.1 and Reference [10].

Also refer to Appendix 1A(B).

Regulatory Guide 1.76

Design Basis Tornado for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.77

Assumptions Used for Evaluating a Control Rod Ejection Accident for Pressurized Water Reactors

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.78

Assumptions for Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.79

Preoperational Testing of Emergency Core Cooling Systems for Pressurized Water Reactors

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.80

Preoperational Testing of Instrument Air Systems

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.81

Shared Emergency and Shutdown Electric Systems for Multi-Unit Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.82

Sumps for Emergency Core Cooling and Containment Spray Systems

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.83

Inservice Inspection of Pressurized Water Reactor Steam Generator Tubes

Discussion

Westinghouse steam generators are designed to permit access to tubes for inspection and/or plugging. The inservice inspection program and compliance with Revision 1 (7/75) of this guide is discussed in Section 5.4.2.2.

Also refer to Appendix 1A(B).

Regulatory Guide 1.84

Code Case Acceptability - ASME Section III Design and Fabrication

Discussion

Refer to the discussion of Regulatory Guide 1.85 and Appendix 1A(B).

Regulatory Guide 1.85

Code Case Acceptability - ASME Section III Materials

Discussion

The CPNPP had its second-round Preliminary Safety Analysis Report questions issued after the July 1, 1974 date on which the original versions of Regulatory Guides 1.84 and 1.85 were made effective. The major NSSS components that are Code Class 1, 2 or 3 were ordered before Westinghouse instituted procedures to control the use of code cases. The only examples of code

cases known to have been used that are not authorized by way of Regulatory Guides 1.84 and 1.85 are Code Case 1528 and Code Case 1637. Westinghouse is conducting a testing program to determine fracture toughness properties of the materials allowed by Code Case 1528 and is in the process of obtaining authorization. Authorization has been obtained from the Commission for use of Code Case 1637 in the purchase of tubing for Class 2 and 3 components.

Refer to Appendix 1A(B) for a further discussion of the CPNPP position.

Regulatory Guide 1.86

Termination of Operating Licenses for Nuclear Reactors

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.87

Guidance for Construction of Class 1 Components in Elevated- Temperature Reactors (Supplement to ASME Section III Code Cases 1592, 1593, 1594, 1595, and 1596)

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.88

Collection, Storage, and Maintenance of Nuclear Power Plant Quality Assurance Records

Discussion

This regulatory guide recognizes N45.2.9-1974. For the CPNPP, the Westinghouse Quality Assurance Records Program follows the guidance of this standard. Records are identified, indexed, stored, and protected in a manner consistent with Revision 2 (10/76) of Regulatory Guide 1.88.

For active files, Westinghouse maintains duplicate records in separate geographical locations as an alternative to the protective construction provisions of the standard.

Also refer to Appendix 1A(B).

Regulatory Guide 1.89

Qualification of Class 1E Equipment for Nuclear Power Plants

Discussion

The Westinghouse approach to satisfying the guidelines of Regulatory Guide 1.89 (dated November 1974) and IEEE Standard 323-1974 is documented in WCAP 8587, Revision 6-A which has been reviewed and approved by the NRC. However, as supported by the statements

of consideration for 10CFR50.49 (Federal Register, 48FR2731, January 21, 1983), the recommendations of this regulatory guide need not be applied for Class 1E equipment located in a mild environment area.

Also refer to Appendix 1A(B).

Regulatory Guide 1.90

Inservice Inspection of Prestressed Concrete Containment Structures with Grouted Tendons

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.91

Evaluation of Explosions Postulated to Occur on Transportation Routes Near Nuclear Power Plant Sites

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.92

Combining Modal Responses and Spatial Components in Seismic Response Analysis

Discussion

Westinghouse takes exception to several major positions in this regulatory guide (dated December 1974) as discussed below.

1. Combination of closely spaced modes

   In Section B.1 it is stated that, “Because of the likelihood that the response of closely spaced modes add directly, the values of the response of these modes should be combined by taking the absolute sum of the maximum values of the response of individual closely spaced modes, as explained in Regulatory Position C.2 of this guide.”

   The regulatory guide cited as its only reference in the closely spaced modes discussion one which did not propose to take the absolute sum of maximum values of the response of individual closely spaced modes. Instead, it has recommended that closely spaced modes be added using a coefficient E which is less than or equal to 1.0 and is a function of the frequency ratio, duration of the earthquake, and damping values. Similar formulas have been proposed by the ASME Dynamic Analysis Task Force which utilize the same E coefficient.

   The formula proposed in Regulatory Guide 1.92 has not been thoroughly discussed in the literature and does not realistically represent the dependence of the response of closely spaced modes on the proximity of frequencies and the modal damping values.

Westinghouse has presented an alternative approach in Section 3.7(N) which has factored in the E coefficient. This formula is more conservative than the referenced formula, since E is considered to be positive for all closely spaced modes, but is equal to or less conservative than the formula proposed in the regulatory guide.

2. Time-history dynamic analysis

Regulatory Position C.3 recommends that time-history dynamic analysis be conducted independently for each of the three directions and summed by the square root of the sum of the squares approach.

The three orthogonal earthquake components are statistically independent, and more importantly, they occur simultaneously. Furthermore, time-history analysis is most often conducted in order to properly account for either geometrical or material nonlinearities. All systems do not behave linearly in responding to the loading. Consequently, all three components of the input may need to be applied simultaneously, and therefore, simultaneous use of these components should be allowed by the regulatory guide in the time-history analysis.

For some systems, independent application of each time-history is justified and the methods given in the regulatory guide are applicable. Simultaneous application, however, must be included as an option.

For response spectra analyses, the option should be provided in the regulatory guide for the simultaneous application of the three load components of the earthquake rather than that method specified in the regulatory guide. Currently, the guide recommends independent application of the three components of the earthquake with subsequent combination by the square root of the sum of the squares. Westinghouse is currently preparing computer programs for the analyses of the Reactor Coolant System which will apply the three seismic load components simultaneously. In the seismic analysis, this method gives generally equivalent conservatisms in comparisons to the independent application of the loads and should be permitted by the regulatory guide.

Also refer to Appendix 1A(B).

Regulatory Guide 1.93

Availability of Electric Power Sources

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.94

Quality Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete and Structural Steel During the Construction Phase of Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.95

Protection of Nuclear Power Plant Control Room Operators Against an Accidental Chlorine Release

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.96

Design of Main Steam Isolation Valve Leakage Control Systems for Boiling Water Reactor Nuclear Power Plants

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.97

Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant Conditions During and Following an Accident

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.98

Assumptions Used for Evaluating the Potential Radiological Consequences of a Radioactive Offgas System Failure in a Boiling Water Reactor

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.99

Radiation Embrittlement of Reactor Vessel Materials

Discussion

CPNPP complies with Revision 2 (5/88) of this Regulatory Guide as discussed in Section 5.3.2.1.

Regulatory Guide 1.100

Seismic Qualification of Electric Equipment for Nuclear Power Plants

Discussion

As discussed in Section 3.10N, the CPNPP NSSS program for seismic qualification of safety-related electrical equipment to the recommendations of Regulatory Guide 1.100 is delineated in References 16 and 17. In summary, seismic qualification will be demonstrated by the following methods:

1. For equipment not subject to high energy line break conditions, which has been previously qualified by the single axis sine beat method (after demonstration of no resonant frequency below 33 hertz) as permitted by IEEE Standard 344-1971 “IEEE Guide for Seismic Qualification of Class 1 Electric Equipment for Nuclear Power Generating Stations” and included in the NRC seismic audit and, where required by the staff, the Supplemental Qualification Program, no additional qualification testing is required to demonstrate acceptability to IEEE 344-1975 provided that:

    a. It can be shown, by separate component testing and/or analysis, that there are no aging mechanisms that could prejudice the previously completed seismic qualification.

    b. Any design modifications made to the equipment do not significantly affect the seismic characteristics of the equipment.

    c. The adequacy of the original seismic test levels can be demonstrated as conservative by plant specific verification.

2. For new equipment, or equipment that cannot meet the provisions of item 1 above, seismic qualification will be performed in accordance with IEEE Standard 344-1975, “IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations.” The method to be employed (i.e., test and/or analysis) is indicated, for the safety-related equipment in the Westinghouse scope of supply, in Reference 17. Where multifrequency biaxial inputs are employed for testing, the methodology described in Reference 18 will be employed. When flexible equipment size and weight precludes biaxial testing (e.g., enclosures), single axis testing with justification will be utilized to meet IEEE Standard 344-1975. For rigid equipment (i.e., no resonant frequency below 33 hertz), qualification will be by analysis in accordance with IEEE Standard 344-1975.

All Class 1E equipment located in a mild environment area will be seismically qualified as described above and in FSAR Sections 3.10N and 3.10B, except that the additional requirements imposed by IEEE Standard 323- 1974 do not apply. The procurement documents will specify that the effects of aging on seismic qualification be assessed and if there are aging effects, require pre-aging or analysis of aging effects as part of the seismic qualification.

Refer to FSAR Section 3.10N for further discussion of Regulatory Guide 1.100.

Also refer to Appendix 1A(B).

Regulatory Guide 1.101

Emergency Planning for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.102

Flood Protection for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.103

Post-Tensioned Prestressing Systems for Concrete Reactor Vessels and Containments

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.104

Overhead Crane Handling Systems for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.105

Instrument Setpoints

Discussion

CPNPP complies with the intent of Revision 2 (2/86) of this guide as discussed below.

Westinghouse Standard Technical Specifications provide the margin from the nominal trip setpoint to the allowable value to account for rack drift and calibration when measured during periodic testing. The allowances between the nominal trip setpoint technical specification limit and the safety analysis limit include a statistical combination of the following items:

1. the inaccuracies of the instrumentation,

2. non-instrument related effects, i.e., process measurement accuracy,

3. uncertainties in the calibration of both the transmitter and racks, and

4. Adverse environmental effects on transmitter accuracy caused by postulated or limiting postulated events (only for those systems required to mitigate consequences of an accident).

Potential transient overshoot is accounted for in the modeling of the event in the safety analyses.

Westinghouse chooses setpoints such that the accuracy of the instrumentation is sufficient to meet the assumptions of the safety analyses.

The range of the instrumentation is chosen based on the span necessary for the function. Narrow range instrumentation will be used where necessary. Instrumentation will be selected based on expected environmental and accident conditions. The need for qualification testing is evaluated and justified on a case-by-case basis.

Administrative procedures, coupled with the present cabinet alarms and/or locks, provide sufficient control over the setpoint adjustment mechanism such that no integral setpoint securing device is required. Integral setpoint locking devices are not supplied.

Also refer to Appendix 1A(B) for further discussion.

Regulatory Guide 1.106

Thermal Overload Protection for Electric Motors on Motor-Operated Valves

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.107

Qualifications for Cement Grouting for Prestressing Tendons in Containment Structures

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.108

Periodic Testing of Diesel Generators Used as Onsite Electric Power Systems at Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.109

Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.110

Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.111

Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.112

Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Light-Water-Cooled Power Reactors

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.113

Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.114

Guidance on Being Operator at the Controls of a Nuclear Power Plant

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.115

Protection Against Low-Trajectory Turbine Missiles

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.116

Quality Assurance Requirements for Installation, Inspection, and Testing of Mechanical Equipment and Systems

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.117

Tornado Design Classification

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.118

Periodic Testing of Electric Power and Protection Systems

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.119

Surveillance Program for New Fuel Assembly Designs

Discussion

This regulatory guide was withdrawn June 23, 1977.

Regulatory Guide 1.120

Fire Protection Guidelines for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.121

Bases for Plugging Degraded PWR Steam Generator Tubes

Discussion

The plugging criteria for the steam generator U-tubes, as specified in the plant Technical Specifications, is based on the more conservative limit required by paragraph IWB-3521.1, Section XI of the ASME Boiler and Pressure Vessel Code, than the plugging criteria derived from the Regulatory Guide 1.121 (dated August, 1976) analysis. Alternate repair criteria which may exceed the plugging limit specified by IWB-3521.1 are defined in the plant Technical Specifications.

Regulatory Guide 1.122

Development of Floor Design Response Spectra for Seismic Design of Floor-Supported Equipment or Components

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.123

Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.124

Design Limits and Loading Combinations for Class 1 Linear-Type Component Supports

Discussion

The CPNPP NSSS position on Revision 1 (1/78) of this guide is as follows:

1. Paragraph B.1

   In the regulatory guide, an increase in bolt allowable stress under emergency and faulted conditions is not permitted. Westinghouse believes that the present ASME Code rules are adequate for bolted connections.

   It is recognized after extensive experimental work by several researchers that the interaction curve between the shear and tension stress in bolts is more closely represented by an ellipse and not a line. This has been clearly recognized by the ASME. Code Case 1644-6 specifies stress limits for bolts and represents this tension/shear relationship as a non-linear interaction equation (incorporated into ASME III Appendix XVII via the Winter 77 Addenda) and has a built-in safety factor that ranges between 2 and 3 (depending on whether the bolt load is predominantly tension or shear) based on the actual strength of the bolt as determined by test. [19]

Study of three interaction curves of allowable tension and shear stress based on the ASME Code (emergency condition allowables per XVII-2110 and faulted condition allowables per F-1370) and the ultimate tensile and shear strength of bolts indicates that there is adequate safety margin between the emergency and faulted condition allowables and failure of the bolts. [20]

From this study it is observed that:

a. For the emergency condition, the safety factor (ratio of ultimate strength to allowable stress) varies between a minimum of 1.63 and a maximum of 2.73 depending upon the actual tensile stress/shear (T/S) ratio on the bolt.

b. For the faulted condition, the safety factor varies between a minimum of 1.36 to a maximum of 2.29, again depending upon actual T/S ratio on the bolt.

The stress limits used for Class 1 component bolting material are those given in ASME III Appendix F-1323.1(b), $Pm \leq 2.4$ Sm or 0.7 S_u (whichever is less) using the material properties of Table I-1.3 taken at the appropriate temperature.

It is thus reasonable to allow an increase in these limits for the emergency and faulted conditions.

Based on the above discussion, for the emergency and faulted conditions, Westinghouse will use allowable bolt stresses specified in Code Case 1644-6, as increased according to the provisions of XVII-2100(a) and F-1370(a), respectively.

The increased design limit for the stress range identified in NF-3231.1(a) shall be limited to the smaller of 2 S_y or S_u unless otherwise justified by shakedown analysis.

2. Paragraphs B.5 and C.8

The reduction of allowable stresses to no greater than level B limits (which in reality are design limits since design, level A and level B limits are the same for linear supports) for support structures in those systems with safety related functions occurring during emergency or faulted plant conditions is overly conservative. The primary concern is that the system remains capable of performing its safety function. For active components, this is accomplished through the operability program as discussed in Section 3.9N. In the case of Class 1 piping, maintaining the pipe stresses within level D limits assures that piping geometry is maintained and that required flow is not impeded. The selection of more restrictive stress limits for component supports is not necessary to assure the functional capability of the system.

3. Paragraph C.4

In the design of component support, member compressive axial loads shall be limited to 0.67 times the critical buckling strength. If, as a result of more detailed evaluation of the supports the member compressive axial loads can be shown to safely exceed 0.67 times the critical buckling strength for the faulted condition, verification of the support functional adequacy will be documented and submitted to the NRC for review. The member

compressive axial loads will not exceed 0.67 times the critical buckling strength without NRC acceptance. In no case shall the compressive load exceed 0.9 times the critical buckling strength.

This regulatory guide states that increases in Level A or B service limits does not apply to limits for bolted connections. The Westinghouse design of component supports restricts the use of bolting material to the following applications:

a. Westinghouse design uses bolting predominantly in tension. Oversized holes are generally provided and a mechanism other than the bolts is provided to take any shear loads. Shear or shear & tension interaction occur only in isolated locations;

b. Westinghouse bolts are limited to the following material A490, SA-354, SA-325, SA-540.

c. The diameters used range between 1/2” and 3”.

These limitations on bolt usage are standard in the Westinghouse supports. We will limit tensile loads in the bolts to 0.7 S_u, but not to exceed in any case 0.9 S_y. The allowables are taken at temperature. In those few cases where bolts are used in shear or tension and shear, ASME Code Appendix XVII - 2460 Requirements will apply with an increase factor that is defined in Regulatory Guide 1.124 or in Appendix F-1370. This provides an adequate margin of safety for the Westinghouse design. If future revisions to the bolting criteria in ASME Section III modify the Westinghouse criteria listed above, we will review the criteria at the time.

4. Paragraph C.6(a)

Westinghouse will interpret this paragraph as follows: “The stress limits of XVII-2000 of Section III and Regulatory Position 3 increased according to the provisions of XVII-2110(a) of Section III and Regulatory Position 4, should not be exceeded for component supports designed by the linear elastic analysis method.”

5. Paragraph C.7(b)

Westinghouse will use the provisions of F-1370(d) to determine service level D allowable loads for supports designed by the lead rating method. If future revisions to Appendix F modify this criteria, it will be reviewed further. If the load rating method is used, further details of its implementation will be provided at that time.

Also refer to Appendix 1A(B).

Regulatory Guide 1.125

Physical Models for Design and Operation of Hydraulic Structures and Systems for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.126

An Acceptable Model and Related Statistical Methods for the Analysis of Fuel Densification

Discussion

Fuel for CPNPP is provided by Westinghouse. The methodology for the analysis of fuel densification used by Westinghouse is described in Reference 12.

Regulatory Guide 1.127

Inspection of Water-Control Structures Associated with Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.128

Installation Design and Installation of Large Lead Storage Batteries for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.129

Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.130

Service Limits and Loading Combinations for Class 1 Plate- and Shell-Type Component Supports (Revision 1, October, 1978)

Discussion

The Applicant takes the following exceptions to this Regulatory Guide:

1. Regulatory Guide states in Paragraph B.1:

   “Allowable design limits for bolted connections are derived on a different basis that varies with the size of the bolt. For this reason, the increases permitted by NF-3224 and F-1323.1(a) of Section III are not directly applicable to bolts and bolted connections.”

   It is the Applicant’s position that it is reasonable to allow an increase in the limits for bolted connections for emergency and faulted conditions. Further justification of this position can be found in the discussion of Regulatory Guide 1.124 on Class 1 linear type supports.

2. Paragraphs C.2, C.4(a), and C.6(a) of the Regulatory Guide state that the allowable buckling strength should be calculated using a design margin of 2 for flat plates and 3 for shells for normal, upset and emergency conditions.

   In the design of plate-type supports, member compressive axial loads shall be limited per the requirements of Paragraph C.3 for normal, upset and emergency conditions.

3. In Paragraph C.7 of the Regulatory Guide, inclusion of the upset plant condition is unappropriate in the load combination under discussion. The Applicant will not include the upset plant condition in this combination.

4. In Paragraphs C.7(a) and B.1 of the Regulatory Guide, the stress limits of F-1370(c) are discussed. The criterion stated in F-1370(c), “...loads should be exceed 0.67 times the critical buckling strength of the support...”.

   In the design of plate-type component supports, member compressive axial loads shall be limited to 0.67 times the critical buckling strength. If, as a result of a more detailed evaluation of the supports the member compressive axial loads can be shown to safely exceed 0.67 times the critical buckling for the faulted condition, verification of the support function adequacy will be documented and submitted to the NRC for review. The member compressive axial loads will not exceed 0.67 times the critical buckling strength without NRC acceptance.

5. In Paragraph C.7(b) of the Regulatory Guide, the limit based on the test load given in the Regulatory Guide, T.L. x 0.7 S'_u/S_u, is overly conservative and is inconsistent with ASME Code requirements presented in Appendix F.

   The Applicant will use the provisions of F-1370(c) to determine service level D allowable loads for supports designed by the load rating method.

Regulatory Guide 1.131

Qualification Tests of Electric Cables, Field Splices, and Connections for Light-Water-Cooled Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.132

Site Investigations for Foundations of Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.133

Loose-Part Detection Program for the Primary System of Light-Water- Cooled Reactors

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.134

Medical Evaluation of Nuclear Power Plant Personnel Requiring Operator Licenses

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.135

Normal Water Level and Discharge at Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.136

Material for Concrete Containments

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.137

Fuel-Oil Systems for Standby Diesel Generators

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.138

Laboratory Investigations of Soils for Engineering Analysis and Design of Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.139

Guidance for Residual Heat Removal

Discussion

In lieu of Regulatory Guide 1.139, CPNPP addressed Branch Technical Position RSB 5-1 as provided in FSAR Chapter 5.

Regulatory Guide 1.140

Design, Testing, and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water- Cooled Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.141

Containment Isolation Provisions for Fluid Systems

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.142

Safety-Related Concrete Structures for Nuclear Power Plants (Other Than Reactor Vessels and Containments)

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.143

Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.144

Auditing of Quality Assurance Programs for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.145

Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.146

Qualification of Quality Assurance Program Audit Personnel for Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.148

Functional Specification for Active Valve Assemblies in Systems Important to Safety in Nuclear Power Plants

Discussion

Refer to Appendix 1A(B).

Regulatory Guide 1.150

Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations

Discussion

The CPNPP position on Revision 1 (2/83) of this guide is as follows:

Preservice Inspection

A partial R.G. 1.150 inspection was performed on Units 1 and 2 reactor vessels in accordance with Reference [21].

Inservice Inspection

CPNPP complies with revision 1 of this regulatory guide.

Regulatory Guide 1.155

Station Blackout

Discussion

Refer to Appendix 1A(B)

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18. Jarecki, S. J., “General Method of Developing Multifrequency Biaxial Test Inputs for Bistables,” WCAP-8624 (Proprietary), September 1975 and WCAP-8695 (Non-Proprietary), August 1975.

19. Fisher and Struik, Guide to the Design Criteria of Bolted & Riveted Joints, John Wiley & Sons, 1974, p. 54.

20. Chesson, E. Jr. Faustino, N. L., Munse, W. H., High Strength Bolts Subjected to Tension and Shear, Journal of the Structural Division, Proceedings of the American Society of Civil Engineer, October 1965, pp. 155-180.

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TABLE 1A(N)-1
TUBULAR PRODUCTS WITHIN WESTINGHOUSE SCOPE RELATED TO REGULATORY GUIDE 1.66

Westinghouse Application	Tubular Product Form	UT[a] Circumf. Axial	ET[a]	RT[a]	PT[a]	Complies with Regulatory Guide 1.66
Steam generator tubing	Seamless tube	X[b],[c]	X			Yes[d]
Pressurizer heater tube	Seamless tube	X[c]	X		O.D.	Yes
Heat exchanger tubing	Welded tube	Part.	X		O.D.	Yes
Vent pipe monitor tube	Seamless tube	X[c]	X		O.D.	Yes
Instrument tubing	Seamless tube	X[c]			O. D. ends	No[e]
Instrument nozzles	Bar	X[c]	X		O.D.	Yes
CRDM housings	Bar	X[c]	X		O.D., I.D.	Yes
Adaptor flange	Bar	X[c]	X		O.D., I.D.	Yes
Reactor coolant pipe wrought	Extrusions	X[c]		Welds	O.D., I.D.	No[e]
Surge line pipe wrought	Extrusions	X[c]		Welds	O.D., I.D.	No[e]

a) UT - Ultrasonic
ET - Eddy current
RT - Radiographic
PR - Dye penetrant

b) X indicates that the tests are performed.

c) Two directions.

d) Unit 2 only.

e) These items are outside the range of O.D. sizes covered by those sections of the ASME Code, Section III, which incorporate the ultrasonic testing provisions of the guide.

APPENDIX 1A(B) - DISCUSSION OF REGULATORY GUIDES

This appendix discusses the Comanche Peak Nuclear Power Plant (CPNPP) positions on, and compliance with, Division 1 regulatory guides as they apply to the balance of plant design and construction as well as start-up and operations. Appendix 1A(N) is provided separately for the NSSS related information.

Identification of specific issues of regulatory guides are provided in the discussions where appropriate.

Regulatory Guide 1.1

Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal System Pumps

Discussion

The CPNPP Containment Spray System design complies with the requirements of Safety Guide 1 (11/2/70) except as follows:

In the calculation of the net positive suction head (NPSH) for containment spray pumps it is assumed that the containment pressure is equal to the vapor pressure of the sump water.

The above assumption is conservative and consistent with the intent of the regulatory guide.

Also refer to Appendix 1A(N) and Section 6.2.2.3.4 for further discussion.

Regulatory Guide 1.2

Thermal Shock to Reactor Pressure Vessels

Discussion

Refer to Appendix 1A(N).

Regulatory Guide 1.3

Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors

Discussion

This regulatory guide is not applicable to the CPNPP which has pressurized water reactor steam supply systems.

Regulatory Guide 1.4

Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Pressurized Water Reactors.

Discussion

The analysis of the radiological consequences of the loss-of-coolant accident presented in Section 15.6.5 follows the guidance provided in Regulatory Guide 1.195 instead of Regulatory Guide 1.4.

Regulatory Guide 1.5

Assumptions Used for Evaluating Potential Radiological Consequences of a Steam Line Break Accident for Boiling Water Reactors.

Discussion

This regulatory guide is not applicable to the CPNPP which has pressurized water reactor steam supply systems.

Regulatory Guide 1.6

Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems

Discussion

The CPNPP design complies with the requirements of Safety Guide 6 (3/10/71). For details see Section 8.3.

Regulatory Guide 1.7

Control of Combustible Gas Concentrations in Containment Following a Loss of Coolant Accident

Discussion

Based on a revision to 10CFR50.44, Regulatory Guide 1.7 no longer applies to CPNPP. See Section 6.2.5.

Regulatory Guide 1.8

Personnel Selection and Training

Discussion

Minimum qualifications of unit staffs, with the exception of licensed Senior Reactor Operators and Reactor Operators, will be in accordance with Regulatory Guide 1.8, Revision 2. Minimum qualifications for licensed Senior Reactor Operators and Reactor Operators will be in accordance with Regulatory Guide 1.8, Revision 3.

The training requirements of Regulatory Guide 1.8, Revision 2 have been superseded by the provisions of 10CFR parts 50 and 55.

Regulatory Guide 1.9

Selection of diesel Generator Set Capacity for Standby Power Supplies

Discussion

The CPNPP Diesel generator sets comply with the requirements of Safety Guide 9 (3/10/71) with the following comment:

The voltage may dip below 75 percent of nominal voltage when the diesel generator breaker closes and energizes the two 2000/2666 kVA, 6.9 kV/480 V unit substation transformers supplied from each diesel generator. The dip is due to transformer magnetizing inrush current which exists for two to three cycles. The diesel generator sets are designed to recover to 80 percent of nominal voltage within 10 cycles for this transient. The effect on the first load groups (see Tables 8.3-1 and 8.3-2) therefore would be a maximum possible delay in motor starting of 12-13 cycles after closure of the diesel generator circuit breaker. However, the objective of the first load group and subsequent load groups is not affected. For details see Section 8.3.

Regulatory Guide 1.10

Mechanical (Cadweld) Splices in Reinforcing Bars of Category I Concrete Structures

Discussion

Testing and sampling of Mechanical (Cadweld) Splices in Reinforcing Bars of the CPNPP Concrete Containment Structure complies with the requirements of Revision 1 (1/2/73) of this regulatory guide. For other seismic Category I concrete structures, the testing and sampling of Mechanical (Cadweld) splices complies with the requirements of this guide except that the location of all splices are not recorded and shown in as-built drawings.

Also refer to Section 3.8.

Regulatory Guide 1.11

Instrument Lines Penetrating Primary Reactor Containment

Discussion

The CPNPP instrument lines penetrating primary reactor containment comply with the requirements of Safety Guide 11 (3/10/71), as described by Section 7.3.1.1.2 and 6.2.4.1.4.

Also refer to Appendix 1A(N).

Regulatory Guide 1.12

Instrumentation for Earthquakes

Discussion

The installation of instrumentation for earthquakes in the CPNPP plant meets the intent of Revision 1 (4/74) of this regulatory guide with respect to the ability to determine exceedance of the OBE in a timely manner. Seismic instrumentation includes only the free-field triaxial accelerometer installed in the Yard. Determination of OBE exceedance will be based on the methods of ANSI/ANS-2.10-2003, “Criteria for the Handling and Initial Evaluation of Records from Nuclear Power Plant Seismic Instrumentation.”

Also refer to Section 3.7B.4.

Regulatory Guide 1.13

Spent Fuel Storage Facility Design Basis

Discussion

The design of the CPNPP spent fuel storage facility complies with Revision 1 (12/75) of this regulatory guide except that the air filtration system is not actuated by a high radiation level alarm. Instead the normal plant exhaust filtration system operates continuously. Refer to Sections 3.5, 3.8.4, 9.1.2, 9.1.3, 9.1.4 and 9.4.2 for details.

Regulatory Guide 1.14

Reactor Coolant Pump Flywheel Integrity

Discussion

Refer to Appendix 1A(N).

Regulatory Guide 1.15

Testing of Reinforcing Bars for Category I Concrete Structures

Discussion

The testing of reinforcing bars for CPNPP Category I concrete structures complies with the requirements of Revision 1 (12/28/72) of this regulatory guide.

Also refer to Section 3.8.

Regulatory Guide 1.16

Reporting of Operating Information - Appendix A Technical Specifications

Discussion

This regulatory guide was withdrawn on August 11, 2009.

Regulatory Guide 1.17

Protection of Nuclear Power Plants Against Industrial Sabotage

Discussion

Regulatory Guide 1.17 endorses the requirements and recommendations of ANSI N18.17-1973. This criteria does not reflect current regulations or industry standards and has been superseded by more recent guidelines. CPNPP takes exception to Regulatory Guide 1.17 and ANSI N18.17-1973 and instead implements a security program in accordance with the current applicable regulations and guidelines identified in FSAR section 13.6.

Regulatory Guide 1.18

Structural Acceptance Test for Concrete Primary Reactor Containments (Revision 1, December 28, 1972)

Discussion

The structural acceptance test for the CPNPP Concrete Containments are in accordance with paragraph CC-6000 of the ASME B&PV Code, Section III, Division 2, 1980 Edition with Summer 1980 Addenda (as applicable to non-prototype containments). As such, this test is in conformance with Revision 1 of this regulatory guide except as follows:

Radial deflections of the containment walls are measured along four azimuths only.

Vertical deflections along one azimuth are measured at two equally spaced intermediate points between the dome apex and the springline and along four azimuths at the dome springline. Vertical deflection is also measured at the dome apex.

Only radial deflections at 12 points around the largest opening (the equipment hatch) are measured. In addition, the increase in diameter of the opening is measured in two mutually perpendicular directions.

See Subsection 3.8.1.7.1 for description of the test.

Regulatory Guide 1.19

Nondestructive Examination of Primary Containment Liner Welds

Discussion

The requirements for nondestructive examination of the CPNPP containment liner welds are in conformance with the intent of Revision 1 (08/11/72) of this regulatory guide by use of ASME-ACI 359 Code applicable to this type of structure and the alternate requirements as discussed in Sections 3.8.1 and 3.8.2. Acceptance criteria are those provided in Subsection 3.8.1.6.5.

Regulatory Guide 1.20

Comprehensive Vibration Assessment Program for Reactor Internals During Preoperational and Initial Startup Testing

Discussion

Refer to Appendix 1A(N).

Regulatory Guide 1.21

Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants

Discussion

Measuring, evaluating and reporting of radioactive materials released from CPNPP will meet the recommendations of Revision 1 (6/74) of this regulatory guide.

Also refer to Section 11.5.

Regulatory Guide 1.22

Periodic Testing of Protection System Actuation Functions

Discussion

Refer to Appendix 1A(N).

Regulatory Guide 1.23

Onsite Meteorological Programs

Discussion

The meteorological monitoring program at CPNPP complies with the requirements and those applicable recommendations of the Second Proposed Revision 1 to Regulatory Guide 1.23 (April, 1986) as discussed in Section 2.3. Refer to the CPNPP Offsite Dose Calculation Manual (ODCM), Section I, 4.3.3.6 and Bases 3/4.3.3.6 for an exception.

Refer to Section 2.3 for a description of the design and siting of the primary meteorological tower. The quality assurance program for meteorological monitoring is identified in FSAR Table 17A-1 and Section 17.2.

Regulatory Guide 1.24

Assumptions Used for Evaluating the Potential Radiological Consequences of a Pressurized Water Reactor Radioactive Gas Storage Tank Failure

Discussion

The analysis of the radiological consequences of the radioactive gas storage tank failure accident presented in Section 15.7.1 complies with the requirements of Safety Guide 24 (3/23/72) except that only gamma radiation contribution is taken into account in the determination of whole body exposures and the dose calculation methodology is consistent with Regulatory Guide 1.195.

Regulatory Guide 1.25

Assumptions used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors

Discussion

The analysis of the radiological consequences of the fuel handling accident presented in Section 15.7.4 follows the guidance provided in Regulatory Guide 1.195 instead of that in Regulatory Guide 1.25.

Regulatory Guide 1.26

Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants

Discussion

The CPNPP quality group classification described in Section 3.2.2 is generally in accordance with ANSI N18.2, Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants, 1973, which is an alternate acceptable method of meeting the intent of Revision 3 (2/76) of this regulatory guide. Deviations are described in Section 3.2.2.

Also refer to Appendix 1A(N).

Regulatory Guide 1.27

Ultimate Heat Sink for Nuclear Power Plants

Discussion

The CPNPP ultimate heat sink meets the requirements of Revision 2 (January 1976) of the Regulatory Guide 1.27 as described in Sections 2.3.1.2.10, 2.4.11.5, 2.4.11.6 and 9.2.5.

Regulatory Guide 1.28

Quality Assurance Program Requirements (Design and Construction)

Discussion

The quality assurance program (design and construction) for CPNPP complies with the requirements of Safety Guide 28 (6/7/72) except as stated in Appendix 1A(N). Revisions 1 (3/78) and 2 (2/79) of this guide are not addressed.

Also refer to Sections 17.1 and 17.2

Regulatory Guide 1.29

Seismic Design Classification

Discussion

The seismic Category I classifications of CPNPP structures, systems and components conforms to Revision 2 (2/76) of this regulatory guide.

Also refer to Appendix 1A(N) and Sections 3.1, 3.2 and 13.5.

Regulatory Guide 1.30

Quality Assurance Requirements for the Installation, Inspection, and Testing of Instrumentation and Electric Equipment

Discussion

Safety Guide 30 (8/11/72) is applicable to the installation, inspection, and testing of instrumentation and electric equipment at CPNPP. The quality assurance methods for operations phase activities will comply with the applicable guidance contained in this regulatory guide. The application of the requirements of ANSI N45.2.4 - 1972, as endorsed by this regulatory guide, will be in accordance with the guidance provided in ANSI N18.7 - 1976.

Also refer to ANSI/NCSL Z540-1-1994 “American National Standard for Calibration Laboratories and Measuring and Test Equipment General Requirements” for M&TE and reference standards traceability.

Also refer to Appendix 1A(N) and to Sections 17.1 and 17.2.

Regulatory Guide 1.31

Control of Ferrite Content in Stainless Steel Weld Metal

Discussion

The CPNPP design complies with the recommendations of Revision 3 (4/78) of this regulatory guide except as follows:

1. The acceptable alternative methods of FSAR Subsection 6.1B.1.1.3 are used.

2. The recommendations of Revision 1 (6/73) or Revision 2 (5/77) of this regulatory guide are used.

3. The exception described in Subsection 6.1B.1.1.4.

Also refer to Appendix 1A(N).

Regulatory Guide 1.32

Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants

Discussion

The CPNPP design complies with the requirements of Revision 2 (2/77) of this regulatory guide. For details see Section 8.3.

Regulatory Guide 1.33

Quality Assurance Program (Operation)

Discussion

The quality assurance requirements for the operations phase of CPNPP are in compliance with Revision 2 (2/78) of this regulatory guide as implemented by ANSI N18.7-1976, "Administrative Controls and Quality Assurance for Operational Phase of Nuclear Power Plants", with the following exceptions:

1. Biennial Reviews of Plant Procedures

The quality assurance program has specified alternatives to the program area audit frequencies stated in Regulatory Position C.4. The quality assurance program schedules the audits provided for in Regulatory Position C.4 at 24 month frequencies. The audit schedule is performance-based and additional audits may be scheduled based upon program or functional area performance or other factors that indicate the need for increased assessment.

The intent of the biennial review is accomplished by CPNPP programmatic controls already in place. The following controls assure that procedures are appropriately reviewed and revised to incorporate information based on plant operations, design changes, regulatory requirements, industry experience and other conditions that may impact plant procedures.

- Site Modification Process
- Corrective Action Program
- Off-Normal Occurrence
- User Feedback and Procedure Compliance
- Operating Experience Review

- Vendor Technical Information
- Licensed Document Change/50.59 Evaluation
- Commitment Tracking System (CTS)
- Trending Activities
- Infrequently Performed Evolutions Control
- Requalification Training
- Quality Assurance Activities

In addition, biennial reviews are performed of non-routine procedures (Emergency Response guidelines (ERGs), Functional Restoration Guidelines (FRGs) and Abnormal Plant Operating Procedures (ABNs)).

Note: 10CFR50.59 has been revised and the terminology in Section 4.3.4 of ANSI N18.7-1976 is no longer current. Section 17.2 has been updated to reflect the revision to 10CFR50.59.

2. Identification of QA Program Requirements in Procurement Documents

Quality Assurance program requirements consistent with 10CFR50 Appendix B or ANSI N45.2 are not imposed in procurement documents for commercial grade calibration services from a National Voluntary Laboratory Accreditation Program (NVLAP) or American Association for Laboratory Accreditation (A2LA) accredited calibration laboratory evaluated in accordance with Section 17.2.7.

<u>Regulatory Guide 1.34</u>

Control of Electroslag Weld Properties

<u>Discussion</u>

Refer to Appendix 1A(N).

<u>Regulatory Guide 1.35</u>

Inservice Inspection of Ungrouted Tendons in prestressed Concrete Containment Structures

<u>Discussion</u>

This regulatory guide is not applicable to the CPNPP which has a steel-lined, reinforced concrete containment structure.

<u>Regulatory Guide 1.36</u>

Nonmetallic Thermal Insulation for Austenitic Stainless Steel

Discussion

This regulatory guide is not applicable for components located inside CPNPP Containment Buildings, since only stainless steel metal reflective thermal insulation is used for austenitic stainless steel components located there. Nonmetallic thermal insulation used for austenitic stainless steel piping and components located outside the Containment Buildings meets the requirements of this regulatory guide dated February 23, 1973, with the exception of packaging and shipping requirements of paragraph C.1 of this guide. In lieu of controlled packaging and shipping, a receipt inspection is required, which consists of visual inspection for physical or water damage to shipping containers, to determine if insulation materials have been contaminated by external sources.

Also refer to Appendix 1A(N) and Section 6.1B, 6.2 and 5.2.3.

Regulatory Guide 1.37

Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water-Cooled Nuclear Power Plants

Discussion

This regulatory guide is not applicable to the design and construction of CPNPP. The quality assurance methods for operating phase activities will comply with the applicable provisions of this regulatory guide, dated March 16, 1973, for those activities in this area which are similar to construction activities. The application of the requirements of ANSI N45.2.1 - 1973, as endorsed by this guide, will be in accordance with the guidance provided in ANSI 18.7 - 1976.

Also refer to Appendix 1A(N) and Section 17.2.

Regulatory Guide 1.38

Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Water-Cooled Nuclear Power Plants

Discussion

This regulatory guide is not applicable to the design and construction of CPNPP. The quality assurance methods and administrative controls utilized in the area of packaging, shipping, receiving, storage and handling of items during the operations phase, as described in Section 17.2, will comply with the applicable guidance contained in Revision 1 (10/76) of this regulatory guide. The application of the provisions of ANSI N45.2.2 - 1972, as endorsed by this regulatory guide, will reflect the guidance provided in ANSI N18.7 - 1976.

Although ANSI N45.2.2 - 1972 is entitled, “Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants During the Construction Phase,” CPNPP meets the requirements of this standard during the operation phase with the clarification noted below:

Maintenance of items in-storage during operations will be in accordance with the preventive maintenance requirements of ANSI N18.7-1976 as supplemented by the EPRI guidelines for determining in-storage maintenance of items for nuclear facilities (NCIG-18).

For handling of items during operation phase, the following codes and standards shall apply.

ANSI B30.9 - 1971

ANSI B30.2 - 1976 (1967 for Design and Fabrication)

ANSI B30.5 - 1968

Regulatory Guide 1.38, Revision 2 (5/77) is not addressed.

Also refer to Appendix 1A(N) and Section 17.2.

Regulatory Guide 1.39

Housekeeping Requirements for Water-Cooled Nuclear Power Plants

Discussion

The administrative methods utilized to control station housekeeping practices will comply with ANSI N45.2.3 - 1973, as endorsed by Revision 2 (9/77) of this regulatory guide and as applied to the operations phase by the provisions of ANSI N18.7 - 1976.

Also refer to Section 17.2

Regulatory Guide 1.40

Qualification Tests of Continuous-Duty Motors Installed Inside the Containment of Water-Cooled Nuclear Power Plants

Discussion

This regulatory guide is not applicable to CPNPP since there are no continuous-duty Class 1E motors inside the Containment. For details see Section 3.11B.

Regulatory Guide 1.41

Preoperational Testing of Redundant On Site Electric Power Systems to Verify Proper Load Group Assignments

Discussion

The CPNPP onsite electric power system design complies with the preoperational testing requirements of this guide dated March 1973. For details see Section 8.3. The Initial Test Program, as described in Section 14.2, will comply with the provisions of this regulatory guide.

Regulatory Guide 1.42

Interim Licensing Policy on As Low As Practicable for Gaseous Radioiodine Release from Light-Water-Cooled Nuclear Power Reactors

Discussion

This regulatory guide was withdrawn March 22, 1976.

Regulatory Guide 1.43

Control of Stainless Steel Weld Cladding of Low Alloy Steel Components

Discussion

Refer to Appendix 1A(N).

Regulatory Guide 1.44

Control of the Use of Sensitized Stainless Steel

Discussion

The CPNPP design will comply with this regulatory guide, dated May 1973, except for Regulatory Position C6. The intergranular corrosion tests are eliminated because the weld arc heat input is controlled as described in Section 6.1B.1.1.2, Item 1e. Exception to this regulatory position is also taken for some equipment as described in Section 6.1B.11.2, Item 2.

Also refer to Appendix 1A(N) for further discussion.

Regulatory Guide 1.45

Reactor Coolant Pressure Boundary Leakage Detection Systems

Discussion

The reactor coolant pressure boundary leakage detection system meets the requirements of this guide, dated May 1973 with the exception of the radioactive gaseous monitor leak detection sensitivity (one gpm within one hour), as discussed in Section 5.2.5.3.

Regulatory Guide 1.46

Protection Against Pipe Whip Inside Containment

Discussion

In accordance with Standard Review Plan 3.6.2, protection against pipe whip inside the CPNPP Containment Buildings meets the requirements of Regulatory Guide 1.46, dated May 1973, or Branch Technical Position MEB 3-1 except as discussed in Section 3.6B.

Regulatory Guide 1.47

Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems

Discussion

The CPNPP bypassed and inoperable status indication system presented in Section 7.1 complies with the requirements of this regulatory guide dated May 1973.

Regulatory Guide 1.48

Design Limits and Loading Combinations for Seismic Category I Fluid System Components

Discussion

Balance of Plant components are designed using the stress limits and loading combinations presented in Section 3.9B.3. The conservatism in these limits and the associated ASME design requirements precludes any component structural failure.

The operability of active Code Class 2 and 3 valves and pumps will be verified by methods detailed in Section 3.9B.3.

Alternate provisions to meeting the guidance of this regulatory guide dated May 1973, have been utilized for valves and piping as provided in Section 3.9B.3.

Also refer to Appendix 1A(N).

Regulatory Guide 1.49

Power Levels of Nuclear Power Plants

Discussion

Refer to Appendix 1A(N).

Regulatory Guide 1.50

Control of Preheat Temperature for Welding of Low-Alloy Steel

Discussion

This guide, dated May 1973, is considered applicable to ASME Section III Code Class 1 components only.

The CPNPP design of Code Class 1 components is in agreement with the requirements of this regulatory guide except for Regulatory Positions 1(a) and 1(b). The recommendations of this regulatory guide are not applied to Code Class 2 and 3 components.

In the case of Regulatory Position 2, the low alloy steel welds have been made to ASME code requirements, and therefore the regulatory guide requirements are considered unnecessary.

Also refer to Appendix 1A(N) and 6.1B for further discussion.

Regulatory Guide 1.51

Inservice Inspection of ASME Code Class 2 and 3 Nuclear Power Plant Components

Discussion

This regulatory guide was withdrawn July 21, 1975.

Regulatory Guide 1.52

Design, Testing, and Maintenance Criteria for Post Accident Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants

Discussion

The CPNPP design meets the requirements of Revision 1(07/76) of Regulatory Guide 1.52, as indicated in Table 6.5-1, except part C.2.g instrumentation (see Section 6.5.1.5); part C.3.h, water drains; Part C.3.n, ductwork design; Part C.4.c, ease of maintenance; part C.4.d, test probes; Part C.5.b, Air flow distribution; Parts C.5.c, and C.5.d, in-place testing, and part C.6, laboratory testing criteria for activated carbon.

1. Part C.2.g, instrumentation:

   The flow rates and pressure drops for the ESF filtration units are not recorded or monitored from the control room. Operability of the ESF filtration units is maintained in accordance with the Technical Specifications. For those units provided for postulated DBA conditions, alarm annunciators in the Control Room are utilized to monitor design limits (e.g., flow, pressure drops, temperature, etc.) as well as system malfunction (e.g., damper, fan). This design conforms to the intent of NRC Regulatory Guide 1.52, Revision 1 (07/76).

2. Part C.3.e:

   In lieu of ORNL-NSIC-65, ANSI N509 was used for design.

3. Part C.3.f:

   In lieu of ORNL-NSIC-65 or ERDA 76-21, filter banks are arranged in accordance with ANSI/ASME N509-1980.

4. Part C.3.g:

   In lieu of ORNL-NSIC-65, ANSI N509 was used for design.

5. Part C.3.h, Water drains:

   Check valves have been used on some drains in lieu of seals or traps. The drains for the demister compartments of the four Primary Plant Ventilation System ESF filtration units have not been provided with seals, traps, or check valves. Any minimal airflow through

the demister drain will be filtered prior to discharge at the stack. This design conforms to the intent of NRC Regulatory Guide 1.52, Revision 1 (07/76).

6. Part C.3.n, Ductwork Design:

   In lieu of ORNL-NSIC-65 OR ANSI/ASME N509-1976, ANSI/ASME N509-1980 is used as noted below.

   The following exception is taken to the ANSI/ASME N509-1980 standard (NRC R.G. 1.52, Rev. 2, refers to ANSI/ASME N509-1976):

   Quantitative leak testing of ductwork is limited to:

   a. All Primary Plant Ventilation System ductwork located above el. 873'-6" designated as Safety Class 3.

   b. All ductwork from the fresh air intake up to the Emergency Pressurization Units of the Control Room Air Conditioning System (CRACS).

   c. All ductwork related to the make-up air system from the fresh air intakes up to the isolation dampers (CPX-VADPOU-17, 18, 20, & 21) of the CRACS.

   d. All ductwork penetrating the Control Room envelope.

7. Part C.4.c, Ease of Maintenance:

   The spacing provided between the components of the filtration units is, in some cases, less than the minimum required by this regulatory position. However, it has been determined by operation and maintenance personnel that the spacing provided is sufficient to perform all required maintenance operations. This design conforms to the intent of Reg Guide 1.52, Revision 1 (07/76).

8. Part C.4.d, Test Probes:

   Test ports will be provided in lieu of permanently installed test probes. Permanently installed probes are a convenience in the periodic testing of filters and absorbers. Replacing them with test ports is of no safety significance. This design meets the intent of NRC Regulatory Guide 1.52, Revision 1 (07/76).

9. Part C.5.b, Air flow distribution:

   The air flow distribution to the HEPA filters and iodine absorbers will be tested in place for uniformity initially and after maintenance affecting the flow distribution for all units except the control room pressurization units.

10. Parts C.5.c and C.5.d, In-Place Testing Criteria:

    ANSI/ASME N509-1980 and ANSI/ASME N510-1980 will be issued for field testing activities in place of the older versions of these codes referenced in this Regulatory Guide.

In-place testing of the HEPA filter banks and adsorber will be required following any significant painting, fire or chemical release described in position C.5.c and C.5.d of this guide. This design conforms to the intent of NRC Regulatory Guide 1.52, Revision 2 (03/78).

HEPA filter and charcoal adsorber efficiency for the Primary Plant Filtration Units is 95% which corresponds to an acceptance criteria of less than 1% for in-place penetration and bypass leakage at rated flow.

11. Part C.6, Laboratory Testing Criteria for Activated Carbon:

Laboratory testing of activated carbon will be in accordance with ANSI/ASME N509-1980, ANSI/ASME N510-1980 and ASTM-D3803-1989. The parameters applicable to new and used charcoal at CPNPP shall be applied in the lab test as follows:

New Charcoal	Used Charcoal
4" Beds[(a)]	4" Beds[(a)]
40 ft/min	40 ft/min
30°C & 95% RH	30°C & 70% RH
Pre-equilibrated	Pre-equilibrated

a) When the carbon sample is less than 4" (e.g., as a result of settling during shipment) the correction as detailed in ASTM D3803-1989 Section 9.2 may be applied.

The allowable methyl iodide penetration for 99% efficiency units (control room ventilation filtration and pressurization units) shall be 0.5% instead of 0.175% as shown in Table 2 of the Regulatory Guide.

The allowable methyl iodide penetration for 95% efficiency units (primary plant ventilation filtration ESF units) shall be 2.5% instead of 1.0% as shown in Table 2 of the Regulatory Guide.

When all or most of the charcoal canisters in the filtration units have been used, a representative sample of the charcoal from the bed will be obtained by grain thief sampling in accordance with ANSI N509-1980, Appendix A. The representative samples obtained with the grain thief will be used for laboratory testing and/or refilling the charcoal canisters.

The carbon adsorber beds will be replaced when (1) testing in accordance with the frequency specified in Footnote c of Table 2 results in a representative sample failing to pass the applicable test in Table 2 or (2) no representative sample is available for testing, at a time when testing is required.

This design conforms to the intent of NRC Regulatory Guide 1.52, revision 2 (03/78).

Regulatory Guide 1.53

Application of the Single-Failure Criterion to Nuclear Power Plant Protection Systems

Discussion

BOP systems meet the recommendations of this regulatory guide (dated June 1973) in accordance with the comments of Section 7.1.2.7.

Also refer to Appendix 1A(N).

Regulatory Guide 1.54

Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants

Discussion

Protective Coatings inside containment were declassified from Nuclear Safety Related to Non-safety Related during construction, prior to the receipt of the Operating License. The protective coatings program is subject to a specifically structured quality assurance program as described in Appendix 17A.

A detailed "suitability of application review" of the protective coatings inside containment for Units 1 and 2 has been performed based on the guidance in EPRI Report 1003102 "Guideline on Nuclear Safety-Related Coatings", Revision 1 (formerly TR-109937) and ASTM D 5144-00, Standard Guide for Use of Protective Coating Standards in Nuclear Power Plants. [ER-ME-124, Evaluation of CPNPP Protective Coatings] All of the protective coatings have been evaluated and classified as either "Acceptable" or "unqualified" coatings. This evaluation concluded that all of the applied protective coatings within both containment buildings are acceptable coatings with the exception of those coatings on the Coatings Exempt Log for each unit.

As of December 31, 2007, protective coatings inside containment are classified as Service Level I, coatings. The protective coatings program for ongoing Service Level I inspections, maintenance, repair and modifications is in accordance with the following guidance:

EPRI Report 1003102 "Guideline on Nuclear Safety-Related Coatings", Revision1 (formerly TR-109937).

ASTM D 5144-00, Standard Guide for Use of Protective Coating Standards in Nuclear Power Plants.

For the above reasons, Regulatory Guide 1.54, "Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants", does not apply to Comanche Peak.

Also refer to Appendix 1A(N) and Section 6.1B.2 for further discussion.

Regulatory Guide 1.55

Concrete Placement in Category I Structures

Discussion

The CPNPP design and construction requirements and procedures for concrete placements in Category I structures are in conformance with the requirements of this regulatory guide dated June 1973.

Also refer to Section 3.8.

Regulatory Guide 1.56

Maintenance of Water Purity in Boiling Water Reactors

Discussion

This regulatory guide is not applicable to the CPNPP which has pressurized water reactor steam supply systems.

Regulatory Guide 1.57

Design Limits and Loading Combinations for Metal Primary Reactor Containment System Components

Discussion

The following is applicable to structural systems, i.e. air locks, equipment hatch, etc.

The design limits and loading combinations utilized for the CPNPP metal containment system components conform to the requirements of this regulatory guide dated June 1973.

Also refer to Section 3.8.

Regulatory Guide 1.58

Qualification of Nuclear Power Plant Inspection, Examination, and Testing Personnel

Discussion

With reference to the subject Regulatory Guide as it applies to activities during the Construction phase:

1. For inspection activities within the scope of the ASME Code, inspectors are qualified in compliance with the requirements of Regulatory Guide 1.58, Revision 1.

2. For inspection activities outside the scope of the ASME Code, inspection personnel are qualified in general compliance with the requirements of Regulatory Guide 1.58, Revision 1 except as follows:

a. Some inspection personnel qualifications are documented on a TUGCO form and not on the Constructor's form.

b. Some of the qualification forms are signed by a TUGCO representative and not by a Constructor representative.

3. Qualification records are collected, stored and controlled in compliance with ANSI N45.2.9 Draft 11, Revision 0 dated January 17, 1973 as included in the "Gray Book".

For Operational Phase activities, CPNPP Luminant Power Operations will comply with the provisions of Regulatory Guide 1.58, Revision 1, for the qualification of quality control inspection personnel.

Also refer to Appendix 1A(N) and Section 17.2.

Regulatory Guide 1.59

Design Basis Floods for Nuclear Power Plants

Discussion

The CPNPP probable maximum flood (PMF) analysis was done prior to the issuance of R.G. 1.59. However, a detailed examination has shown that it complies with revision 2 (8/77) of this regulatory guide except as noted below:

Revision 2 of this guide differs, in part, from revision 1 in that it refers to ANSI Standard N170-1976. The CPNPP PMF analysis differs slightly from the recommended methods in ANSI N170-1976 in three areas.

The probable maximum precipitation (PMP) used in the CPNPP analysis is based on Hydrometeorological Report (HMR) No. 33. ANSI N170 - 1976 refers to HMR 33 and also to a draft version of the later HMR 51. The use of HMR 33 PMP data instead of HMR 51 has only a small effect on the calculated high water levels.

The CPNPP PMF analysis used a rainfall time distribution slightly different from the time sequence recommended by ANSI N170 - 1976. This results in no significant difference in calculated maximum water height in either the reservoir or Safe Shutdown Impoundment.

ANSI N170 - 1976 recommends using an antecedent rainfall preceding or following the PMF. The CPNPP analysis assumed the reservoir is full to the top of the conservation storage. The assumption of antecedent rainfall results in slightly higher calculated maximum water levels.

The combined effect of the three computational differences above results in calculated maximum water elevations that are within design limits. Specifically, the resulting minimum freeboard values are in excess of the required freeboard heights for protection against wave action at the peak of the flood.

Regulatory Guide 1.60

Design Response Spectra for Seismic Design of Nuclear Power Plants

Discussion

The design response spectra for the seismic design of the CPNPP plant is in conformance with Revision 1 (12/73) of this regulatory guide except in the high frequency region greater than 33 Hz of vertical response spectra where the vertical response spectra are reduced to a maximum vertical ground acceleration of 0.08g at 50 Hz. This exception is in accordance with NRC Standard Review Plan, Section 3.7.1 and is also consistent with the recommendation of Newmark, Blume and Kapur (Reference 14 of Section 3.7B) from which the vertical design response spectra of this regulatory guide was developed. Similarly, vertical response spectrum frequency of 4.0 Hz was recommended by Newmark, Blume and Kapur and used here instead of 3.5 Hz adopted in Regulatory Guide 1.60. The effect of these deviations is insignificant.

Also refer to Appendix 1A(N).

Regulatory Guide 1.61

Damping Values for Seismic Design of Nuclear Power Plants

Discussion

The damping values utilized for the seismic design of the CPNPP are in conformance with this regulatory guide dated October 1973. For piping systems analyzed by the response spectrum method, ASME Code Case N-411 damping values may be used in lieu of the damping values in this Regulatory Guide.

Also refer to Appendix 1A(N) and Section 3.7B.

Regulatory Guide 1.62

Manual Initiation of Protective Actions

Discussion

Manual initiation controls for BOP systems meet the recommendations of this Regulatory Guide in accordance with the comments of Section 7.3.2.2.7. System level manual actuation of BOP components (such as the auxiliary feedwater pumps, containment spray pumps, component cooling water pumps, etc.) is accomplished through the system level actuation devices described in Section 7.3.2.2.7, for manual initiation of safety injection, spray actuation, or steam line isolation, as appropriate to the component.

Also refer to Appendix 1A(N).

Regulatory Guide 1.63

Electric Penetration Assemblies in Containment Structures for Light-Water-Cooled Nuclear Power Plants

Discussion

The CPNPP Electric Penetration Assemblies comply with the intent of Revision 2 (7/78) of this regulatory guide. For details see Section 8.3.

Regulatory Guide 1.64

Quality Assurance Requirements for the Design of Nuclear Power Plants

Discussion

The quality assurance program for design and construction at CPNPP incorporates the intended objectives of ANSI N45.2.11 (Draft 2, Revision 2 - 5/73). The quality assurance methods for operation phase activities will comply with applicable guidance contained in Revision 2 (6/76) of this regulatory guide. The application of the requirements of ANSI N45.2.11 - 1974, as endorsed by this regulatory guide, will be in accordance with the guidance provided by ANSI N18.7 - 1976.

Also refer to Appendix 1A(N) and Section 17.2.

Regulatory Guide 1.65

Materials and Inspections for Reactor Vessel Closure Studs

Discussion

Refer to Appendix 1A(N).

Regulatory Guide 1.66

Nondestructive Testing of Tubular Products

Discussion

This regulatory guide was withdrawn September 28, 1977.

Regulatory Guide 1.67

Installation of Overpressure Protection Devices

Discussion

This regulatory guide was withdrawn by the NRC on April 15, 1983 because the Winter 1978 Addenda to the 1977 edition of the ASME Boiler and Pressure Vessel Code, Appendix O, Section III, Division 1, included requirements equivalent to the recommendations in this Reg. Guide. The NRC accepted these changes in the code by reference in 50.55a of 10CFR50 (46FR20153) on April 3, 1981.

Regulatory Guide 1.68

Preoperational and Initial Startup Test Programs for Water-Cooled Power Reactors

Discussion

The testing activities conducted as part of the Initial Test Program, as described in Section 14.2, and startup program comply with the intent of this Regulatory Guide, Revision 2, dated August 1978, with the following exceptions and justification.

1. Appendix A subparagraph 1.c

   As identified in Table 14.2-2, Sheet 42A of 60 of the FSAR, the response time acceptance criteria of the various logic channels will be consistent with Technical Specifications requirements. The Reactor Trip System Response Time is defined in the technical specifications as the time interval from when the monitored parameter exceeds its trip setpoint at the channel sensor until loss of stationary gripper coil voltage. The accident analysis accounts for conservative values for delay times, setpoint drift, etc. Therefore, it is not necessary to account these delay times in the test methods or acceptance criteria.

2. Appendix A subparagraph 1.d.1, 1.e.6, 1.e.g, 1.f.1, 1.j.2 & 1.j.17

   There are no safety related functions of the turbine control and bypass valves as discussed in FSAR Section 10.2.2.7.7. The circulating water system also has no safety related function as described in FSAR Section 10.4.5. Therefore these systems are not included in the preoperational program. However, as identified by Section 14.2.1 these systems are intended to be acceptance tested in accordance with applicable startup administrative procedures.

   The feedwater control system is not required for safety but does have an interface with the protective system. These interfaces are exclusively part of the feedwater isolation valves ability to close upon the actuation of the proper logic and is covered within preoperational test summary FSAR Table 14.2-2, Sheet 50.

3. Appendix A subparagraph 1.d.3

   The accident analysis concerning the inadvertent depressurization of the reactor coolant system is discussed in FSAR Section 3.9N.1.1, Upset Condition number 5. Subsection 5.b lists the condition of the inadvertent opening of one pressurizer power operated relief valve (PORV). The analysis states that the limiting case is the actuation of the pressurizer safety valve. This is classified as an Upset Condition with no operational impairment. The design parameters listed in Table 5.4-16 of the FSAR indicate that the relieving capacity for the pressurizer power operated relief valve is one-half the capacity of the pressurizer safety valve, 210,000 lb/hr vs 420,000 lb/hr. Therefore there is no intention of performing capacity tests of the pressurizer power operated relief valves during the startup phase.

   Testing of these valves is listed in Table 14.2-2, Sheet 53, of the FSAR as a preoperational test.

   The accident analysis covering the opening of a steam generator power operated relief valve is similar. The analysis is described in FSAR Section 15.1.4. This accident

analysis uses a value of 968,400 lbm/hr @ 1200 psia. In addition, for plant cooldown requirements, a minimum capacity of 62,150 lbm/hr @ 100 psia is also required. Table 10.3-3 in the FSAR describes these requirements. Because of extensive validation program conducted by the valve vendor, the uncertainties associated with a field test and the routine calibration of the valve stem travel stop positions, there is no need to test the capacities of the steam generator power-operated atmospheric relief valves during the startup program.

The testing of the steam generator power operated relief valves is presented in FSAR Table 14.2-2, Sheet 49.

4. Appendix A subparagraph 1.k.2,3

The equipment identified in the above paragraphs of Regulatory Guide 1.68 is calibrated and functionally tested as part of the instrument calibration program for the TUGCO Chemistry and Health Physics section. The calibration and functional testing is performed and documented in accordance with approved station calibration procedures. Therefore, TUGCO Startup will not perform additional testing, in the form of a preoperational test, on this equipment.

5. Appendix A subparagraph 1.n.11

Refer to the discussion of Regulatory Guide 1.68.3.

6. Appendix A subparagraph 1.o.1

The vendor has performed applicable load testing on the head lifting and internals lifting devices for 125% static loads.

7. Appendix A subparagraph 4.t

Natural circulation tests have been successfully completed at McGuire Unit 1, Salem 2, Sequoyah 1 and other Westinghouse plants similar to CPNPP. It is unnecessary for CPNPP to compare flow (without pumps) and temperature data to that of these plants since no design differences exist which would significantly effect natural circulation capabilities. Typical natural circulation characteristics for 4 loop Westinghouse plants are given in WCAP-8460, “Natural Circulation Test Report for Zion Station Unit 1.” However, in order to verify natural circulation cooldown and boron mixing capability per requirements of Branch Technical Position RSB 5-1, CPNPP referenced test results from Diablo Canyon Unit 1 which were found to be acceptable. See Appendix 5A for further discussion.

8. Appendix A subparagraph 5.k.k

The most influential contributor for this transient is the value of moderator temperature coefficient of reactivity, which has a relatively low value at beginning of core life. Since this parameter is determined in other startup tests, thus validating the safety analysis, the performance of this test provides no new information needed to verify the plant design. The transient does introduce the potential for thermal stress damage to the steam

generator feedwater inlet nozzles and it expends one of the analyzed thermal cycles. Therefore, we do not intend to perform a test to comply with this subparagraph.

9. Appendix A, Subparagraphs 4c, 5e, 5f and 5i

   The pseudo ejected rod tests and pseudo dropped rod tests referenced by these sections of the Regulatory Guide have been successfully performed at plants of similar design to Comanche Peak. Previous tests on similar facilities indicate little new information is generated by the performance of these tests. Additionally, vendor predictions indicate that a violation of the F-delta-H Technical Specification may occur if the 50% power pseudo dropped rod test is performed at Comanche Peak. Recent industry experience indicates there is an increased potential for causing severe xenon transients by performing these tests. Based on these reasons, we do not intend on performing tests to comply with Appendix A, Subparagraphs 4c, 5e, 5f and 5i. A normal function of the Digital Rod Position Indication system is to detect misaligned control rods which satisfies subparagraph 5i. The Digital Rod Position Indication system is a diverse and independent method of detecting control rod positions.

10. Appendix A, subparagraph 5.d.

    CPNPP plant design does not include part-length control rods. The ability to control core xenon transients is a design feature of the Westinghouse Nuclear Steam Supply System and has been demonstrated in numerous operating pressurized water reactors. In addition, compliance with Technical Specification 3/4.2.1, “Axial Flux Difference”, ensures proper power and flux distributions. On these bases, CPNPP does not intend to perform an Initial Startup Test to comply with subparagraph 5.d.

11. Appendix A, subparagraph 5.i.i.

    The performance of this test provides no new information needed to verify the plant performance during design transients. Trip of the reactor coolant pumps result in a reactor trip with flow coastdown, as verified in the Reactor Coolant System Flow Coastdown Test, providing sufficient heat removal to ensure DNBR does not decrease below the limit value. Performing this test expends one of the analyzed transients and results in unnecessary cost and down time for the utility.

12. Appendix A, subparagraph 5.u.

    Operability and response times of the main steam isolation valves will be verified in hot standby (mode 3) rather than at the recommended 25% power level. Testing at hot, zero power will result in more conservative results and will eliminate the unnecessary pressure and steam flow transients which would otherwise be induced.

13. Appendix A, subparagraph 5.m.m.

    The performance of this test provides no new information needed to verify the plant performance during design transients. Closure of all Main Steam Isolation Valves from 100% power causes a turbine trip and a reactor trip. A turbine trip and reactor trip from 100% power will be performed during initial startup testing. Closure of the MSIV’s may cause the operation of the pressurizer and steam generator power operated relief valves

and/or safety valves which may then require repair and unnecessary down time for the utility. This test would expend one of the analyzed pressure transients for the reactor coolant system and steam generators and therefore will not be performed at CPNPP.

14. Appendix A, subparagraph 2.b

Hot no flow, cold no flow and cold full flow rod drops do not provide any additional useful data. By Technical Specifications, critical operations are only permitted when plant is hot and RCP operating and thus scram testing is not required for hot no flow, cold no flow and cold full flow conditions. We do not intend to take credit for cold no flow, cold full flow and hot no flow rod drops, although one or more of these tests may be optionally performed for diagnostic or demonstration purposes.

15. Appendix A, subparagraph 5.h

Rod drop times are measured during pre-critical testing at hot full-flow conditions. There is no provision in the design of CPNPP to allow for determination of rod scram times following normal plant trips. These tests meet the intent of subparagraph 5.h.

16. Appendix A, subparagraph 5.j

The CPNPP design does not include partial scram or rod runback features. Therefore, an Initial Startup Test will not be performed to comply with subparagraph 5.j.

17. Appendix A, subparagraph 5.l

The CPNPP residual heat removal (RHR) system does not include a “steam condensing mode” of operation. Also, the “reactor core isolation cooling (RCIC) system” pertains to Boiling Water Reactors. Since these features do not exist at CPNPP, they cannot be tested during the Initial Startup Test program. The remainder of paragraph 5.l will be complied with.

18. Appendix A, subparagraph 5.a

The power coefficient measurement test method recommended by Westinghouse cannot be used because it requires installed instrumentation (narrow range hot leg temperature) which is not part of CPNPP design. Power coefficient measurement results, obtained during the startup of several Westinghouse plants, have verified consistency between design calculations and measurement data in plants having fuel similar to the Comanche Peak design. CPNPP’s Initial Startup program includes measurement of the critical RCS boron concentration under the conditions of all rods out, hot full power, equilibrium xenon. From this, the core reactivity balance is verified. This test is considered sufficiently accurate to detect any significant differences between the designed and as-built core. This test is in addition to the minimum specifications of the Regulatory Guide.

19. Appendix C, subparagraph 4.h.

The power ascension program for CPNPP requires flux maps to be taken at each power plateau. The values for $F_Q(Z)$ (heat flux hot channel factor) and F^N_H (nuclear enthalpy

rise hot channel factor) obtained from these flux maps will be compared to and evaluated against Technical Specification limits. This evaluation will be used in place of extrapolating DNBR and linear heat rate values. This action is consistent with the Reference Startup Document supplied by the fuel vendor. Station Administrative procedures will require management review and approval of test results prior to ascending to the next power plateau.

20. Section C.8, Appendix A (Various)

Testing will not be performed at the Regulatory Guide suggested 25% (30%) power. Testing originally specified at 30% RTP will be conducted at 50% RTP. Where testing had been previously performed for both 30% and 50% RTP, only the 50% RTP test will be performed.

The tests that were previously prescribed to be conducted at the 30% rated thermal power (RTP) plateau include the following:

Core Performance Evaluation
Unit Load Transients (10% Step Load Change)
Automatic Reactor Control System Test

The core performance data that could be obtained at 30% RTP is utilized for gross calibration adjustments of the Nuclear Instrumentation System (NIS) prior to power escalation to 50% RTP. This activity will be performed at 25-30% RTP as a hold prior to escalation to 50% RTP. The flux distribution measurement at 30% RTP will not be performed unless the peaking factors measured at low power do not support escalation to 70% RTP, the NIS trip setpoint for the 50% RTP testing plateau. This is per the direction of RG-1.68 Appendix C, paragraph 4.h.

For Unit 2, one low power flux map will be taken prior to exceeding 30% RTP as a fulfillment of Regulatory Guide 1.68, Appendix A, subparagraph 4.e. At power, flux maps will be taken at 50%, 75% and 100% RTP to satisfy Regulatory Guide 1.68, Appendix A, subparagraph 5.b. Additional flux maps will be taken if required by Regulatory Guide 1.68, Appendix C, subparagraph 4.h.

For Unit 1, the unit load transient at approximately 30% RTP will be performed following completion of 50% RTP plateau testing to assure proper control system response. For Unit 2, the 30% RTP unit load transient will not be performed.

The Automatic Reactor Control System test is performed at 50% RTP and intended as a precursor to the first Unit Load Transient test. It is designed to ensure that the automatic rod control system can restore the Reactor Coolant System (RCS) temperature to within a +1.5 Deg-F deadband of the reference temperature. Prior to 50% RTP, proper operation of this function would be demonstrated by observation during the normal power escalation, where the control rods will be in automatic and already controlling the RCS temperature to within the deadband.

21. Appendix A, subparagraph 5.z

For Unit 2, each radiation monitor and detector will be calibrated in lieu of only verifying response to a radiation check source as part of the preoperational test program (Table 14.2-2, Sheet 24A). The calibration of the monitors and detectors meet the intent of RG 1.68, Revision 2, Appendix A, Sections 4.g and 5.z (see FSAR 11.5.2.11) and provides a more accurate method for demonstration of their proper operation.

22. Appendix A, subparagraph 1.j.(13).

    The incore neutron instrumentation portion of this subparagraph cannot be fully tested as a preoperational test program item because the system is not fully installed until after initial fuel load. The fuel assemblies provide the structural support for the incore flux mapping system thimbles, the thimbles are not self-supporting and cannot be installed until after the fuel is all in place. For this reason, the only valid demonstration of proper system function over its full operational range must be performed after initial fuel load. Portions of this testing are also customarily performed at normal operating temperatures prior to initial reactor criticality to ensure that thimble thermal expansion does not create any system operation interferences.

23. Appendix A, subparagraph 1.j.(18).

    The neutron response checks of the auxiliary startup instrumentation are not included as part of the preoperational test program. This testing is performed prior to the start of initial fuel loading, but is addressed as an initial startup test. The auxiliary startup instrumentation is typically received only a short time prior to the start of initial fuel load and is tested prior to the actual fuel movements. The neutron response check portion of this testing is required to be performed within 8 hours of the actual start of initial fuel loading. This time constraint makes it impractical to retain this testing in the preoperational testing program as it allows too little time to close out the preoperational testing program prior to fuel load.

24. Appendix A, subparagraph 5.q.

    The failed fuel detection system consists of the failed fuel monitor with letdown chemistry samples used as both a backup and supplement. The failed fuel monitor, itself, is one of the process radiation monitors that are tested elsewhere under subparagraph 5.z. Additional testing of this one monitor, beyond that already planned as part of the process monitor testing, would not be expected to provide additional useful test results. Normal plant operating surveillances provide sufficient assurance of failed fuel monitor operability and of the ability to detect any actual failed fuel.

<u>Regulatory Guide 1.68.1</u>

Preoperational and Initial Startup Testing of Feedwater and Condensate Systems for Boiling Water Reactor Power Plants

<u>Discussion</u>

This regulatory guide is not applicable to the CPNPP

Regulatory Guide 1.68.2

Initial Startup Test Program to Demonstrate Remote Shutdown Capability for Water Cooled Nuclear Power Plants

Discussion

The testing activities conducted as a part of the startup test program will comply with the applicable requirements of Revision 1 (7/78) of this regulatory guide.

Also refer to Section 14.2.

Regulatory Guide 1.68.3

Preoperational Testing of Instrument Air Systems

Discussion

The CPNPP Instrument Air System testing meets with the intent of the requirements of NRC Regulatory Guide 1.68.3, Regulatory Positions C.1 through C.11, as described below:

Position C.1: CPNPP meets the intent of position C.1 by performing preoperational tests on those aspects of the system which are important to safety as described in Section 14.2. The balance of the Instrument Air System testing is performed under the acceptance testing program at CPNPP.

Position C.7: Air operated components which are required to operate in order to perform a safety function are provided with safety related air accumulators as described in section 9.3.1.1. These accumulators and their associated check valves are, for the purposes of single failure analysis, considered an extension of the component being supplied. In no case are safety related air accumulators shared between two redundant components. Therefore, CPNPP meets the required single failure criterion. Tests on these accumulators are described in FSAR Section 14.2.

Position C.8: Preoperational tests for loss of Instrument Air are performed as described in FSAR Section 14.2. Prerequisite tests are performed to verify air operated component failure positions. This testing meets the intent of position C.8.

Position C.9: Regulatory Position C.9 is not applicable to CPNPP since there is no provision for connecting the plant Service Air System to the Instrument Air System.

Position C.10: Regulatory Position C.10 addresses air header pressure transients caused by large air users. The CPNPP Instrument Air Systems only bulk load is the Turbine Generator Gas Purge. This function is manually initiated and is only used while the plant is not operational. To date, operation of the Turbine Generator Gas Purge has not revealed any problems associated with pressure transients. Therefore, no testing will be performed.

Position C.11: Regulatory Position C.11 addresses Instrument Air System overpressure transients. The CPNPP Instrument Air System is protected from overpressurization by relief valves which are individually tested. No additional overpressure testing is performed.

Also refer to Section 14.2

Regulatory Guide 1.69

Concrete Radiation Shields for Nuclear Power Plants

Discussion

The regulatory guide states that ANSI N101.6-1972, Concrete Radiation Shields, is considered applicable to shielding structures for nuclear power plants, subject to certain conditions. These conditions are stated in Regulatory Positions Nos. 1-8 of the regulatory guide. The guidance provided in this regulatory guide, dated December 1973, is adhered to as follows:

1. Regulatory Position No. 1: The codes and standards of concrete shielding are those listed in subsection 3.8.4.2 (outside the Containment).

2. Regulatory Position No. 2: This position is complied with as described in Section 3.8.

3. Regulatory Position No. 3: In the design of concrete radiation shields, there has been consideration of steady state and transient thermal loads and loads due to postulated missiles, as described in Sections 3.3, 3.8.3.3, and 3.8.4.3.

4. Regulatory Position No. 4: This position is complied with as described in Sections 3.8.3 and 3.8.4.

5. The intent of Regulatory Position Nos. 5 and 6 is complied with.

6. Regulatory Position No. 7: Provision is made for adequate means by transferring all forces through construction joints. All loads described in Sections 3.3, 3.5, and 3.8 are considered in the design.

7. Regulatory Position No. 8: Vacuum box testing of pool liner welds, or an equivalent alternate method, are considered as an acceptable supplementary method of testing liner welds or leaktight integrity.

Also refer to Section 12.3.2.

Regulatory Guide 1.70

Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants, LWR Edition

Discussion

The CPNPP FSAR conforms to the format of Revision 2 (9/75) of this regulatory guide with minor variations where needed for clarity. In a number of sections the NSSS information is separated from the BOP (i.e. 1A(N) and 1A(B), 3.6N and 3.6B). Appendices are used appropriately and incorporated by reference.

Printing/reproduction for FSAR amendments may be performed mechanically or photographically, including “Xerox-type” copier quality reproduction.

Following clarification is provided for Revisions Section (Page V):

Amendment number and date of change is provided on each affected pages of Sections and Tables. For flow diagrams, it will be provided on the index pages in lieu of each flow diagram.

Regulatory Guide 1.71

Welder Qualification for Areas of Limited Accessibility

Discussion

The CPNPP design complies with the requirements of this regulatory guide, dated December 1973, for piping only.

Also refer to Appendix 1A(N).

Regulatory Guide 1.72

Spray Pond Plastic Piping

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.73

Qualification Tests of Electric Valve Operators Installed Inside the Containment of Nuclear Power Plants

Discussion

Safety-related motor operated valves inside Containment comply with the guidance of Regulatory Guide 1.73, dated January 1974, with the exception that stem mounted limit switches are tested separately to the requirements of IEEE Standard 382-1972.

For details see Section 3.11B.

Also refer to Appendix 1A(N).

Regulatory Guide 1.74

Quality Assurance Terms and Definitions

Discussion

This guide is not applicable to CPNPP design and construction. The quality assurance provisions for operating phase activities are in accordance with the guidance of ANSI N45.2.10 - 1973, as endorsed by this regulatory guide dated February 1974.

Also refer to Section 17.2.

Regulatory Guide 1.75

Physical Independence of Electric Systems

Discussion

CPNPP design complies with the intent of Revision 1 (1/75) of this regulatory guide with the following comments:

Regulatory Position C.1 - Non-Class 1E power or control circuits may be isolated from their Class 1E power source by two circuit breakers, two fuses or a breaker and a fuse in series, both coordinated with an upstream circuit protective device, and the circuit breakers periodically tested. Non-safety instrument circuits powered from distribution panels 1PC1, 1PC2, 1PC3, and 1PC4 will have a non-safety circuit breaker or fuse connected in series with the panel circuit breaker.

The non-Class 1E AC essential lighting circuits use interconnecting cable (i.e., from the distribution panel feeder breaker to the lighting load) routed in conduit. The routing of the circuits in conduit ensures the physical and electrical independence from Class 1E circuits beyond the isolation breaker.

The non-Class 1E DC emergency lighting circuits connected to dedicated batteries are routed in conduit. The routing of the circuits in conduit ensures physical and electrical independence from Class 1E circuits.

The lighting circuits routed in conduit meet the separation criteria of FSAR Section 8.3.1.4.

Electrically, Class 1E circuits are equal or superior to non-Class 1E circuits. Physically, Class 1E circuits are subject to more stringent analysis than non-Class 1E circuits. Therefore, devices qualified for non-Class 1E-to-Class 1E isolation applications provide more than adequate train-to-train isolation.

Separation between Radiax and Heliax radio antenna cables and Class 1E cables is not required. The analysis is provided in Section 8.3.1.4(4).

Separation between Thermistor and Class 1E cables is not required. The analysis is provided in Section 8.3.1.4(4).

Fiber optic cables used in non-Class 1E monitoring circuits carry no electrical energy by themselves and therefore are not required to maintain physical separation from Class 1E circuits.

Lesser internal wiring separation is being used between redundant safety systems and safety and non safety systems in BOP Analog Process Instrumentation Panels. This analysis is provided in Section 7.1.2.2.

The non-Class 1E diesel generator neutral grounding transformer is connected to the neutral of the Class 1E diesel generator. An analysis has been performed which demonstrates that a fault on the non-Class 1E portion of the circuit will not cause an unacceptable influence on the Class 1E system. In addition, the interconnecting cable is routed within the diesel generator room. The cable is routed in dedicated raceway and is inspected to Class 1E requirements.

Isolation between Non-Class 1E cables originating from Non-Class 1E, 6.9kV switchgear reactor coolant pump and potential transformer Class 1E fuse, is not required based on the analysis provided in Section 8.3.

Isolation between the Class 1E pressure indicating switch contact and Non-Class 1E time delay relay contact in Emergency Diesel Generator control panels CP1-ECCPEC-01 and 02 is not required based on the analysis provided in Section 8.3.

Isolation between Non-class 1E cables originating from the annuniciator in Spent Fuel Pool Panel CPX-EIPRLV-06 and Class 1E electronic boxes X-LY-4849A and B is not required based on the analysis provided in Section 8.3.

Isolation between the Non-Class 1E coaxial cable and the epoxy mica capacitor (EMC) which forms part of the Class 1E Partial Discharge Monitor Bus Coupler connected to each of the Unit 1 and Unit 2 Station Service Water Pump and Component Cooling Water motor feeders and Emergency Diesel Generators, is not required based on the analysis provided in Section 8.3.

Regulatory Position C.2 - For the purpose of electrical cable separation, acceptable barriers include rigid metal conduit, electrical metallic tubing (EMT), flexible metallic conduit, cable tray covers (both solid and ventilated types), cable bus enclosures, equipment and device enclosures, enclosed metal wireways inside equipment, a wrap of woven silicon dioxide and one hour fire rated materials (i.e. thermolag and one hour fire rated cable).

A wrap of woven silicon dioxide, thermolag and one hour fire rated cable are considered equivalent to a metal enclosed raceway with respect to protection from electrical failures. Thermolag and one hour fire rated cable shall only be used as a Regulatory Guide 1.75 electrical separation barrier when installed to satisfy the requirements described in FSAR Section 9.5.1.2.

Metal Clad (MC) cables include copper sheathed (CS) cable, aluminum sheathed (ALS) cable and Galvanized Steel Sheathed Cable (GS). MC cables are considered the same as cable inside conduit for separation purposes. See Section 8.3 for the analysis and discussion on MC cables.

CS cable is constructed of continuous corrugated 16 mil thick copper tube with no outer jacket and 600V XHHW, 90°C insulation. CS cable will be used only inside the containment and only in the lighting system.

ALS cable is constructed of continuous corrugated 25 mil. thick seamless aluminum tube with an outer thermosetting chlorosulphonated polyethylene jacket and 600V XHHW, 90° C insulation. ALS cable will only be used outside of the containment building in the lighting, fire protection, heat tracing and communication systems.

The one hour fire rated cable provides a one hour fire rated barrier per ASTM standard E 119-1971. The cable is Class 1E qualified per IEEE 323-1974 and IEEE 383-1974 for flame retardancy (unaged cables only). See FSAR Section 1A(B), Regulatory Guide 1.131. The cable is constructed of a continuously welded corrugated 12 mil thick stainless steel sheath with high temperature nickel-clad copper conductors, glass braid cable jacket and silicone rubber insulation. This cable will be used to satisfy the fire safe shutdown requirements, as described in FSAR Section 9.5.1.2, in power and control circuits outside containment where the total radiation

dose is less than or equal to 50 MRADS gamma. Cable sizes will be and smaller. The cable is considered equivalent to cable in conduit for electrical separation purposes.

Regulatory Position C.4 - The multiconductor cable between the Safety System Inoperable Indication (SSII) logic panel located in the control room and the termination cabinet in the cable spreading room meet the requirements of this position except for Class 1E environmental qualification. The cable materials meet IEEE Standard 383-1974 for the attributes of flame and radiation resistance. The cable is installed in a mild environment. Based on analysis, a fault at the SSII logic panel will not impact the availability of adjacent Class 1E cables with which these associated cables are routed. This analysis is provided in Section 8.3.

Regulatory Position C.6 - Lesser separation, based on RG 1.75 Rev. 3, is being used for interaction involving instrumentation cables only. This analysis is provided in Section 8.3.

Lesser separations are being used in several locations between Class 1E wiring and non-Class 1E Area Radiation Monitoring detector wiring and Public Address System speaker wiring based on analysis. This analysis is provided in Section 8.3.

Separation between Class 1E circuits and non-Class 1E Emergency Diesel Generator stator RTD circuits is not required based on analysis. This analysis is provided in Section 8.3.

Separation between Class 1E Cables and Non-Class 1E cables at the Electronics Boxes (X-LY-4849A-1, X-LY-4849A-2, X-LY-4849B-1 and X-LY-4849B-2) furnished by FCI is not required based on analysis. This analysis is provided in Section 8.3.

Separation between associated circuits and non-Class 1E circuits in fire panels CPX-EIPRLV-29, CPX-EIPRLV-29A, and CPX-EIPRLV-30 is not required based on analysis. This analysis is provided in Section 8.3.

Separation between associated cables and non-Class 1E cables at the Safety System Inoperable Indication panels is not required based on analysis. This analysis is provided in Section 8.3.

Separation between the output circuits of the spare inverters is not required based on the analysis provided in Section 8.3.

Separation between non-Class 1E cables originating from 6.9kV switchgear (Reactor Coolant Pump) and Class 1E PT fuses inside the Class 1E PT cabinet is not required based on the analysis. This analysis is provided in Section 8.3.

Separation between associated cables and non-Class 1E Regulating transformers TXEC1, TXEC2, TXEC3 and TXEC4 is not required based on analysis. This analysis is given in Section 8.3

Separation between associated cables and non-class 1E cable CP2-EIPRLV-48 is not required based on analysis. This analysis is given in section 8.3.

Minimum physical separation between class 1E cables and nonclass 1E differential relay (87/ST1 and 87/ST2) protection cables are not required inside the 6.9 kV class 1E switch gear based on analysis. This analysis is provided in Section 8.3.

Separation between non-Class 1E Train C cables connected to the line and load terminals of breaker CP1-BSDSEB-01, CP2-BSDSEB-01 and Class 1E Train B cables connected to the shunt trip coil are adequate to ensure that the non-Class 1E cabling will not degrade the Class 1E system based on analysis provided in Section 8.3.1.2.1.7.I.

When a cable, conduit or tray is protected by One-Hour Fire rated Thermo-lag installed to satisfy the requirements as described in FSAR section 9.5.1.2; there is no separation requirement from the Thermo-lag protected cable, conduit or tray, to the redundant cable, conduit or tray outside the Thermo-lag enclosure based on analysis. This analysis is provided in section 8.3.

Associated cables used to selectively connect the non-Class 1E alternate power diesel generators to the Class 1E 6.9kV switchgear are installed in outdoor raceway sections that are not seismically supported. These cables do not have Class 1E protection for over current and faults. This is based on the analysis provided in Section 8.3.

Separation/Isolation between associated control cables and non-Class 1E control cables at Instrument Air Compressor Termination Cabinet CP1-CICACO-01A is not required based on analysis. This analysis is provided in section 8.3.

Physical separation between non-Class 1E and Class 1E circuits or non-Class 1E and associated Class 1E circuits inside the Diesel Generator Engine Control Panels CP1/2-MEDGEE-01A/02A is not required based on the analysis provided in Section 8.3.1.4.5.

Regulatory Position C.9 - Splice type connections have been used to terminate field routed cables in raceways. Such splices are utilized in CPNPP design at:

1. Electric penetration assemblies (EPAs), Core Exit Thermocouple (CET) Integral Reference Junction (IRJ), Control Rod Drive Mechanism (CRDM) disconnect panel connectors and Electric Conductor Seal Assemblies (ECSAs) pigtail cables

2. Solenoid valves, limit switches, level switches, etc. (local mounted devices - LMDs)

3. Connection of LMDs to Electric Conductor Seal Assembly (ECSA) pigtails.

An analysis to justify cable splices in raceways is provided in Appendix 8A.

Regulatory Position C.10 - Cable jackets requiring field color coding are color coded at intervals not to exceed every 5 feet for exposed cable runs (cable not in raceway, i.e., cable not in cable tray, conduit or pull box) and at each end.

Regulatory Position C.12 - Power circuits for the following equipment located inside the Control Room complex, are routed in exclusive conduits within the Control Room complex:

Regulating transformers TXEC3 and TXEC4, and air conditioners CP1- VAACTC-01, CPX-VAACTC-01 and CP2-VAACTC-01.

The ratings of the above equipment do not categorize them as high energy equipment. Regulating transformers TXEC3 and TXEC4 and the air conditioners listed above are located in the Control Building Mezzanine Area, which is separated from the Control Room by a Seismic Category II partial height gypsum wall and concrete floor.

For details see Section 8.3.

Also refer to Appendix 1A(N).

Regulatory Guide 1.76

Design Basis Tornado for Nuclear Power Plants

Discussion

The CPNPP is designed to conform to the requirements of this regulatory guide, dated April 1974, except that it is designed to withstand the effects of a Design Basis Tornado having a maximum wind speed of 360 mph which is made up of a rotational speed of 300 mph and a translational speed of 60 mph. A simultaneous pressure drop of 3.0 psi at the rate of 1.0 psi per second is considered.

The Design Basis Tornado for CPNPP was determined prior to the issuance of this Regulatory Guide and was approved for use by the Atomic Energy Commission's Safety Evaluation Report Dated September 3, 1974.

Also refer to Section 3.3.

Regulatory Guide 1.77

Assumptions Used for Evaluating a Control Rod Ejection Accident for Pressurized Water Reactors

Discussion

The analysis of the radiological consequences of a control rod ejection accident presented in Section 15.4.8 follows the guidance provided in Regulatory Guide 1.195 instead of that in Regulatory Guide 1.77.

Regulatory Guide 1.78

Assumptions for Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release

Discussion

The CPNPP design meets the intent of this regulatory guide, dated June 1974, as discussed in Sections 2.2 and 6.4.

Regulatory Guide 1.79

Preoperational Testing of Emergency Core Cooling Systems for Pressurized Water Reactors

Discussion

The Initial Test Program, as described in Section 14.2, is in compliance with the provisions of Revision 1 (9/75) of this regulatory guide with the following exception.

1. Regulatory Position C.1.b(2)
Recirculation Test - Cold Conditions

A satisfactory in-plant test of the containment sump to demonstrate vortex control and acceptable pressure drops across screening and suction lines and valves was not practical for reasons which include physical limitations, difficulty of cleanliness control and the possibility of equipment damage.

However, a full scale model of the Containment Recirc sumps, screens and surrounding area was used to demonstrate that unacceptable vortex formation in the sump area is precluded while simulating operation under various flow and pump combinations. In addition, the inlet loss coefficient across the sump screens and sump intake piping configuration was evaluated for comparison to analytically determined values and to verify the adequacy of new positive suction head at the pumps.

The capability to realign valves and injection pumps to recirculate coolant from the containment floor was demonstrated. The full flow test was performed with the RHR pumps taking suction from the Refueling Water Storage Tank (RWST) and delivering to the RCS. The RHR pumps were not running when demonstrating the realignment capability. The net positive suction head was determined from the level in the RWST and in the containment sump and shown to be greater than the required net positive suction head for the pump.

The lines from the containment sump to the RHR pumps were flushed and inspected to ensure that they are free from obstruction.

For details refer to Table 14.2-2, Sheet 15.

Regulatory Guide 1.80

Preoperational Testing of Instrument Air Systems

Discussion

Regulatory Guide 1.80 was superseded by Regulatory Guide 1.68.3.

Refer to the discussion of Regulatory Guide 1.68.3.

Regulatory Guide 1.81

Shared Emergency and Shutdown Electric Systems for Multi-Unit Nuclear Power Plants

Discussion

The CPNPP design complies with the provisions of Revision 1 (1/75) of this regulatory guide with an exception to Regulatory Position C1. For details see Section 8.3.1.2.1 Item 8.

Regulatory Guide 1.82

Sumps for Emergency Core Cooling and Containment Spray Systems

Discussion

The containment recirculation sump design in the CPNPP complies with the intent of the Regulatory Positions of this regulatory guide dated June 1974 with clarifications as noted below. The description and design evaluation of the containment recirculation sumps is provided in Section 6.2.2.

C.3 and C.8 - The screen design with (1) an outer trash rack and (2) a fine inner screen mounted on a structure with a solid top cover has been replaced by a strainer which incorporates the function of both the screen and the trash rack. The strainer is located on the lowest floor elevation in the containment exclusive of the reactor vessel cavity. The strainer is fully submerged prior to switchover of containment spray from injection to recirculation for LOCAs and secondary pipe breaks. This design meets the intent of the Reg. Guide.

C.4 and C.6 - The floor level in the vicinity of the sumps does not slope away from the sumps. However, the design meets the intent of the Reg. Guide by the provision of a one foot tall solid debris interceptor surrounding the sump strainers.

Regulatory Guide 1.83

Inservice Inspection of Pressurized Water Reactor Steam Generator Tube

Discussion

The inservice inspection of steam generator tubes complies with the intent of Revision 1 (7/75) of this regulatory guide.

Regulatory Guide 1.84

Design and Fabrication Code Case Acceptability ASME Section III Division 1

Discussion

Code cases listed in this regulatory guide will be used where appropriate.

By reference to ASME Section III requirements in the procurement specifications, the use of code cases by mechanical equipment suppliers requires mutual consent of the Owner or his agent and the manufacturer. The ASME Code Cases which are used for design and erection at CPNPP are identified in the appropriate mechanical design and erection specifications or the Brown & Root QA Manual; conditionally-approved Code Cases will show justification for their

use, as required by NRC, in these documents. The application of ASME Code Cases is documented on the ASME Data Report Forms.

ASME Code Case N-31-1 regarding the use of elastomer diaphragm valves in ASME Class 2 and 3 applications has been applied to CPNPP. This Code Case is listed as having contingent approval in Regulatory Guide 1.84. Based on the technical justification referenced in the applicable design specification, the Code Case with the following conditions in lieu of the conditions imposed by the Regulatory Guide should apply:

1. The service life of the elastomer diaphragms should be lower of that determined based on (a) 1/2 of the average number of cycles from a minimum of three tests per the Code Case and (b) total anticipated radiation exposure during applicable operating modes determined based on valve operability requirements; and

2. the shelf life of the elastomer diaphragm should be determined in accordance with CPNPP procedures for shelf life determination.

Also refer to Appendix 1A(N).

Regulatory Guide 1.85

Materials Code Case Acceptability ASME III Division 1

Discussion

Code cases listed in this regulatory guide will be used where appropriate.

By reference to ASME Section III requirements in the procurement specifications, the use of code cases by mechanical equipment suppliers requires mutual consent of the Owner or his agent and the manufacturer. The ASME Code Cases which are used for design and erection at CPNPP are identified in the appropriate mechanical design and erection specifications or the Brown & Root QA Manual; conditionally-approved Code Cases will show justification for their use, as required by NRC, in these documents. The application of ASME Code Cases is documented on the ASME Data Report Forms.

Also refer to Appendix 1A(N).

Regulatory Guide 1.86

Termination of Operating Licenses for Nuclear Reactors

Discussion

The termination of the operating license and subsequent decommissioning of the Comanche Peak Nuclear Power Plant will address the regulations in effect at that time.

Regulatory Guide 1.87

Guidance for Construction of Class 1 Components in Elevated-Temperature Reactors (Supplement to ASME Section III Code Cases 1592, 1593, 1594, 1595 and 1596)

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.88

Collection, Storage, and Maintenance of Nuclear Power Plant Quality Assurance Records

Discussion

The quality assurance program for design and construction at CPNPP incorporates the intended objectives of ANSI N45.2.9 (Draft 11, Revision 0, 1/73). During the operations phase, the quality assurance methods and administrative controls utilized for controlling and storing QA records, as described in Section 17.2, will comply with the applicable guidance provided in ANSI N45.2.9 - 1974, as endorsed by Revision 2 (10/76) of this regulatory guide; except for paragraph 3 of section 5.6. For this exception, CPNPP will comply with paragraph 3 of section 5.6.1 of ANSI N45.2.9-1979, which requires a minimum two hour rating for the structure, doors, frames and hardware of the storage facility. Application of the requirements of Revision 2 (10/76) of this regulatory guide will be in accordance with the guidance provided in ANSI N18.7 -1976.

To ensure adequate protection and timely processing of quality related documentation prior to transmittal of this documentation to the permanent records storage facility for retention, the following control measures shall be implemented in accordance with approved procedures:

1. Within 60 days from the time that the work activity was completed, quality related documentation shall be processed through any required post work or closure reviews and transmitted to the permanent records storage facility for retention;

2. Once the work activity has been completed, the associated quality related documentation shall be provided adequate protection from damage, deterioration, loss and unauthorized alteration.

Regulatory Guide 1.89

Qualification of Class IE Equipment for Nuclear Power Plants

Discussion

The CPNPP Class 1E equipment design complies with the qualification program guidelines as delineated in this regulatory guide dated November 1974. However, as supported by the statements of consideration for 10CFR50.49 (Federal Register, 48FR2731, January 21, 1983), the recommendations of this regulatory guide need not be applied for Class 1E equipment located in a mild environment area.

Also refer to Appendix 1A(N).

Regulatory Guide 1.90

Inservice Inspection of Prestressed Concrete Containment Structures with Grouted Tendons

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.91

Evaluation of Explosions Postulated to Occur on Transportation Routes Near Nuclear Power Plant Sites

Discussion

No transportation routes in the vicinity of CPNPP are within the distances established by this regulatory guide dated January 1975.

Revision 1 (2/78) of this guide is addressed in Section 2.2.3.

Regulatory Guide 1.92

Combining Modal Responses and Spatial Components in Seismic Response Analysis

Discussion

Modal responses and spatial components are combined in the seismic response analysis of the CPNPP in conformance with Revision 1 (2/76) of this regulatory guide.

Also refer to Appendix 1A(N) and 3.7B.

Regulatory Guide 1.93

Availability of Electric Power Sources

Discussion

The CPNPP design complies with the requirements of this regulatory guide dated December 1974.

Also refer to Section 8.3.

Regulatory Guide 1.94

Quality Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete and Structural Steel During the Construction Phase of Nuclear Power Plants

Discussion

This regulatory guide is not applicable to CPNPP design and construction activities. The quality assurance methods for operations phase activities will comply with applicable guidance contained in Revision 1 (4/76) of this regulatory guide. The application of the requirements of ANSI N45.2.5 -1974, as endorsed by this regulatory guide, will be in accordance with the guidance provided in ANSI N18.7 - 1976.

Also refer to Section 17.2.

Regulatory Guide 1.95

Protection of Nuclear Power Plant Control Room Operators Against an Accidental Chlorine Release

Discussion

The CPNPP design complies with the intent of Revision 1 (1/77) of this regulatory guide as described in Section 2.2.

Regulatory Guide 1.96

Design of Main Steam Isolation Valve Leakage Control Systems for Boiling Water Reactor Nuclear Power Plants

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.97

Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant Conditions During and Following an Accident

Discussion

A plant specific analysis of the information system requirements for CPNPP was conducted. This analysis was based on the design basis accident event scenarios and required operator actions, using the guidance provided in U.S. NRC Regulatory Guide 1.97, Revision 2. As a result, specific variables were selected and specific design and qualification criteria developed to assure the safety of CPNPP. These variables and criteria are described in detail in Section 7.5.

Regulatory Guide 1.98

Assumptions Used for Evaluating the Potential Radiological Consequences of a Radioactive Offgas System Failure in a Boiling Water Reactor

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.99

Effects of Residual Elements on Predicted Radiation Damage to Reactor Vessel Materials

Discussion

Refer to Appendix 1A(N).

Regulatory Guide 1.100

Seismic Qualification of Electric Equipment for Nuclear Power Plants

Discussion

The CPNPP design for Class 1E Electrical Equipment complies with the requirements and recommendations of Revision 1 (8/77) of this regulatory guide with the following clarification:

The intent of Section C.1 is met by performing an analysis to verify the approach and/or by following the Equivalent Static Load Method.

Also refer to Section 3.10B and Appendix 1A(N).

Regulatory Guide 1.101

Emergency Planning for Nuclear Power Plants

Discussion

Section 13.3 Appendix A, “Emergency Planning,” is intended to comply with the contents of Revision 3 (8/92) of this regulatory guide with the following exception:

Luminant Power takes exception to the part of Section C which states licensees may use either NUREG 0654/FEMA-REP-1 or NUMARC/NESP-007 in developing their EAL scheme but may not use portions of both methodologies. CPNPP EALs reflect criteria from both documents and have been specifically reviewed and approved by NRC letter of October 6, 1994.

Regulatory Guide 1.102

Flood Protection for Nuclear Power Plants

Discussion

Plant grade for the CPNPP is located above the PMF level, and Category I structures, with the exception of the Service Water Intake Structure and the Electrical and Control Building, are not subject to flooding.

The operating deck and safety-related equipment in the Service Water Intake Structure are located above the PMF level. Flooding of the Electrical and Control Building is prevented by the use of incorporated barriers (i.e., isolation valves and/or stop-gates in the Circulating Water System). Emergency operating procedures are discussed in Section 3.4 and 13.5. Therefore the CPNPP is in conformance with Revision 1 (9/76) of this regulatory guide.

Also refer to Sections 2.4 and 3.4.

Regulatory Guide 1.103

Post-Tensioned Prestressing Systems for Concrete Reactor Vessels and Containments

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.104

Overhead Crane Handling Systems for Nuclear Power Plants

Discussion

This regulatory guide was withdrawn August 16, 1979.

CPNPP cranes and hoists which are required to be single failure proof are described in “CPNPP Final Response to NUREG-0612”, dated June 1983. Also refer to sections 3.2.1.1.3, 9.1.4.2 and 9.1.4.3.

Regulatory Guide 1.105

Instrument Setpoints

Discussion

The CPNPP design complies with the provisions of Revision 2 (2/86) of this regulatory guide. Setpoint securing devices do not have separate physical locks (requiring an administratively controlled key). The adjustment of setpoints and release/securing of securing devices is controlled by administrative procedures.

Also refer to Appendix 1A(N) and Section 7.1.

Regulatory Guide 1.106

Thermal Overload Protection for Electric Motors on Motor-Operated Valves

Discussion

The CPNPP design complies with the provisions of Revision 1 (3/77) of this regulatory guide as described in Section 8.3.1.1.11 Item 2.

Regulatory Guide 1.107

Qualifications for Cement Grouting for Prestressing Tendons in Containment Structures

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.108

Periodic Testing of Diesel Generators Used As Onsite Electric Power Systems at Nuclear Power Plants

Discussion

The CPNPP design complies with the intent of Revision 1 (8/77) of this regulatory guide.

1. The requirements of position C. 1b.4 are satisfied as described below:

   a. Diesel generator (D-G) “Ready Stand by” status indication in the Control Room can be acknowledged by the combination of a green light for output breaker and the absence of a “D-G disable” and a “D-G trouble” annunciator indication.

   b. “D-G Lockout” status is indicated by means of a “D-G disable” annunciation in the Control Room. This status is also indicated by “DG PWR” indication on the safety system bypass and inoperable status indicating light box in the Control Room due to any of the following:

      1. DC power unavailable

      2. Remote-Local-Maintenance switch not in remote on the generator control panel.

   c. “D-G undertest” status light is not provided in the CPNPP design.

   d. A means of communication is provided between the diesel generator room and the Control Room.

2. The requirements of Regulatory Positions are clarified as described below:

   Regulatory Position C.2.a.(4)

   The largest single load is taken to be the largest single end load and not combined distribution system loads (e.g., distribution system transformers or load centers). This load is 783 kW equal to the nameplate rating of the Component Cooling Water pump.

   Regulatory Position C.2.d

   If the number of failures in the last 100 valid tests is seven or more for an individual diesel generator unit, the reliability of that diesel generator requires special evaluation (i.e., the reliability of both diesel generators is not impacted).

3. The CPNPP periodic testing program meets the intent of the regulatory guide with the following exceptions:

   a. Regulatory Position C.2.a.3

      During preoperational testing, testing will be conducted at the full-load-carrying capability for an interval of not less than 24 hours, of which 22 hours will be at the continuous rating capability of the diesel generator and 2 hours at a load equivalent to the two hour rating of the diesel generator. At a frequency specified in accordance with Technical Specification 5.5.21, “Surveillance Frequency Control Program”, testing will be conducted to demonstrate full-load-carrying

capability for an interval of not less than 24 hours, of which 22 hours will be at a load which exceeds the maximum expected diesel generator load requirements and 2 hours at a load which is approximately 110% of this maximum expected load.

b. Regulatory Position C.2.a.5

Demonstrate functional capability at full load temperature conditions by rerunning the test phase outlined in Regulatory Position C.2.a.1 and by demonstrating proper operation for shutdown-loading-sequence to shutdown-load requirements immediately following the performance of C.2.a.3, except during preoperational testing when the proper operation for the design-accident-loading-sequence to design-load requirements will be demonstrated.

c. Regulatory Position C.2.a.9

Demonstrate the reliability of the Emergency Diesel Generator by performing at least a total of 69 (but no less than 35 per Emergency Diesel Generator) consecutive valid start and load tests on the Emergency Diesel Generators from cold ambient conditions to at least 50 percent continuous rating for at least 1 hour with no failures. These tests need not be performed as part of the pre-operational test program, but may be performed at any time prior to the required operability of the Emergency Diesel Generator.

d. Regulatory Position C.2.c.2

Periodic testing of the diesel generator units during normal plant operation to demonstrate full-load-carrying capability will be conducted at a load which exceeds the maximum expected diesel generator load requirements. During this test, loading to the diesel generator is accomplished in accordance with vendor recommendations.

e. Regulatory Position C.2.d

Diesel generators testing frequency is in accordance with the requirements of the technical specifications.

4. The requirements of Regulatory Position c.3.b is satisfied as described below:

Other existing reporting requirements adequately ensure that the NRC learns of significant problems with diesel generator performance. Reporting requirements for EDG failures provided in this section will not be submitted.

<u>Regulatory Guide 1.109</u>

Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I

Discussion

Compliance with Appendix I was evaluated in accordance with Revision 1 (10/77) of this regulatory guide.

Also refer to Appendix 11A.

Regulatory Guide 1.110

Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors

Discussion

This regulatory guide is not applicable to the CPNPP.

Regulatory Guide 1.111

Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors

Discussion

The methods of Revision 1 (7/77) of this regulatory guide were used in the evaluation of gaseous effluents as described in Appendix 11A.

Regulatory Guide 1.112

Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Light-Water-Cooled Power Reactors

Discussion

The radioactive source terms calculation presented in Section 11.1 complies with the requirements of Revision O-R (4/76 - reissued 5/77) of this regulatory guide.

Regulatory Guide 1.113

Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I

Discussion

The methods of Revision 1 (4/77) of this regulatory guide were used in the evaluation of effluents as described in Appendix 11A.

Regulatory Guide 1.114

Guidance on Being Operator at the Controls of a Nuclear Power Plant

Discussion

The CPNPP administrative operating procedures will incorporate the applicable guidance of Revision 1 (11/76) of this regulatory guide.

Also refer to Section 13.5.

Regulatory Guide 1.115

Protection Against Low Trajectory Turbine Missiles

Discussion

The turbines of the CPNPP are so oriented that low trajectory turbine missiles cannot strike any of the essential systems as discussed in Section 3.5. The CPNPP design is in compliance with Revision 1 (7/77) of this regulatory guide.

Regulatory Guide 1.116

Quality Assurance Requirements for Installation, Inspection, and Testing of Mechanical Equipment and Systems

Discussion

This regulatory guide is not applicable to CPNPP design and construction. The quality assurance methods for operations phase activities will comply with the applicable guidance contained in Revision 0-R (5/77) of this regulatory guide. Application of the requirements of ANSI N45.2.8 - 1975, as endorsed by this regulatory guide, will be in accordance with guidance contained in ANSI N18.7 - 1976.

Also refer to Section 17.2.

Regulatory Guide 1.117

Tornado Design Classification

Discussion

The CPNPP structures, systems, and components are designed to withstand the effects of a design basis tornado, including tornado missiles, in conformance with Revision 1 (4/78) of this regulatory guide.

Also refer to Section 3.5.

Regulatory Guide 1.118

Periodic Testing of Electric Power and Protection Systems

Discussion

Although the implementation of this regulatory guide, dated June 1976, does not include CPNPP, the CPNPP electrical power systems are testable to the extent described in FSAR Section 8.2.1.2.2, 8.3.1.1.11 item 3 and 8.3.2.1 item 6.

Regulatory Guide 1.119

Surveillance Program for New Fuel Assembly Designs

Discussion

This regulatory guide was withdrawn June 23, 1977.

Regulatory Guide 1.120

Fire Protection Guidelines for Nuclear Power Plants

Discussion

The fire protection system design for CPNPP is in accordance with the criteria outlines in Appendix A to Branch Technical Position APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to 7/1/76." The fire protection system design complies with the requirements for plants under construction except as stated in Section 9.5.1 of the FSAR. Where the guidelines of Revision 1 (11/77) of Regulatory Guide 1.120 are comparable with those of BTP APCSB 9.5-1, the former criteria are employed to the extent practical for the CPNPP design.

The CPNPP Fire Protection Program is described in Section 9.5.1.6.1 and Appendix 13.3B.

Regulatory Guide 1.121

Bases for Plugging Degraded PWR Steam Generator Tubes

Discussion

Refer to Appendix 1A(N).

Regulatory Guide 1.122

Development of Floor Design Response Spectra for Seismic Design of Floor Supported Equipment or Components

Discussion

Floor Design Response Spectra are developed in accordance with the methods described in Revision 1 (2/78) of this regulatory guide with the following conservative clarification to C.2:

In constructing instructure response spectra, uncertainties inherent to the analysis, such as the material properties of the foundation material and the structures, damping values, soil structure

interaction, approximations in modeling techniques and computation of structural natural frequencies, are accounted for by parametric variations incorporated into the analysis and by broadening the peaks of the resulting envelope response spectra.

The procedure of parametric variations consists of evaluating and using in the dynamic analysis lower bound, best estimate, and upper bound values for the foundation spring constants in the case of all seismic Category I structures with the exception of the Fuel Building and the Service Water Intake Structure, where only lower bound and upper bound values are used. In addition, the analysis of the Containment Building is performed for each set of foundation spring constants by considering a cracked and an uncracked containment wall. Then, before smoothing of the envelope spectra, which envelopes the spectra developed for each parametric variation, a minimum frequency shift to the peaks of + 10 percent is also incorporated to account for other variations in the structural properties which are not considered in the described parametric variation approach. This approach is more conservative than applying a peak shifting to spectral curves generated from a single dynamic model, without considering parametric variation.

The Fuel Building was re-analyzed to determine the effects of added mass due to the addition of high density spent fuel storage racks. Best estimate soil properties were used in the re-rack analysis in lieu of parametric variations involving upper and lower bound soil properties. The resulting spectrum peak responses were widened by at least +/- 15% in accordance with RG 1.122. The results from this approach remain conservative since results of previous studies show that variations in soil properties and building structure stiffness have minimal effect on the dynamic response of the Fuel Building.

Also see Section 3.7B.2.5.

Regulatory Guide 1.123

Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants

Discussion

The quality assurance program for design and construction at CPNPP incorporates the intended objectives of ANSI N45.2.13 (Draft dated 5/73). The quality assurance methods and administrative controls utilized in the procurement of quality-related items and services, during the operations phase, as described in Section 17.2, will be consistent with the applicable guidance contained in Revision 1 (7/77) of this regulatory guide. The application of the provisions of ANSI N45.2.13 - 1976, as endorsed by this regulatory guide, will be in accordance with the guidance provided in ANSI N18.7 - 1976 except for imposing quality assurance program requirements consistent with 10CFR50 Appendix B or ANSI N45.2 in procurement documents for commercial grade calibration services from a NVLAP or A2LA accredited calibration laboratory evaluated in accordance with Section 17.2.7.

Regulatory Guide 1.124

Design Limits and Loading Combinations for Class 1 Linear-Type Component Supports

Discussion

All non-NSSS supplied Class I linear-type supports comply with Revision 1 (1/78) of this regulatory guide, with the following exceptions:

1. Paragraph C.4 (which is also referenced in Paragraphs C.5 and C.7)

   Service limits for bolts shall be increased for Service Level D (faulted) plant conditions. The increased allowable permitted for tensile stress in bolts shall not exceed the lesser of 0.7 Su or Sy at temperature. The increased allowable permitted for shear stress in bolts shall not exceed the lesser of 0.42 Su or 0.6 Sy. This exception is implemented by the use of ASME III Subsection NF paragraphs NF-3225 and NF-3324.6 of the 1983 Edition - Summer 1983 Addenda for the design of bolting.

   The current industry position on the design of bolting is that the maximum safe increased allowables are achieved by limiting bolting tensile stress to the lesser of 0.7 Su or Sy at temperature and bolting shear stress to 0.42 Su or 0.6 Sy at temperature. The 0.7 Su limit is well recognized in Section III of the Code. The average shear strength of bolting material is about 0.62 Su according to test data, with a standard deviation of 0.033. Results indicate that the ratio of sear strength to tensile strength is independent of the bolt grade. Curves showing this appear on page 50 of “Guide to Design for Bolted and Riveted Joints,” by J. W. Fisher. Test data are given in a paper by J. J. Wallaert and J. W. Fisher, “Shear strength of High-Strength Bolts,” Journal of the Structural Division, ASCE, Volume 91, ST3, June 1965.

2. Paragraph C.8 (which is also referenced in Paragraphs C.6 and C.7)

   As stated in Appendix 1A(N) of Section 1.0, system functional capability is provided for in Class 1 piping systems by maintaining the pipe stresses within Level D (faulted) limits. This assures that piping geometry is maintained and that required flow is not impaired. The selection of more restrictive stress limits for component supports is not necessary to assure the functional capability of the system.

   However, to provide additional conservatism, ASME Class 1 component supports associated with the Safety Injection System and the Containment Spray system are designed to the limits described in Regulatory Position C-6 for Level C (emergency) conditions when subjected to the loadings associated with the Level D (faulted) plant condition.

Also refer to Appendix 1A(N) for a discussion of NSSS-supplied Class 1 supports.

Regulatory Guide 1.125

Physical Models for Design and Operation of Hydraulic Structures and Systems for Nuclear Power Plants

Discussion

This regulatory guide is not applicable to CPNPP.

Regulatory Guide 1.126

An Acceptable Model and Related Statistical Methods for the Analysis of Fuel Densification

Discussion

Refer to Appendix 1A(N).

Regulatory Guide 1.127

Inspection of Water-Control Structures Associated with Nuclear Power Plants

Discussion

CPNPP commits to comply with the requirements of Revision 1 (3/78) of this regulatory guide for the Safe Shutdown Impoundment in the manner described in Chapters 2.4 and 2.5 of the FSAR. Additionally, inspections addressed in the guide relative to Embankment Slope Stability, Unlined Saddle Spillways, the Reservoir proper and the Intake Structure and Discharge Channel will be accomplished.

This guide is not applicable to Squaw Creek Dam which is not safety related.

Regulatory Guide 1.128

Installation Design and Installation of Large Lead Storage Batteries for Nuclear Power Plants

Discussion

This regulatory guide is not applicable to CPNPP.

Regulatory Guide 1.129

Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Nuclear Power Plants

Discussion

The CPNPP design complies with the provisions of Revision 1 (2/78) of this regulatory guide, with the clarification that IEEE 450-1995 applies instead of IEEE 450-1975 as endorsed by the regulatory guide. Refer to Section 8.3 for further discussion.

Regulatory Guide 1.130

Service Limits and Loading Combinations for Class 1 Plate-and-Shell-Type Component Supports

Discussion

Refer to Appendix 1A(N).

Regulatory Guide 1.131

Qualification Tests of Electric Cables, Field Splices, and Connections for Light-Water-Cooled Nuclear Power Plants

Discussion

Although the implementation of this regulatory guide, dated August 1977, does not include CPNPP, all Class 1E cables and field splices of the CPNPP meet most of the requirements of this regulatory guide with the few exceptions noted below:

1. All prefabricated cables of the CPNPP do not meet the following requirements:

    a. Vertical tray flame test on the aged cables to determine their relative self-extinguishing tendencies. (Regulatory Guide position C.6),

    b. Flame testing with the gas burner face in the front (Regulatory Guide position C.10). However, work is in progress by vendor on these items.

2. All 8kv cables, 600V power and lighting cables of the CPNPP do not meet the following requirements:

    a. “Radiation Exposure Total” - per Regulatory Guide 1.89 Position C.5.

    b. Vertical tray flame test on the aged cables to determine their relative self-extinguishing tendencies. (Regulatory Guide position C.6).

    c. Flame testing with the gas burner face in the front (Regulatory Guide position C.10).

    d. Gas and air flow requirements (Regulatory Guide position C.11).

3. All Raychem type WCSF-N field splices of the CPNPP have not been tested according to the following regulatory guide positions:

    a. Vertical tray flame test on aged cable splices to determine their relative self-extinguishing tendencies. (Regulatory Guide Position C.6).

    b. Flame testing with only natural grade propane and a release of approximately 70,000 BTU per hour at an air-gas ratio of 5 to 1. (Regulatory Guide Position C.9).

    c. Flame testing with the gas burner face in the front. (Regulatory Guide Position C.10).

    d. Gas and air flow requirements. (Regulatory Guide Position C.11).

    e. Flame temperature requirements. (Regulatory Guide Position C.13).

4. The Partial Discharge Monitor Bus Coupler jumpers (15 kV rated) installed in the motor and emergency diesel generator termination boxes are not flame retardant and are not qualified to the requirements of Regulatory Guide 1.131.

Regulatory Guide 1.132

Site Investigations for Foundations of Nuclear Plants

Discussion

This regulatory guide is not applicable to CPNPP.

Regulatory Guide 1.133

Loose-Part Detection Program for the Primary System of Light-Water-Cooled Reactors

Discussion

The CPNPP O.L. Application was docketed prior to June 1, 1978, as provided by this guide dated September 1977.

A discussion of the CPNPP loose parts monitoring system is provided in Section 4.4.6.4.

Regulatory Guide 1.134

Medical Evaluation of Nuclear Power Plant Personnel Requiring Operator Licenses

Discussion

The medical certification and monitoring requirements of licensed personnel comply with the requirements of Revision 2 (4/87) of this regulatory guide.

Regulatory Guide 1.135

Normal Water Level and Discharge at Nuclear Power Plants

Discussion

This regulatory guide is not applicable to CPNPP.

Regulatory Guide 1.136

Material for Concrete Containments

Discussion

This regulatory guide is not applicable to CPNPP; however, the application of ACI-359 is discussed in Section 3.8.1.2.1.

Regulatory Guide 1.137

Fuel-Oil Systems for Standby Diesel Generators

Discussion

The CPNPP design complies with the requirements of this regulatory guide, dated January 1978, with the following exception to portions of Parts C.1, C.1.b, C.1.d, C.1.g, C.2.b, C.2.c; and C.2.d:

1. Part C.1.b (Paragraph 7.1 of ANSI N195-1976 [49]):

   Venting components for the storage and day tanks are not safety class 3. However, piping and components are seismically supported and missile protection requirements are satisfied for the vent path.

2. Part C.1.d (Paragraph 6.1 of ANSI N195-1876):

   The suction from the day tank is provided from the bottom of the tank.

3. Part C.1.g (Paragraph 7.5 of ANSI N195-1976):

   Fill lines to the storage and day tanks do not have strainers.

4. Part C.2.b:

   Prior to addition of new fuel into the storage tanks, the fuel is tested in accordance with tests specified in ASTM D975-1981 for:

   a. [a]API or Specific Gravity when tested in accordance with ASTM D1298-1980

   b. Kinematic viscosity

   c. Flash point

   d. Water and Sediment (Either a Clear and Bright Test, ASTM D4176-1982 or a water and sediment content of less than or equal to 0.05% volume when tested in accordance with ASTM D1796-1968)

   The remainder of the tests specified in Table-1 of ASTM D975-1981 will be completed within 31 days of the fuel addition and fuel oil will meet the requirements when tested in accordance with ASTM D975-1981 except that the analysis for sulphur may be performed in accordance with ASTM D1552-1979 [46], ASTM D2622-1982 [47], or ASTM D4294-2003.

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a. If new fuel oil does not meet the diesel generator manufacturer’s requirements for absolute specific gravity at 60/60^{o}F of $\geq$ 0.8299 or for API gravity at 60^{o}F of $\leq$ 39^{o}, it is acceptable to add new fuel oil to the storage tank(s) only if, after being added, the entire storage tank(s) will meet the manufacturer’s recommendations.

5. Part C.2.c:

New fuel sampling procedures for the fuel oil will be in accordance with ASTM D4057-1981, “Standard Practice for Manual Sampling of Petroleum and Petroleum Products”.

6. Part C.1 (Paragraph 6.3 of ANSI N195-1976):

The strainers provided in the diesel fuel oil transfer system are not duplex strainers.

7. Part C.2.d:

Accumulated condensate is checked for, and removed from storage tanks at least every 31 days.

8. C.1 (Section 4 of ANSI N195-1976):

Section 4 of the standard includes requirements for security for the diesel-generator fuel-oil system. The requirements of this section are not considered applicable to the CPNPP Security Plan since this subject is addressed separately in more detail in other NRC documents. See Section 13.6 for a description of security requirements.

9. C.2.a

If new fuel oil does not meet the diesel generator manufacturer’s requirements for absolute specific gravity at 60/60^{o}F of $\geq$ 0.8299 or for API gravity at 60^{o}F of $\leq$ 39^{o}, it is acceptable to add new fuel oil to the storage tank(s) only if, after being added, the entire storage tank(s) will meet the manufacturer’s recommendations.

Also refer to Section 9.5.4.

Regulatory Guide 1.138

Laboratory Investigations for Soils for Engineering Analysis and Design Of Nuclear Power Plants

Discussion

This regulatory guide is not applicable to CPNPP; however, soils investigations are discussed in Section 2.5.

Regulatory Guide 1.139

Guidance for Residual Heat Removal

Discussion

Refer to Appendix 1A(N).

Regulatory Guide 1.140

Design, Testing and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Absorption Units of Light-Water-Cooled Nuclear Power Plants

Discussion

The CPNPP design, maintenance and testing of the normal HVAC systems is in compliance with the requirements of Regulatory Guide 1.140 (03/78) except part C.3.h, water drains; part C.4.b, ease of maintenance; part C.4.c, test probes;, part C.5.b, air flow distribution; parts C.5.c and C.5.d, in-place testing; and part C.6, laboratory testing criteria for activated carbon.

1. Part C.3.h, Water drains:

   Check valves have been used on some drains in lieu of seals or traps. The drains for the demister compartments of the Hydrogen Purge Filtration units have not been provided with seals, traps, or check valves. Any minimal airflow through the demister drain will be filtered prior to discharge at the stack. This design conforms to the intent of NRC Regulatory Guide 1.140 (03/78).

2. Part C.4.b, Ease of Maintenance:

   The spacing provided between the components of the filtration units is, in some cases, less than the minimum required by this regulatory position. However, it has been determined by operation and maintenance personnel that the spacing provided is sufficient to perform all the required maintenance operations. This design conforms to the intent of Regulatory Guide 1.140 (03/78).

3. Part C.4.c, Test Probes:

   Test ports will be provided in lieu of permanently installed test probes. Permanently installed probes are a convenience in the periodic testing of filters and adsorbers. Replacing them with test ports is of no safety significance. This design meets the intent of NRC Regulatory Guide 1.140 (03/78).

4. Part C.5.b, Air Flow Distribution:

   The air flow distribution to the HEPA filters and iodine adsorbers will be tested in place for uniformity initially and after maintenance affecting the flow distribution for all units except the hydrogen purge units.

5. Parts C.5.c and C.5.d, In-Place Testing Criteria

   ANSI/ASME N509-1980 and ANSI/ASME N510-1980 shall be used for field testing activities in place of the older versions of these codes referenced in this regulatory guide.

   Atmospheric cleanup trains installed at CPNPP have two HEPA filter banks in series with a charcoal adsorber between them. In-place testing of the upstream HEPA bank only will be performed.

In-place testing of the HEPA filter banks and adsorber will not be required following painting, fire and chemical release described in position C.5.c and C.5.d of this guide. Only laboratory testing will be performed for carbon efficiencies. This design conforms to the intent of NRC Regulatory Guide 1.140 (03/78).

HEPA filter and charcoal adsorber efficiency for non-Engineered Safety Feature Filtration Units is 90% which corresponds to an acceptance criteria of less than 1% for in-place penetration and bypass leakage at rated flow.

The in-place testing of the HEPA filter and charcoal adsorber for the containment preaccess filtration units is performed in accordance with ANSI N510-1980, Table 1, NOTES 2 & 5. As discussed in FSAR section 9.4A, the preaccess filtration system is a recirculating system inside containment that reduces airborne contamination inside containment prior to personnel entry. Leakage through the HEPA or charcoal adsorber would not contribute to any increased radiological release to the environment. This design conforms to the intent of Reg. Guide 1.140 (3/78).

6. Part C.6, Laboratory Testing Criteria for Activated Carbon:

Laboratory testing of activated carbon will be in accordance with ANSI N509 and N510-1980 (which refers to ASTM D3803-79), except for the determination of the efficiency of charcoal to remove radioiodine. The parameters applicable to new and used charcoal at CPNPP shall be applied in the lab test as follows:

New and Used Charcoal
4" Beds
40 ft/min
30°C & 95% RH
Pre-equilibrated

The allowable methyl iodide penetration for these units shall be 10% as shown in Table 2 of the Regulatory Guide.

When all or most of the charcoal canisters in the filtration units have been used, a representative sample of the charcoal from the bed will be obtained by grain thief sampling in accordance with ANSI N509-1980, Appendix A. The representative samples obtained with the grain thief will be used for laboratory testing and/or refilling the charcoal canisters.

The carbon adsorber beds will be replaced when (1) testing in accordance with the frequency specified in Footnote c of Table 2 results in a representative sample failing to pass the applicable test in Table 2 or (2) no representative sample is available for testing, at a time when testing is required.

This design conforms to the intent of NRC Regulatory Guide 1.140 (03/78).

Regulatory Guide 1.141

Containment Isolation Provisions for Fluid Systems

Discussion

This regulatory guide is not applicable to CPNPP; however, the containment isolation is discussed in Section 6.2.

Regulatory Guide 1.142

Safety-Related Concrete Structures for Nuclear Power Plants (Other Than Reactor Vessels and Containments)

Discussion

This regulatory guide is not applicable to CPNPP; however the design of safety-related concrete structures is discussed in Section 3.8.

Regulatory Guide 1.143

Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants

Discussion

This regulatory guide is not applicable to CPNPP, however, the code, code class, safety class, and seismic classification of Liquid Waste Processing and Gaseous Waste Processing System components comply with Table 1 of Regulatory Guide 1.143, Rev. 1. Reference Section 11.2, 11.3 and 11.4 for related information.

Regulatory Guide 1.144

Auditing of Quality Assurance Programs for Nuclear Power Plants

Discussion

The program for auditing of Quality Assurance Programs for CPNPP complies with the requirements of Regulatory Guide 1.144 Revision 1 (9/80). The following suppliers are not audited by Luminant Power and are exempt from the requirements of this regulatory guide:

National or state calibration sources

Authorized Nuclear Inspection Agency

NVLAP and A2LA accredited commercial grade calibration suppliers evaluated in accordance with Section 17.2.7.

Regulatory Guide 1.145

Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants

Discussion

This regulatory guide is not applicable to CPNPP.

Regulatory Guide 1.146

Qualification of Quality Assurance Program Audit Personnel for Nuclear Power Plant

Discussion

Effective June 1, 1983, CPNPP Quality Assurance Audit Personnel are in compliance with regulatory guide 1.146, August 1980.

Regulatory Guide 1.148

Functional Specification for Active Valve Assemblies in Systems Important to Safety in Nuclear Power Plants

Discussion

CPNPP is not committed to this Regulatory Guide. The operability program for active valves is covered in Section 3.9N and 3.9B.

Regulatory Guide 1.150

Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations.

Discussion

Refer to Appendix 1A(N).

Regulatory Guide 1.155

Station Blackout

Discussion

CPNPP complies with the guidance of Regulatory Guide 1.155 (August 1988) as described in Appendix 8B.

Regulatory Guide 1.163

Performance-Based Containment Leak-Test Program

Discussion

Effective by August 12, 1996, CPNPP complies with Regulatory Guide 1.163, September 1995.

Regulatory Guide 1.195

Methods and Assumptions for Evaluating Radiological Consequences of Design Basis Accidents at Light-Water Nuclear Power Reactors, May 2003.

Discussion

The radiological consequences analysis for the design basis accidents follow the guidance provided in Regulatory Guide 1.195 and CPNPP adopts the dose limits defined by Regulatory Guide 1.195. The CPNPP design for skin dose calculations DCFs uses DOE/EH-0070 instead of Figure 12 recommended in Regulatory Guide 1.195.

Regulatory Guide 1.196

Control Room Habitability at Light-Water Nuclear Power Reactors, May 2003.

Discussion

The Control Room Envelope Habitability Program in Technical Specification 5.5.20 is consistent with the guidance of TSTF-448, Revision 3, which incorporate the specific aspects of Regulatory Guides 1.196 and 1.197. CPNPP currently uses RG 1.52, Revision 1 for the control room design. CPNPP used Revision 2 for testing only. CPNPP uses RG 1.140 as information only for non-safety related air filtration systems.

Regulatory Guide 1.197

Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors, May 2003.

Discussion

The Control Room Envelope Habitability Program in Technical Specification 5.5.20 is consistent with the guidance of TSTF-448, Revision 3, which incorporates the specific aspects of Regulatory Guide 1.197 with the following exceptions:

1. C. - Section 4.3.2 “Periodic CRH Assessment” from NEI 99-03 Revision 1 will be used as input to a site specificSelf assessment procedure.

2. C.1.2 - No peer reviews are required to be performed.

2.0 SITE CHARACTERISTICS

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2.1 GEOGRAPHY AND DEMOGRAPHY

2.1.1 SITE LOCATION AND DESCRIPTION

2.1.1.1 Specification of Location

The CPNPP site is located in Somervell County in North Central Texas. Squaw Creek Reservoir (SCR), established for station cooling, extends northward into Hood County. The site is owned by the Applicants. The site is situated along Squaw Creek, a tributary of the Paluxy River, which is a tributary of the Brazos River. The station site is over 30 miles southwest of the nearest portion of Fort Worth and approximately 4.5 miles north- northwest of Glen Rose, the nearest community (see Figure 2.1-1). Site coordinates are:

	Unit No. 1	Unit No. 2
Texas Grid (Feet)	Y = 229,723.96 X = 1,911,921.11	Y = 230,010.86 X = 1,911,951.27
U.T.M. Grid (Zone 14) (Meters)	N = 3,573,903 E = 614,393	N = 3,537,991 E = 614,401
Latitude	32º 17' 52.02"	32º 17' 54.85"
Longitude	97º 47' 06.15"	97º 47' 05.79"

2.1.1.2 Site Area

The site area map (Figure 2.1-2) shows the concurrent plant property and site boundary line, the Exclusion Area, and Squaw Creek Reservoir (SCR). The site area is approximately 7,700 acres. Site area access is by a plant railroad, which connects to the Atchison, Topeka and Santa Fe Railroad Company main line at Tolar, Texas, by a plant access road which connects to FM 56 (previously Highway 201) and by County road 213 (also known as Coates Rd) which connects to State Highway 144.

The plant railroad and access road are owned and controlled by the Applicants. There are no other highways, railways or navigable waterways which traverse or are immediately adjacent to the site. Luminant Power maintains Squaw Creek Park and controls access to the park and reservoir.

Principal plant structures are also shown on Figure 2.1-2.

2.1.1.3 Boundaries For Establishing Effluent Release Limits

The Exclusion Area consists of approximately 4,170 acres. Figure 2.1-2 depicts the Exclusion Area boundary. This boundary is used for establishing effluent release limits and enables the owners to fulfill their obligations with respect to the requirements of 10 CFR Parts 20 and 100 (see Section 2.1.2.1.5).

Figure 2.1-2 shows that the points of release for each of the two units are located closer to the southwest property line than any other segment of the property line. This southwesterly distance

coincides with the minimum Exclusion Area boundary distance, which is 5,067 feet (1544 meters) from the midpoint of the centerline between the Containment buildings.

2.1.2 EXCLUSION AREA AUTHORITY AND CONTROL

2.1.2.1 Authority

2.1.2.1.1 Surface Rights

Luminant Power has acquired and will maintain surface ownership of all the land within the Exclusion Area (see Figure 2.1-2A). Accordingly, Luminant Power has the authority to determine all activities within the Exclusion Area, except for certain improbable and de minimus mineral exploration activities as discussed in greater detail below.

That portion of Squaw Creek Reservoir which is within the Exclusion Area is subject to the waterway exclusion provided in 10 CFR Part 100.3(a). Consistent with that regulation, appropriate and effective arrangements will be made to control traffic on the reservoir to protect the public health and safety in case of emergency. The Exclusion Area is not traversed by any public highway or railroad. See Figure 2.1-2. The nearest primary public road, FM 56 (previously State Highway 201 as denoted on Figure 2.1-2), lies outside the Exclusion Area approximately 8900 feet southwest of the center line between the Containment buildings. Luminant Power owns and operates the plant railroad from the plant to its junction with the Atchison, Topeka and Santa Fe Railroad at Tolar, Texas, approximately 11 miles from the site.

2.1.2.1.2 Mineral Rights

Luminant Power has acquired mineral rights beneath all seismic Category I structures (see Figure 2.1-2C). Portions of the remainder of the Exclusion Area are subject to certain outstanding mineral rights. As noted above, Luminant Power owns the surface rights for the entire Exclusion Area.

As to the mineral rights within the Exclusion Area not owned by Luminant Power, Luminant Power will assure that the exercise of such mineral rights will pose no health and safety threat during normal reactor operation or in the event of an accident. The only outstanding mineral rights in the Exclusion Area for CPNPP, and surrounding areas, relate to the exploration for and production of oil, gas, and other subsurface minerals. There are no outstanding rights which permit the production of surface minerals. As discussed in Section 2.5.1, the potential for commercial production of minerals at CPNPP and in the surrounding area is low. Thus, it is anticipated that the exercise of such outstanding mineral rights would involve only sporadic, exploratory activity, and little or no production.

Nevertheless, Luminant Power will maintain sufficient authority and control over, and knowledge of, attempted ingress into the Exclusion Area to ensure that no unauthorized entry is allowed by use of a mobile patrol at random intervals. Ingress for the purpose of exercising mineral rights in any area within 2250 feet of a seismic Category I building (See Section 2.2.3.2.1) or within 2800 feet of either Containment Building (See Section 2.1.2.1.5) is prohibited by virtue of Luminant Power ownership of the mineral rights or by deed restrictions on any reserved mineral rights. This area has been designated in Figure 2.1-2C as the “External Hazard Free Zone.” The distances of 2250 and 2800 feet are based upon the analysis of a postulated gas well in Section 2.2.3. The distance of 2250 feet from any seismic Category I building assures that any

conceivable detonation (of the maximum quantity of explosives that could be used within the exclusion area) would have no effect on the safety-related structures and components (see Regulatory Guide 1.91). The forbidden zone of 2800 feet in radius corresponds to the equivalent distance for the 2 hour dose limit of 10 CFR 100 and the maximum design basis accidents for CPNPP (See Section 15.6). Ingress to the remaining outer areas of the Exclusion Area will only be permitted pursuant to written agreements between Luminant Power and the necessary parties which would provide that Luminant Power has absolute authority to determine all activities within the Exclusion Area, including removal of personnel and equipment.

A mineral owner or lessee has no legal right to use physical force or to create a public disturbance to obtain access to the outer areas of the Exclusion Area for purposes of mineral exploration or extraction. If such access is sought as to areas outside the “External Hazard Free Zone”, Luminant Power likewise will refuse to allow access unless the written agreement discussed above has been executed by the mineral owner or lessee. In such case, legal remedy of a mineral owner or lessee to obtain access to the surface of the Exclusion Area after being so excluded would be to file a lawsuit in the State District Court for the county where the land is located (either Somervell or Hood County). Should such a suit be filed, Luminant Power would then file an immediate cross-action to condemn the mineral rights of the party seeking ingress and thereby prevent the ingress. Luminant Power has statutory authority to do so. Article 3269, V.A.T.S.

In this manner, Luminant Power will have absolute authority to determine all activities within the Exclusion Area, including the authority to exclude or remove persons. Thus, the exercise of mineral rights in the Exclusion Area will pose no health and safety threat during normal reactor operation or in the event of an accident. In view of the unusual nature and limited scope of activities associated with the mineral rights and the plan and commitments by Luminant Power to control all activities within the Exclusion Area, the present status of ownership is deemed to be of de minimis safety consequence.

As stated above, Luminant Power has acquired the mineral rights beneath all seismic Category I structures as well as beneath the Squaw Creek Dam (See Figure 2.1-2C). No measurable subsidence due to mineral extraction is anticipated. See Section 2.5.1.2.6 for a discussion of the effects of mineral extraction in the area of the site.

2.1.2.1.3 Easements

A 6-inch natural gas pipeline and a 26-inch crude oil pipeline traverse the Exclusion Area about 4,900 feet southwest of the midpoint of the centerline between the Containment buildings as shown on Figure 2.1-2B. These pipelines are also described in Section 2.2.3. Luminant Power has granted the pipeline owners easements which retain for Luminant Power absolute control to determine all such activities within the Exclusion Area including ingress and egress for the purpose of maintaining the pipelines and their right-of-way.

2.1.2.1.4 Status of Ownership

Luminant Power has acquired all of the land which will constitute the site property. One small tract of land within the site area has been excluded from purchase: the Hopewell cemetary east of the plant (see Figure 2.1-2). This tract is outside the Exclusion Area and is fenced off from the site property.

2.1.2.1.5 Minimum Exclusion Area Distance

The minimum distance to the Exclusion Area boundary from the midpoint of the centerline between the Containment buildings is 5,067 feet (1,544 meters) to the west-southwest. The minimum Exclusion Area boundary distance is substantially larger, and therefore more conservative, than the distance which literal compliance with 10 CFR 100 would dictate (See Section 15.6).

2.1.2.2 Control of Activities Unrelated to Plant Operation

Activities unrelated to plant operation which may be permitted within the Exclusion Area include the exercising of mineral rights and the maintenance of pipelines as described in Sections 2.1.2.1.2 and 2.1.2.1.3 above, and cattle grazing. Luminant Power will have the necessary control to determine these activities and will require that all persons involved in them report to the Plant Manager (See Section 13.1.1.2.1) or a designated representative prior to engaging in the activities.

Arrangements have been made (in coordination with the appropriate agencies) to control access to, activities on, and the removal of persons and property from the CPNPP owner controlled area in case of emergency. Arrangements for recreational use and emergency procedures governing such use have been completed. Luminant Power has the authority to exclude or remove any person from this area at any time.

Luminant Power conducts practices that provide knowledge of the approximate number and location of persons within the Exclusion Area engaged in such activities. Normal evacuation of persons within the Exclusion Area will take no more than two hours.

2.1.2.3 Arrangements for Traffic Control

In the event of an emergency, traffic on the plant access road will be controlled by Luminant Power.

If Squaw Creek Reservoir is opened to the public, arrangements will be made to control traffic in the event of an emergency (see Section 2.1.2.2, above).

2.1.2.4 Abandonment or Relocation of Roads

An unpaved county road which traversed the northeast corner of the Exclusion Area was abandoned in April 1975 because of the construction of Squaw Creek Dam and Reservoir. Arrangements for the closing of this section of road were made with the Somervell County Commissioner's Court in December 1974. No other public roads traverse the Exclusion Area.

2.1.3 POPULATION DISTRIBUTION

The purpose of this section is to provide detailed estimates of the present and projected size and distribution of population within a 50-miles radius of CPNPP. The population estimates provided in the PSAR have been reviewed, revised, and updated for purposes of the FSAR. Estimates of population distribution are provided for 1970 (most recent census year), 1976 (current year), and for census decades 1980 through 2020.

In reviewing and updating the population estimates in the PSAR, it was recognized that the actual centerline locations of the containment structures for Units 1 and 2 differ slightly (approximately 88 feet) from the locations as originally shown. In these revised population estimates, the actual centerline of the Unit 1 containment structure has been taken as the point of origin for the sector lines and concentric distance circles which form the sector-areas used in portraying population distribution within the 50-mile radius of CPNPP. While the 1970 county-by-county population base in the CPNPP area remains the same as shown in the PSAR, the slight difference in Unit 1 location causes some change in location of sector lines and distance circles. Thus, very small changes are found in this updated population study in the 1970 distribution of population by sector- areas.

The territory included within the 50-mile radius of CPNPP includes all or a part of 19 counties, all in Texas. The general location of CPNPP in Somervell County and the locations of the rest of the counties located within 50 miles of the plant site are shown in Figures 2.1-3 and 2.1-4. The population of these 19 counties is given in Table 2.1-1 for the census decades 1930 through 1970; in addition, the table provides an estimate of the 1976 population for each county and the projected future population for each census decade 1980 through 2020. Footnotes to the table provide brief comment regarding the sources of the historical data and the projections. Within the 50-mile radius of CPNPP, there is wide diversity in land use, urbanization, and population density. The plant site is located in Hood and Somervell counties, which are essentially rural, sparsely-populated areas. The entire population of Somervell County was 2,793 residents in 1970. Hood County, which is much larger in area than Somervell County (as may be seen in Figure 2.1-3), had a population of 6,368 inhabitants in 1970. In 1970, there were three small communities with a total of 4,339 people within the 10-mile area around the CPNPP site. The total population within the 10-mile area at that time was 5,353, or an overall population density of approximately 17 persons per square mile.

The sparsely-settled rural character extends well beyond the 10-mile radius, as indicated in Table 2.1-2, which lists all incorporated communities and all unincorporated settlements with over 1,000 inhabitants within the entire 50-mile radius of the site. The area extending from 10 to 20 miles out from the CPNPP site is even more sparsely populated than the 0 to 10-mile area. As the table shows, in 1970 there were two communities totaling 1,028 people within the entire 10 to 20-mile area around the CPNPP site, and the total population in this area was 7,532 (this is a 1970 population density of only 8 persons per square mile). Beyond the 20-mile radius there are more communities, and the 30 to 50-mile area to the northeast is dominated by the Fort Worth metropolitan complex.

In reviewing the county-by-county population projections which were given in the PSAR, it was found that most of the county population projections should be revised somewhat in accordance with current population estimates and the most recent projections prepared by the councils-of-government and the state agencies. Accordingly, in providing updated county population data (Table 2.1-1), current estimates for 1976 are given along with the revised projections for the years 1980 through 2020. It should be noted that the current estimates and the projections of expected population growth in Hood and Somervell counties are based upon an enumeration of housing units in the two counties in mid-1976 and an updated evaluation of recent and probable future trends in recreational development in the local area. Moreover, the estimates for Hood and Somervell counties include detailed consideration of the current and possible future impact of CPNPP construction and operation on population growth. As a general procedure in determining population distribution, the 1970 population of each county (wholly or partially within the 50-mile radius of the plan) was allocated to sector-areas within the county on

the basis of (1) the population of each community and enumeration district located wholly within a particular sector-area, and (2) a percentage share of the population of each enumeration district and community partially within a particular sector-area (the percentage share of population of an enumeration district to be allocated to a particular sector-area was generally assumed to be equal to the percentage portion of the area of the enumeration district within the particular sector-area).

In the case of Hood and Somervell counties, the county and enumeration district populations were allocated to sector-areas on the basis of (1) an actual count of housing units within each sector-area, and (2) the estimated number of residents per housing unit, considering available census data for the particular local area. The housing count for Hood and Somervell counties for the PSAR was made in 1973 utilizing a combination of available mapping, aerial photography, and field survey resources. The housing unit count made in mid-1976 for the FSAR was based on a comprehensive field survey and housing enumeration for all of Hood and Somervell counties. The estimates of population within individual sector-areas have been reconciled to the population totals for each county (or a portion of a county).

The percentage ratio of the total population of a county which was estimated to be within each individual sector-area in the county in 1970 (1976 in the case of Hood and Somervell counties) was assumed to remain the same in 1980 and beyond. This assumption was made after concluding that there is little possibility of a significant and radical change in the basic pattern of current population distribution within individual counties in the 50-mile area.

2.1.3.1 Population Within 10 Miles

The area within the 10-mile radius of CPNPP is predominantly a rural agricultural area. In 1970, there were three small communities having more than 100 residents. The total population of Hood and Somervell counties changed little over the period from 1930 to 1970 (see Table 2.1-1).

2.1.3.1.1 Current Population Within 10 Miles

Since 1970, Hood and Somervell counties have experienced increases in population, as indicated by the following:

	Population	
County (and Community)	1970 (census)	1976 (estimate)
Hood County	6,368	15,601
Granbury (county seat)	2,473	3,526
Tolar	312	435
Somervell County	2,793	5,216
Glen Rose (county seat)	1,554	2,790

The estimates for 1976 are based upon the July/August 1976 enumeration of housing units in the two counties (including the communities). The growth of Granbury may be understated in

comparing the data above because much of the urban growth of the community has taken place beyond the city limits.

The increase in population of Hood County since 1970 is largely related to the attractions of Lake Granbury for residential developments. These developments are attracting large numbers of permanent residents as well as vacation and recreational visitors. In 1970, there were 2,628 housing units in use as permanent residences in Hood County. By 1976, there were 5,566 housing units accounting for an estimated population of 15,601 full-time residents in Hood County and there were an additional 1,648 housing units in use primarily during weekends and vacations. A significant portion of the increase in housing units has been in mobile homes used both as vacation homes and permanent residences. The increase in permanent residents in Hood County is partially accounted for by attractive living conditions; many people that have moved into Hood County are commuting to jobs elsewhere. Significant numbers of retired people have established their permanent residence in Hood County. With the above, and the general stimulus of vacation and recreational activity, there has been an increase in local economic activity and job opportunity within the county.

The number of permanent housing units in Somervell County increased from 1,203 in 1970 (but only 1,035 households at that time) to an estimated 1,856 housing units in 1976. An additional 26 vacation homes were located in the housing enumeration, but as the data indicates, virtually the entire housing inventory of Somervell County (fixed structures, mobile homes, and apartments or courts) was permanently occupied in mid-1976. Somervell County has participated only peripherally in the Lake Granbury stimulus to housing development and recreational activity.

In addition to the foregoing, it should be noted that the influx of construction workers employed on CPNPP accounts for a significant portion of the population increase from 1970 to 1976, particularly in the case of Somervell County. For example, at the end of July 1976, there were 2,285 workers regularly employed at the CPNPP construction site. Of that number, 216 had moved into Somervell County specifically to work at CPNPP. In addition to the 2,285 man active work force as of the end of July 1976, there was a total of 1,968 workers who had been terminated since the start of construction on CPNPP in October 1974. Of these terminated employees, 177 had moved into Somervell County for the purpose of employment at CPNPP. Data on the CPNPP work force indicates that, on the average, each worker had 1.8 dependents. Thus, considering both active and terminated workers, a total of 1,100 workers and dependents had moved into Somervell County as of July 1976.

The tabulation below provides a summary showing the total number of CPNPP workers who have moved into Hood and Somervell counties through July 1976:

	Total No. of Workers as of July 1976	
	Active	Terminated
Total (on-site work force)	2,285	1,968
Residing in Somervell County:		
Local Hire	160	138

	Total No. of Workers as of July 1976	
	Active	Terminated
Relocated	216	177
Residing in Hood County:		
Local Hire	278	240
Relocated	201	173

The total number of workers (both active and terminated) and dependents relocating to Hood and Somervell counties through July 1976 is estimated as follows:

	Total Workers	Dependents	Total
Hood County	374	673	1,047
Somervell County	393	707	1,100

While 45 to 47 percent of these totals are represented by now terminated CPNPP employees and dependents, there are strong indications that a large portion of the terminated employees who originally moved with their dependents into the local area to work on CPNPP actually stayed in the area after termination of employment at CPNPP. The overall growth of population in both counties is creating increasing opportunities for employment in local service industries. Moreover, as indicated earlier, substantial numbers of new residents in Hood and Somervell counties are commuting to jobs outside the local area.

Table 2.1-3 shows estimated population distribution by sector and mileage zones within 10 miles of CPNPP for the years 1970 and 1976 and for the census decades 1980 through 2020. Figure 2.1-3 indicates the location of the plant in Somervell County and the sector areas out to a 10-mile radius. As may be seen from the data in the table, a substantial part of the increase in population in the two counties from 1970 to 1976 has occurred in or near the established communities. The population of the remainder of Somervell County has increased by an estimated 95 percent over the same period (1970-1976) and examination of the data in the table indicated that this growth was widely distributed in the county.

In some contrast to Somervell County, the population growth in Hood County has been more highly concentrated (in the areas near Lake Granbury). The population of the county seat of Granbury (within the city limits) increased by an estimated 42 percent from 1970 to 1976. The population of the balance of Hood County increased by well over 300 percent. Much of this increase has occurred in the north, north-north-east, and northwest sectors in the 5 to 10-mile area and the 10 to 20-mile area. These increased concentrations of population within particular sector-areas in Hood County are clearly evident in a comparison of the 1970 and 1976 data in Table 2.1-3.

2.1.3.1.2 Projected Population Within 10 Miles

The size and distribution of population within 10 miles of the CPNPP plant site as projected for the census decades 1980 through 2020 are shown in Table 2.1-3 (along with estimates for 1970 and 1976). These projections of future population distribution within the 10-mile radius of the site are fully reconciled to the overall population projections for Hood and Somervell counties (as described earlier). These projections take into account the size and residential distribution of the CPNPP construction work force and the expected phase-out of construction activity over the period 1980-1982.

It is expected that the continued growth of population and employment opportunities associated with lake-oriented residential community development and recreational activities in Hood County will tend to offset the sharp drop in construction employment on CPNPP. It is also expected that the completion of CPNPP will cause an actual decline in population in Somervell County after 1980 (for a period of two to three years), but by 1990 the loss will be regained due to the underlying slow rate of growth expected for the county.

2.1.3.1.3 Age Distribution of Population Within 10 Miles

To provide an estimate of the population by age groups, it was necessary first to compare the 1970 population distribution by age group for Somervell County and the U.S. as a whole. Because the percentage distribution by age groups 0 to 11, 12 to 18, and 19 and over for Somervell County and for the U.S. for 1970 differed by less than 10 percent, the distributions for the year 2000 for the project area were assumed to be the same as the Bureau of Census age-group distribution projections for the U.S. for the year 2000. If the difference had been greater than 10 percent, the U.S. percentages would have required adjustment based on projections for the North Central Texas region.

The U.S. projection for the year 2000 came from Table No. 3 of the “U.S. Statistical Abstract, 1975.” The data had to be modified slightly, however, to compensate for somewhat different age groupings. The population projection for the 10-mile area of CPNPP came from Table 2.1-3. The resulting population distribution by age group for the 10-mile area around CPNPP for the year 2000 (the mid-point of expected plant life) is given in Table 2.1-4.

2.1.3.2 Population Within 10 to 50 Miles

The population within the 10 to 50-mile radius of CPNPP includes the population of a large number of communities and cities including Fort Worth, as listed in Table 2.1-2. The location of all population centers is shown on Figure 2.1-4, which also shows sector lines and distance circles out to the 50-mile radius from CPNPP.

2.1.3.2.1 Current Population Within 10 to 50 Miles

The distribution of the 1970 population and the estimated 1976 population within the 10 to 50-mile radius of CPNPP is shown by sector-area in Table 2.1-5. The estimates of population distribution by sector-area for 1976 are correlated with the county-by-county projections, as described earlier. There was a 13.4 percent increase in population within the entire 10 to 50 mile area from 1970 to 1976 (compared with the 127 percent increase within the 10-mile area). Within the 10 to 50-mile area there are significant differences among counties with respect to population increase (or loss) from 1970 to 1976 as may be seen in reviewing Table 2.1-1. For

example, the population of Johnson County (to the east of the site) increased by 20 percent while Stephens County (to the west of the site) decreased by 3 percent. These differences in recent growth trends among the counties are reflected in the estimates of current population distribution by sector-area.

2.1.3.2.2 Projected Population Within 10 to 50 Miles

The present and projected population growth through the year 2020 is shown by county in Table 2.1-1 for all counties within the 50-mile radius of CPNPP. Table 2.1-5 provides estimates of the distribution of projected population by sector-area for the census decades 1980 through 2020 (along with comparable estimates for 1970 and 1976). As may be seen in a comparison of the cumulative estimates of population for 0 to 10 miles, 0 to 20 miles, etc., for each of the census years (summarized at the end of Table 2.1-5), population growth for the entire 0 to 50-mile area is projected to increase at a much slower rate than for the 0 to 10-mile area, as shown below:

	Population (000)		Percent
Area (radius)	1976	2020	Increase
0-10	12.1	31.1	156
0-20	24.7	64.9	163
0-30	83.8	198.5	137
0-40	438.8	1,024.8	134
0-50	894.0	2,090.5	134

2.1.3.2.3 Age Distribution of Population Within 10 to 50 Miles

The age distribution of the population of Somervell County (in which the plant is located) in 1970 differed by less than 10 percent from the 1970 age distribution for the populations of the United States as a whole. Accordingly, the projected percentage age distribution for the United States for the year 2000 (mid-point of plant life) was assumed for the population within the 10 to 50-mile area around CPNPP for the year 2000. The projected populated distribution by age group for the 10 to 50-mile area is provided in Table 2.1-6.

2.1.3.3 Transient Population

After consideration of the overall patterns of settlement, land use, and population distribution within the entire 50-mile radius of the site, it was concluded that transient population movements and daily and seasonal variations in population distribution and concentration within the 10-mile radius of CPNPP should be examined in some detail. It was also concluded that no such examination and projections should be made of transient movements in the 10 to 50-mile area. There are large-scale movements of daily commuters (in all directions) within the Fort Worth metropolitan complex. However, but the potential significance and meaning of such movements (compared with the potential significance of movements within the 10-mile area) does not appear to justify the inordinate effort that would be required to characterize, analyze, and project transient population movements within the 10 to 50-mile area. Accordingly, the discussions below pertain only to transient population within the 10-mile radius of CPNPP.

2.1.3.3.1 Seasonal Variation

This category of transient population is specifically concerned with overnight visitors coming into the 10-mile area. As will be shown, there are many more overnight visitors in the summer season than during other times of the year, but overnight visitors are found in the area throughout the year. The seasonal or overnight category of transients includes visitors staying for several days or weeks (this category excludes consideration of daily transients, regardless of the season). This category of transient population (seasonal or overnight visitors) includes visitors that would be found in hotel/motels, camp-grounds, recreational vehicle parks, organized camps (church groups, youth groups, etc.), mobile home-parks, and vacation homes. It also includes live-in students in a children's home despite the fact that their stays are for extended periods. These children are not included as part of the permanent population.

Because this category of transients is predominantly comprised of recreational and vacationing visitors, there is a distinct peaking in the summer season of total transients in the area at any one time. Moreover, normal and holiday weekend peaking is different and week- days differ from week-ends, both in summer and winter. See Table 2.1-7 for estimates of the length of stay of various types of transients.

In developing the estimates of seasonal transient population given in Table 2.1-8, consideration has been given to (1) the location and capacity of various facilities that accommodate overnight visitors, and (2) the actual patterns or levels of use which are typically experienced by the facilities at various time of the year. The table presents estimates of weekly, typical weekend and holiday week, and daily and overnite transient during summer and winter.

With respect to the projection of future levels of seasonal or overnight transients, different assumptions were made for the several different types of facilities. Sector-area estimates of vacation home and hotel/motel visitors were assumed to increase from 1980 through 2020 in proportion to the projected increase in population for the county as a whole (in which the sector-areas are located). Organized camp attendance is expected to remain at 1976 levels and the children's institution will remain stable from 1980 onward. Camping at various types of facilities along Lake Granbury is expected to reach its peak by 1990 (achieving levels similar to those at other older facilities in North Central Texas) and level off thereafter. Camping elsewhere in the 10-mile area (away from Lake Granbury) was estimated to grow in general accordance with the population growth projected for Dallas and Tarrant counties (major counties in the larger metroplex).

2.1.3.3.2 Daily Variation

This category of transient population is concerned with daily movements of population into and within the 10-mile area and peaking in the number of transients found in a particular sector-area at any given time. Estimates of daily transient movements and population concentration include consideration of movements to such facilities as public schools, private schools, urban and community shopping centers, and recreational facilities such as parks and lakes. Estimates have been made of daily visitor recreational use of Lake Granbury (in addition to use by overnight and vacationing visitors). Beginning in 1980, when it will have been filled, it is assumed that limited daily visitor recreational use will be permitted at a non-camping park facility on Squaw Creek Reservoir.

It is apparent from Table 2.1-8 that there are great differences in daily transient population movements depending on the season of the year and on the time of the week (weekday, normal weekend, and holiday weekend). It should be noted that the table does not provide estimates of the total number of daily visitors (of different types) but rather it provides estimates of the maximum number of visitors that might be expected in a sector-area during the peak hours of the day. It is also important to note that the estimates of peak daily transient population concentration in a particular sector-area are not accompanied by corresponding decreases in population in sector-area from which the transients originated. This is the situation where large numbers of school children (from numerous sector-areas) are concentrated daily in a single sector-area. This is simply a recognition that peak population concentration in different sector-areas may occur at different times of the day.

The general approach in estimating daily transient movements in 1976 was to utilize empirical data wherever possible, as in the case of school enrollments and the daytime use of some recreational and park facilities. The experience of state parks and other older reservoirs and water-oriented facilities was used as a basis for estimating current and projected daytime use of Lake Granbury and Squaw Creek Reservoir. The numbers and movement patterns of permanent and vacation residents in making use of shipping facilities in Granbury and Glen Rose was estimated on the basis of the geographical distribution of households and a number of working assumptions regarding the frequency and time of week for shoppers coming from various distances. It was assumed that the above communities served only the areas of their respective counties. Again, the estimates indicate the peak number of transients that would be in a sector-area at a particular time and not the total number of transients during a day.

With respect to the projections of daily transients for future years, several assumptions were made as in the case of the seasonal population estimates. Projections of daily transients associated with school enrollments and community shopping activity were related to basic population projections. Recreational use of Lake Granbury and Squaw Creek Reservoir was assumed to reach mature levels by 1990 and level off thereafter at levels found at similar, but older, water-related facilities elsewhere in North Central Texas. It is noted that Unit 2 of CPNPP will not be completed until 1982 or thereafter and that a construction work force will remain on site after completion and start of operations (at least in a test mode) of Unit 1 in late 1980.

2.1.3.3.3 Summary Effect of Transient Population Movements in 10-Mile Area

The most conservative estimate of area population, provided in Table 2.1-9, is the sum of the permanent population and the maximum transient population estimate (summer holiday weekend daily transients). Similar estimates for other transient periods may be obtained by simply summing the permanent population estimate (Table 2.1-4) and the appropriate transient population estimate. Comparison of Table 2.1-4 and 2.1-9 shows that inclusion of the maximum transient population increases total population by nearly 60 percent.

2.1.3.4 Low Population Zone

In accordance with 10 CFR Part 100 guidance, the low population zone shown in Figure 2.1-5 is defined as that area falling within a four-mile radius of the center of the station site. The present number of residents (approximately 500 persons according to the 1976 estimate) within this area is sufficiently small to ensure a reasonable probability that appropriate protective action could be taken in their behalf in the event of a serious accident as required by 10 CFR 100.3. Section 15.6 shows that this area is of sufficient size to preclude an individual located on its outer

boundary from receiving a total dose following a postulated accident in excess of requirements in 10 CFR Part 100.11. Resident and transient populations within the zone have been discussed in detail in Sections 2.1.3.1 through 2.1.3.3.

2.1.3.5 Population Center

The nearest population center (defined in 10 CFR Part 100 as more than 25,000 people) is Fort Worth, Texas. According to the 1970 census, Fort Worth has a population of 393,476 people (approximately 613,000 in metropolitan area). The growth rate was 10.4 percent between 1960 and 1970. The geographic center of Fort Worth, which is approximately 41 miles northeast from CPNPP, does not differ significantly from its population center. Dallas, with 844,401 inhabitants (1,555,950 in metropolitan area), is 67 miles northeast of the station. Cleburne, 23 miles east of the station site with a population of 16,015 people is the next largest community in the area. Cleburne is expected to reach a population of 25,000 by the mid 1980's, thus becoming the nearest population center as defined by 10 CFR Part 100.

2.1.3.6 Population Density

The cumulative resident population projected for the year of initial plant operation (1980) is compared with a cumulative population resulting from a uniform population density of 500 people/square mile in all directions from the plant in Figure 2.1-6. A similar comparison is made for the end of plant life (2020), but compared with a cumulative population resulting from a uniform population density of 1,000 people/square mile in Figure 2.1-7.

TABLE 2.1-1
HISTORICAL AND PROJECTED POPULATIONS FOR COUNTIES WITHIN
50 MILES OF CPNPP

(Sheet 1 of 3)

County	1930	1940	1950	1960	1970
Bosque	15,750	15,761	11,836	10,809	10,966
Comanche	18,430	19,245	15,516	11,865	11,898
Coryell	19,999	20,226	16,284	23,961	35,311
Dallas	325,691	398,564	614,799	951,527	1,327,321
Eastland	34,156	30,345	23,942	19,526	18,092
Ellis	53,936	47,733	45,645	43,395	46,638
Erath	20,804	20,760	18,434	16,236	18,141
Hamilton	13,523	13,303	10,660	8,488	7,198
Hill	43,036	38,355	31,282	23,650	22,596
Hood	6,779	6,674	5,287	5,443	6,368
Jack	9,046	10,206	7,755	7,418	6,711
Johnson	33,317	30,384	31,390	34,720	45,769
McLennan	98,682	101,898	130,194	150,091	147,553
Palo Pinto	17,576	18,456	17,154	20,516	28,962
Parker	18,759	20,482	21,528	22,880	33,888
Somervell	3,016	3,071	2,542	2,577	2,793
Stephens	16,560	12,356	10,597	8,885	8,414
Tarrant	197,178	225,521	361,253	538,495	716,317
Wise	19,178	19,074	16,141	17,012	19,687

TABLE 2.1-1
HISTORICAL AND PROJECTED POPULATIONS FOR COUNTIES WITHIN
50 MILES OF CPNPP

(Sheet 2 of 3)

	Projections					
County	1976	1980	1990	2000	2010	2020
Bosque	10,775	10,711	10,423	10,295	10,353	10,610
Comanche	11,850	11,899	12,046	12,428	13,015	13,780
Coryell	37,000	37,500	39,900	41,900	43,600	45,000
Dallas	1,520,000	1,678,100	2,126,100	2,658,100	3,294,900	4,056,700
Eastland	17,000	16,726	15,669	14,929	14,328	13,857
Ellis	52,100	55,500	63,000	69,600	76,000	82,000
Erath	19,200	19,900	21,900	23,800	25,600	27,400
Hamilton	6,750	6,400	5,600	4,900	4,300	3,700
Hill	21,900	21,861	21,641	22,008	22,816	24,055
Hood	15,601	22,000	27,500	33,577	40,796	49,118
Jack	6,600	6,500	6,300	6,000	5,700	5,400
Johnson	55,000	62,358	86,509	105,627	128,337	154,518
McLennan	152,900	156,600	166,600	174,700	181,700	187,700
Palo Pinto	23,650	24,000	25,000	25,750	26,250	26,500
Parker	36,600	42,589	50,105	56,881	63,055	68,975
Somervell	5,216	5,616	5,600	6,200	7,500	9,000
Stephens	8,200	8,077	7,922	7,964	8,130	8,424
Tarrant	825,000	892,000	1,114,300	1,370,900	1,673,800	2,029,900
Wise	21,600	22,900	26,600	30,500	34,700	39,300

Sources:

a. Historical data for 1930-1970 are from US Bureau of Census.

b. Estimates for 1976 for Hood and Somervell Counties are based on a comprehensive enumeration of housing units by Westwood Research, Inc.

TABLE 2.1-1
HISTORICAL AND PROJECTED POPULATIONS FOR COUNTIES WITHIN 50 MILES OF CPNPP

(Sheet 3 of 3)

c. Estimates for 1976 for counties other than Hood and Somervell, are derived from the long-term trend lines considering historical data through the 1970 Census and long-term projections described below.

d. The long-term projections of population growth in all counties are projections made by various local councils of governments and Texas state agencies. Where there are significant differences in projections made by different authorities for the same county, recent experience and current and short-term trends have been considered in selecting the long-term projections for inclusion in the table.

TABLE 2.1-2
CENTERS OF POPULATION WITHIN 50 MILES OF CPNPP

(Sheet 1 of 4)

Community[(a)]	1970 Population[(b)]	Distance from Site in Miles[(c)]	Direction
0-10 Miles			
Glen Rose	1,554	4.3-5.5	SE,SSE, &S
Granbury	2,473	9.5-10.9	N
Tolar	312	9.7-10.6	NW
10-20 Miles			
Granbury	(see Granbury, 0-10 Miles)		N
Godley	533	18.1-18.8	NE
Tolar	(see Tolar, 0-10 Miles)		NW
Walnut Springs	495	16.3-17.5	S
20-30 Miles			
Aledo	620	29	NNE
Benbrook	8,169	29-35	NNE & NE
Blum	382	25	ESE
Cleburne	16,015	21-25	ENE & E
Hico	975	26	SW & SSW
Iredell	316	22	SSW
Joshua	924	26	ENE
Keene	2,440	28	ENE
Lipan	333	22	NW
Meridian	1,162	27	SSE
Morgan	415	22	SSE
Rio Vista	370	24	E
Stephenville	9,277	24-27	WSW & W

TABLE 2.1-2
CENTERS OF POPULATION WITHIN 50 MILES OF CPNPP

(Sheet 2 of 4)

Community[a]	1970 Population[b]	Distance from Site in Miles[c]	Direction
30-40 Miles			
Alvarado	2,129	34	ENE & E
Benbrook	(see Benbrook, 20-30 Miles)		NNE & NE
Burelson	7,713	30-33	NE & ENE
Clifton	2,578	37	SSE
Crowley	2,662	32	NE
Dublin	2,810	36	WSW
Fort Worth	393,476[d]	33-50	NNE & NE
Edgecliff	1,143	36	NE
Everman	4,570	37	NE
Forest Hill	8,236	39-40	NE
Gordon	457	38	WNW
Lakeside	988	39-40	NNE
Mineral Wells	18,411	38-42	NNW
River Oaks	8,193	39-41	NNE & NE
Weatherford	11,750	31-33	N
Westover Hills	374	37	NE
Westworth Village	4,578	38	NNE & NE
White Settlement	13,449	35-38	NNE
Willow Park	230	31-34	NNE
40-50 Miles			
Arlington	90,643[d]	42-50	NE
Azle	4,493	42-44	NNE
Blue Mound	1,293	47	NE
Dallas	844,401[d]	47-50	ENE

TABLE 2.1-2
CENTERS OF POPULATION WITHIN 50 MILES OF CPNPP

(Sheet 3 of 4)

Community[(a)]	1970 Population[(b)]	Distance from Site in Miles[(c)]	Direction
Dalworthington Gardens	757	46	NE
De Leon	2,170	46	WSW
Fort Worth	(see Fort Worth, 30-40 Miles)[(d)]		NNE & NE
Grand Prairie	50,904[(d)]	49-50	ENE
Gustine	357	48	SW
<u>40-50 Miles</u>			
Haltom City	28,127	44-48	NE
Hamilton	2,760	44-46	SSW
Hillsboro	7,224	42-46	ESE
Hurst	27,215[(d)]	49-50	NE
Kennedale	3,076	40-41	NE
Lake Worth	4,958	40-41	NNE
Mansfield	3,658	41-42	ENE
Maypearl	462	45	E
Midlothian	2,322	48-49	ENE
Mineral Wells	(see Mineral Wells, 30-40 Miles)		NNW
Mingus	273	40-41	WNW
North Richland Hills	16,514[(d)]	47-50	NE
Pantego	1,168	46	NE
Reno	688	44-49	NNE
Richland Hills	8,865	47-50	NE
River Oaks	(see River Oaks, 30-40 Miles)		NNE & NE
Saginaw	2,382	45-47	NNE

TABLE 2.1-2
CENTERS OF POPULATION WITHIN 50 MILES OF CPNPP

(Sheet 4 of 4)

Community[a]	1970 Population[b]	Distance from Site in Miles[c]	Direction
Sansom Park	4,771	41-42	NNE
Springtown	1,194	46-47	N
Strawn	786	45	WNW
Valley Mills	1,022	49-50	SSE
Venus	414	41	ENE
Watauga	3,611[d]	49-50	NE

a) Communities include all unincorporated settlements with 1,000 or more inhabitants, and all incorporated communities.

b) Source is the US Bureau of Census (Ref. 2.1-1).

c) Distances are indicated to the nearest and most distant portion of the densely settled area of a community rather than to city limits, as such. Beyond 20 miles the distance is rounded to the nearest mile.

d) Population of the community is located partly outside of the 50 mile radius of CPNPP.

TABLE 2.1-3
POPULATION DISTRIBUTION BY SECTOR-AREA WITHIN 10 MILES OF CPNPP

(Sheet 1 of 2)

0 to 1 Mile Zone

Sector	1970	1976	1980	1990	2000	2010	2020
N							
NNE							
NE							
ENE							
E							
ESE							
SE							
SSE	NO RESIDENT POPULATION						
S							
SSW							
SW							
WSW							
W							
WNW							
NW							
NNW							
TOTAL							

1 to 2 Mile Zone

Sector	1970	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	6	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	3	3	4	4	4	5	5
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	3	3	4	4	4	5	5
SW	6	45	47	47	53	64	77
WSW	6	12	13	13	14	17	21
W	12	9	10	12	14	16	21
WNW	3	3	3	3	3	3	3
NW	3	0	0	0	0	0	0
NNW	3	0	0	0	0	0	0
TOTAL	45	75	81	83	92	110	132

2 to 3 Mile Zone

Sector	1970	1976	1980	1990	2000	2010	2020
N	3	6	9	11	13	16	20
NNE	6	9	13	17	20	24	29
NE	15	42	58	73	91	111	132
ENE	9	9	9	9	10	13	15
E	0	0	0	0	0	0	0
ESE	15	9	10	10	11	13	15
SE	3	6	6	6	7	8	10
SSE	3	3	4	4	4	5	6
S	9	14	14	14	16	19	23
SSW	0	0	0	0	0	0	0
SW	3	12	12	13	14	17	21
WSW	3	3	4	4	4	5	6
W	9	12	19	23	28	35	42
WNW	6	6	9	11	13	16	20
NW	0	0	0	0	0	0	0
NNW	6	6	7	8	10	12	15
TOTAL	90	137	174	203	241	294	354

3 to 4 Mile Zone

Sector	1970	1976	1980	1990	2000	2010	2020
N	9	23	33	41	50	61	74
NNE	27	40	57	71	87	106	127
NE	18	20	29	36	44	53	64
ENE	18	29	37	43	51	62	75
E	15	26	28	28	31	38	45
ESE	42	62	67	66	74	87	106
SE	12	26	28	28	31	38	45
0	6	12	13	13	14	17	21
S	0	3	4	4	4	5	6
SSW	9	9	9	9	11	13	15
SW	0	9	10	10	11	14	16
WSW	6	6	7	9	10	12	15
W	24	20	29	36	44	53	64
WNW	15	23	31	39	47	57	69
NW	0	0	0	0	0	0	0
NNW	3	0	0	0	0	0	0
TOTAL	204	308	382	433	509	616	742

TABLE 2.1-3
POPULATION DISTRIBUTION BY SECTOR-AREA WITHIN 10 MILES OF CPNPP

(Sheet 2 of 2)

	4 to 5 Mile Zone								5 to 10 Mile Zone						
Sector	1970	1976	1980	1990	2000	2010	2020	Sector	1970	1976	1980	1990	2000	2010	2020
N	36	37	53	66	81	98	118	N	1,434	3,839	5,414	6,766	8,263	10,040	12,087
NNE	21	17	24	30	37	45	54	NNE	93	1,207	1,703	2,129	2,599	3,158	3,802
NE	27	104	144	181	221	268	324	NE	147	409	576	721	880	1,069	1,287
ENE	13	20	29	36	44	53	64	ENE	126	144	201	249	302	368	443
E	18	26	28	28	31	38	45	E	69	189	203	202	223	270	324
ESE	69	84	90	90	100	120	145	ESE	196	549	591	589	653	790	948
SE	90	76	82	82	91	110	131	SE	70	115	124	123	136	165	198
SSE	1,258	2,260	2,433	2,426	2,636	3,249	3,900	SSE	363	726	781	780	863	1,043	1,262
S	88	185	199	198	219	265	319	S	38	98	106	105	117	141	169
SSW	26	51	55	55	61	74	88	SSW	81	180	194	193	214	259	311
SW	18	45	48	48	53	65	77	SW	63	87	94	94	104	125	150
WSW	6	3	4	4	4	5	6	WSW	66	116	144	165	194	235	283
W	12	14	20	25	30	37	44	W	45	79	112	140	171	208	251
WNW	30	31	44	55	67	82	98	WNW	96	196	275	344	420	610	614
NW	3	0	0	0	0	0	0	NW	249	348	491	613	749	910	1,096
NNW	24	20	29	36	44	53	64	NNW	131	362	610	638	779	946	1,140
TOTAL	1,739	2,973	3,282	3,360	3,769	4,562	5,477	TOTAL	3,272	8,643	11,519	18,851	16,667	20,237	24,354

CUMULATIVE POPULATIONS
(Miles from Site)

Year	0-1	0-2	0-3	0-4	0-5	0-10
1970	3	48	138	342	2,081	5,353
1976	0	75	212	520	3,493	12,136
1980	0	81	255	637	3,919	15,438
1990	0	83	286	719	4,079	17,930
2000	0	92	333	842	4,611	21,278
2010	0	110	404	1,020	5,582	25,819
2020	0	132	486	1,228	6,705	31,059

TABLE 2.1-4
POPULATION DISTRIBUTION BY AGE GROUPS WITHIN 10 MILE RADIUS OF CPNPP FOR YEAR 2000

(Mid point of plant life)

	Population	
Age Groups	Number	Percentage[(a)]
0-11	4,807	22.6
12-18	2,843	13.4
19 and over	13,628	64.0
	21,278[(b)]	100.0

a) As specified in Appendix D of the Regulatory Guide 4.3, Revision 2, a "test of significance" was made comparing the 1970 population distribution by age groups of Somervell County with that of the United States as a whole. The test indicated that the two distributions differed less than 10 percent. Thus, the percentages in the table above are based on the unadjusted population distribution by age groups as projected for the United States in the year 2000. The United States projection of the population by age groups is found in Table No. 3 of the Statistical Abstract of the United States, 1975 (Ref. 2.1-3).

b) Population total of the area 0 to 10 miles for the year 2000 is from Table 2.1-3

TABLE 2.1-5
POPULATION DISTRIBUTION BY SECTOR-AREA WITHIN 10 MILES OF CPNPP

10 to 20 Mile Zone

Sector	1970	1976	1980	1990	2000	2010	2020
N	1,779	3,935	5,517	6,883	8,392	10,173	12,223
NNE	819	2,213	3,072	3,850	4,693	5,691	6,838
NE	782	1,113	1,366	1,822	2,224	2,703	3,255
ENE	529	642	730	1,012	1,235	1,500	1,806
E	312	377	428	592	722	878	1,056
ESE	280	334	374	502	606	733	880
SE	185	184	187	193	199	211	228
SSE	201	211	212	207	209	217	230
S	647	660	659	641	640	653	679
SSW	150	175	182	193	201	221	245
SW	265	292	304	331	361	392	426
WSW	338	369	388	429	470	509	549
W	290	315	339	379	419	461	504
WNW	298	351	402	462	526	595	671
NW	398	580	813	1,016	1,239	1,503	1,809
NNW	259	803	1,123	1,401	1,706	2,068	2,484
TOTAL	7,532	12,554	16,096	19,913	23,842	28,508	33,883

20 to 30 Mile Zone

Sector	1970	1976	1980	1990	2000	2010	2020
N	1,437	1,552	1,806	2,124	2,412	2,674	2,925
NNE	2,065	2,241	2,601	3,069	3,497	3,893	4,283
NE	1,675	1,925	2,123	2,762	3,381	4,113	4,965
ENE	13,042	15,675	17,771	24,655	30,104	36,578	44,037
E	14,148	16,996	19,269	26,729	32,636	39,650	47,738
ESE	1,958	2,038	2,131	2,424	2,682	3,014	3,415
SE	463	452	451	443	445	455	474
SSE	1,916	1,882	1,871	1,821	1,799	1,808	1,853
S	235	231	229	223	220	222	227
SSW	1,204	1,150	1,111	1,016	939	878	827
SW	918	913	906	898	894	896	897
WSW	7,895	8,355	8,659	9,631	10,358	11,142	11,923
W	2,987	3,160	3,275	3,605	3,917	4,214	4,510
WNW	465	490	508	558	605	651	696
NW	781	1,045	1,377	1,678	2,002	2,383	2,815
NNW	975	1,053	1,230	1,448	1,645	1,828	2,003
TOTAL	52,164	59,158	65,318	82,984	97,536	114,339	133,588

30 to 40 Mile Zone

Sector	1970	1976	1980	1990	2000	2010	2020
N	14,448	15,610	18,165	21,371	24,251	26,892	29,418
NNE	35,194	40,381	43,806	54,574	66,911	81,386	98,337
NE	211,833	243,980	263,809	329,597	405,492	495,083	600,405
ENE	14,675	17,463	19,604	26,641	32,576	39,616	47,765
E	2,718	3,178	3,555	4,791	5,778	6,956	8,319
ESE	3,013	2,919	2,914	2,885	2,934	3,042	3,208
SE	3,496	3,401	3,392	3,343	3,377	3,476	3,641
SSE	3,296	3,240	3,220	3,134	3,096	3,113	3,189
S	768	750	741	711	693	687	694
SSW	472	442	420	368	322	283	243
SW	615	623	626	644	664	686	710
WSW	3,682	3,897	4,038	4,443	4,830	5,196	5,560
W	736	780	808	889	966	1,039	1,112
WNW	733	647	654	693	725	753	774
NW	1,260	1,044	1,044	1,088	1,120	1,142	1,153
NNW	18,748	16,566	17,292	18,708	19,907	20,908	21,752
TOTAL	315,687	354,921	384,088	473,880	573,652	690,258	826,280

40 to 50 Mile Zone

Sector	1970	1976	1980	1990	2000	2010	2020
N	4,108	4,440	5,130	6,029	6,848	7,605	8,340
NNE	32,037	36,712	39,926	49,632	60,687	73,594	88,663
NE	313,754	361,432	390,785	488,176	600,592	733,291	889,299
ENE	13,818	15,844	17,154	21,181	25,544	30,615	36,474
E	2,258	2,537	2,742	3,323	3,808	4,351	4,947
ESE	8,761	8,497	8,486	8,409	8,558	8,877	9,361
SE	1,969	1,948	1,958	1,978	2,029	2,101	2,195
SSE	2,135	2,118	2,121	2,110	2,118	2,149	2,208
S	911	922	917	930	939	951	957
SSW	3,533	3,313	3,142	2,747	2,405	2,109	1,815
SW	1,065	1,052	1,048	1,044	1,058	1,091	1,138
WSW	3,506	3,496	3,512	3,560	3,675	3,851	4,078
W	1,283	1,243	1,237	1,212	1,206	1,210	1,226
WNW	1,343	1,131	1,131	1,168	1,201	1,222	1,232
NW	1,138	943	943	982	1,012	1,032	1,041
NNW	10,769	9,562	10,008	10,852	11,571	12,172	12,685
TOTAL	402,388	455,190	490,240	603,333	733,251	886,221	1,065,659

CUMULATIVE POPULATIONS
(Miles from Site)

Year	0-10	0-20	0-30	0-40	0-50
1970	5,353	12,885	65,0493	80,736	783,124
1976	12,136	24,690	83,848	438,769	893,959
1980	15,438	31,534	96,852	480,940	971,180
1990	17,930	37,843	120,827	594,707	1,198,040
2000	21,278	45,120	142,656	716,308	1,449,559
2010	25,819	54,327	168,726	858,984	1,745,205
2020	31,059	64,942	198,530	1,024,810	2,090,469

TABLE 2.1-6
POPULATION DISTRIBUTION BY AGE GROUPS BETWEEN 10 AND 50 MILE RADIUS OF CPNPP FOR YEAR 2000

(Mid point of plant life)

	Population	
Age Groups	Number	Percentage[(a)]
0-11	322,791	22.6
12-18	191,390	13.4
19 and over	914,090	64.0
	1,428,271	100.0

a) As specified in Appendix D of the Regulatory Guide 4.3, Revision 2, a “test of significance” was made comparing the 1970 population distribution by age groups of Somervell County with that of the United States as a whole. The test indicated that the two distributions differed less than 10 percent. Thus, the percentages in the table above are based on the unadjusted population distribution by age groups as projected for the United States in the year 2000. The United States projection of the population by age groups is found in Table No. 3 of the Statistical Abstract of the United States, 1975 (Ref. 2.1-3).

b) Population total of total area between 10 miles and 50 miles for the year 2000 is from Table 2.1-5.

TABLE 2.1-7
TYPE AND TYPICAL LENGTH OF STAY OF TRANSIENTS WITHIN 10 MILE RADIUS OF CPNPP

Type of Transients	Typical Length of Stay
Overnight Transients (Seasonal Visitors)	
Camping (Campgrounds and RV Parks)	Winter visitors for weekends Summer visitors for one week
Childrens' Institution	Indefinite[(a)]
Hotels/Motels	Two days
Organizational Camps	Winter campers for weekends Summer campers for 1 to 2 weeks
Vacation Homes	Winter visitors for weekends Summer length of stay cannot be specified for lack of data
Daily Transients	
Childrens' Institution	Eight hours
Recreation (Parks and Lakes)	Four hours
Schools	Eight hours
Shopping Centers	Three hours

a) The children of the institution are listed as transients because they are not included in the estimate and projections of the permanent population. Some students are live-in and some attend day only.

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 1 of 24)

Daily Transient - Summer Weekday

0 to 1 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	3	10	10	10	10
NNE	0	7	27	27	27	27
NE	0	1	4	4	4	4
ENE	0	1	4	4	4	4
E	0	0	0	0	0	0
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	0	1	1	1	1
NNW	0	1	4	4	4	4
TOTAL	0	13	50	50	50	50

1 to 2 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	38	143	143	143	143
NNE	0	23	88	88	88	88
NE	0	80	295	295	295	295
ENE	0	14	52	52	52	52
E	0	0	0	0	0	0
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	2	7	7	7	7
NNW	0	13	47	47	47	47
TOTAL	0	170	632	632	632	632

2 to 3 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	2	10	10	10	10
ENE	0	2	5	5	5	5
E	0	0	0	0	0	0
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	1	3	3	3	3
NNW	0	13	50	50	50	50
TOTAL	0	18	68	68	68	68

3 to 4 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	0	0	0	0	0
E	0	0	0	0	0	0
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	100	110	138	171	211	260
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	1	3	3	3	3
NNW	0	1	3	3	3	3
TOTAL	100	112	144	177	217	266

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 2 of 24)

Daily Transient - Summer Weekday

4 to 5 Mile Zone							5 to 10 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	840	1161	1535	1807	2135	2505
NNE	0	0	0	0	0	0	NNE	176	219	380	380	380	380
NE	0	0	0	0	0	0	NE	171	213	369	369	369	369
ENE	0	0	0	0	0	0	ENE	0	0	0	0	0	0
E	0	0	0	0	0	0	E	0	0	0	0	0	0
ESE	0	0	0	0	0	0	ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	285	308	309	346	419	504	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0	NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0	NNW	0	0	0	0	0	0
TOTAL	285	308	309	346	419	504	TOTAL	1187	1593	2284	2556	2884	3254

CUMULATIVE TRANSIENT POPULATION (miles from site)

YEAR	0-1	0-2	0-3	0-4	0-5	0-10
1976	0	0	0	100	385	1572
1980	13	183	201	313	621	2214
1990	50	682	750	894	1203	3487
2000	50	682	750	922	1268	3824
2010	50	682	750	967	1386	4270
2020	50	682	750	1016	1520	4774

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 3 of 24)

Daily Transient-Summer Weekend

0 to 1 Mile Zone							1 to 2 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	6	23	23	23	23	N	0	85	319	319	319	319
NNE	0	17	61	61	61	61	NNE	0	52	195	195	195	195
NE	0	2	9	9	9	9	NE	0	177	660	660	660	660
ENE	0	2	9	9	9	9	ENE	0	31	115	115	115	115
E	0	0	0	0	0	0	E	0	0	0	0	0	0
ESE	0	0	0	0	0	0	ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	1	2	2	2	2	NW	0	4	16	16	16	16
NNW	0	2	8	8	8	8	NNW	0	28	106	106	106	106
TOTAL	0	30	112	112	112	112	TOTAL	0	377	1411	1411	1411	1411

2 to 3 Mile Zone							3 to 4 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	0	0	0	0	0	0
NNE	0	0	0	0	0	0	NNE	0	0	0	0	0	0
NE	0	6	22	22	22	22	NE	0	0	0	0	0	0
ENE	0	3	11	11	11	11	ENE	0	0	0	0	0	0
E	0	0	0	0	0	0	E	0	0	0	0	0	0
ESE	0	0	0	0	0	0	ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	800	878	1102	1370	1693	2076
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	2	6	6	6	6	NW	0	2	5	5	5	5
NNW	0	30	113	113	113	113	NNW	0	1	6	6	6	6
TOTAL	0	41	152	152	152	152	TOTAL	800	881	1113	1381	1704	2087

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 4 of 24)

Daily Transient-Summer Weekend

4 to 5 Mile Zone							5 to 10 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	2075	2874	3778	4464	5291	6222
NNE	0	0	0	0	0	0	NNE	392	488	845	845	845	845
NE	0	0	0	0	0	0	NE	381	475	822	822	822	822
ENE	0	0	0	0	0	0	ENE	0	0	0	0	0	0
E	0	0	0	0	0	0	E	0	0	0	0	0	0
ESE	0	0	0	0	0	0	ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	535	580	585	653	790	952	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0	NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0	NNW	0	0	0	0	0	0
TOTAL	535	580	585	653	790	952	TOTAL	2848	3837	5445	6131	6958	7889

CUMULATIVE TRANSIENT POPULATION
(miles from site)

YEAR	0-1	0-2	0-3	0-4	0-5	0-10
1976	0	0	0	800	1335	4183
1980	30	407	448	1329	1909	5746
1990	112	1523	1675	2788	3373	8818
2000	112	1523	1675	3056	3709	9840
2010	112	1523	1675	3379	4169	11,127
2020	112	1523	1675	3762	4714	12,603

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 5 of 24)

Daily Transient-Summer Holiday Weekend

0 to 1 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	9	35	35	35	35
NNE	0	25	93	93	93	93
NE	0	4	14	14	14	14
ENE	0	4	15	15	15	15
E	0	0	0	0	0	0
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	1	4	4	4	4
NNW	0	3	13	13	13	13
TOTAL	0	46	174	174	174	174

1 to 2 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	133	495	495	495	495
NNE	0	80	302	302	302	302
NE	0	274	1022	1022	1022	1022
ENE	0	49	179	179	179	179
E	0	0	0	0	0	0
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	6	24	24	24	24
NNW	0	44	164	164	164	164
TOTAL	0	586	2186	2186	2186	2186

2 to 3 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	8	33	33	33	33
ENE	0	5	17	17	17	17
E	0	0	0	0	0	0
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	3	10	10	10	10
NNW	0	47	174	174	174	174
TOTAL	0	63	234	234	234	234

3 to 4 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	0	0	0	0	0
E	0	0	0	0	0	0
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	969	1060	1330	1658	2044	2506
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	2	9	9	9	9
NNW	0	2	9	9	9	9
TOTAL	969	1064	1348	1676	2062	2524

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 6 of 24)

Daily Transient-Summer Holiday Weekend

4 to 5 Mile Zone							5 to 10 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	3127	4328	5697	6725	7965	9362
NNE	0	0	0	0	0	0	NNE	608	757	1312	1312	1312	1312
NE	0	0	0	0	0	0	NE	590	735	1275	1275	1275	1275
ENE	0	0	0	0	0	0	ENE	0	0	0	0	0	0
E	0	0	0	0	0	0	E	0	0	0	0	0	0
ESE	0	0	0	0	0	0	ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	1224	1339	1496	1766	2160	2625	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0	NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0	NNW	0	0	0	0	0	0
TOTAL	1224	1339	1496	1766	2160	2625	TOTAL	4325	5820	8284	9312	10552	11949

CUMULATIVE TRANSIENT POPULATION
(miles from site)

YEAR	0-1	0-2	0-3	0-4	0-5	0-10
1976	0	0	0	969	2193	6518
1980	46	632	695	1759	3098	8918
1990	174	2360	2594	3942	5438	13,722
2000	174	2360	2594	4270	6036	15,348
2010	174	2360	2594	4656	6816	17,368
2020	174	2360	2594	5118	7743	19,692

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 7 of 24)

Daily Transient – Winter Weekday

0 to 1 Mile Zone							1 to 2 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	1	5	5	5	5	N	0	2	8	8	8	8
NNE	0	1	5	5	5	5	NNE	0	2	4	4	4	4
NE	0	1	4	4	4	4	NE	0	31	114	114	114	114
ENE	0	1	4	4	4	4	ENE	0	4	16	16	16	16
E	0	0	0	0	0	0	E	0	0	0	0	0	0
ESE	0	0	0	0	0	0	ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	0	1	1	1	1	NW	0	2	7	7	7	7
NNW	0	1	4	4	4	4	NNW	0	4	13	13	13	13
TOTAL	0	5	23	23	23	23	TOTAL	0	45	162	162	162	162

2 to 3 Mile Zone							3 to 4 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	0	0	0	0	0	0
NNE	0	0	0	0	0	0	NNE	0	0	0	0	0	0
NE	0	1	2	2	2	2	NE	0	0	0	0	0	0
ENE	0	1	5	5	5	5	ENE	0	0	0	0	0	0
E	0	0	0	0	0	0	E	17	87	87	87	87	87
ESE	0	0	0	0	0	0	ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	8	8	11	14	17	21
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	O	O	O	O	O	O	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	1	3	3	3	3	NW	0	1	3	3	3	3
NNW	0	2	10	10	10	10	NNW	0	1	3	3	3	3
TOTAL	0	5	20	20	20	20	TOTAL	25	97	104	107	110	114

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 8 of 24)

Daily Transient – Winter Weekday

4 to 5 Mile Zone							5 to 10 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	1215	1699	2160	2611	3156	3769
NNE	0	0	0	0	0	0	NNE	69	86	151	151	151	151
NE	0	0	0	0	0	0	NE	68	85	147	147	147	147
ENE	0	0	0	0	0	0	ENE	0	0	0	0	0	0
E	0	0	0	0	0	0	E	0	0	0	0	0	0
ESE	0	0	0	0	0	0	ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	716	774	768	852	1031	1238	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0	NW	221	312	389	475	579	696
NNW	0	0	0	0	0	0	NNW	0	0	0	0	0	0
TOTAL	716	774	768	852	1031	1238	TOTAL	1573	2192	2847	3384	4033	4763

CUMULATIVE TRANSIENT POPULATION
(miles from site)

YEAR	0-1	0-2	0-3	0-4	0-5	0-10
1976	0	0	0	25	741	2314
1980	5	50	55	152	926	3118
1990	23	185	205	309	1077	3924
2000	23	185	205	312	1164	4548
2010	23	185	205	315	1346	5379
2020	23	185	205	319	1557	6320

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 9 of 24)

Daily Transient-Winter Weekend

0 to 1 Mile Zone							1 to 2 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	2	8	8	8	8	N	0	3	13	13	13	13
NNE	0	2	9	9	9	9	NNE	0	2	6	6	6	6
NE	0	2	7	7	7	7	NE	0	51	187	187	187	187
ENE	0	2	7	7	7	7	ENE	0	7	27	27	27	27
E	0	0	0	0	0	0	E	0	0	0	0	0	0
ESE	0	0	0	0	0	0	ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	1	2	2	2	2	NW	0	3	12	12	12	12
NNW	0	2	6	6	6	6	NNW	0	6	23	23	23	23
TOTAL	0	11	39	39	39	39	TOTAL	0	72	268	268	268	268

2 to 3 Mile Zone							3 to 4 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	0	0	0	0	0	0
NNE	0	0	0	0	0	0	NNE	0	0	0	0	0	0
NE	0	1	3	3	3	3	NE	0	0	0	0	0	0
ENE	0	2	9	9	9	9	ENE	0	0	0	0	0	0
E	0	0	0	0	0	0	E	0	0	0	0	0	0
ESE	0	0	0	0	0	0	ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	20	22	27	34	42	51
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	1	5	5	5	5	NW	0	1	4	4	4	4
NNW	0	5	16	16	16	16	NNW	0	1	4	4	4	4
TOTAL	0	9	33	33	33	33	TOTAL	20	24	35	42	50	59

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 10 of 24)

Daily Transient-Winter Weekend

4 to 5 Mile Zone							5 to 10 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	1631	2285	1209	3509	4231	5047
NNE	0	0	0	0	0	0	NNE	116	145	250	250	250	250
NE	0	0	0	0	0	0	NE	113	141	243	243	243	243
ENE	0	0	0	0	0	0	ENE	0	0	0	0	0	0
E	0	0	0	0	0	0	E	0	0	0	0	0	0
ESE	0	0	0	0	0	0	ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	515	556	555	616	745	897	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0	NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0	NNW	0	0	0	0	0	0
TOTAL	515	556	555	616	745	897	TOTAL	1860	2571	1702	4002	4724	5540

CUMULATIVE TRANSIENT POPULATION
(miles from site)

YEAR	0-1	0-2	0-3	0-4	0-5	0-10
1976	0	0	0	20	535	2395
1980	11	83	92	116	672	3243
1990	39	307	340	375	930	2632
2000	39	307	340	382	998	5000
2010	39	307	340	390	1135	5859
2020	39	307	340	399	1296	6836

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 11 of 24)

Daily Transient-Winter Holiday Weekend

0 to 1 Mile Zone							1 to 2 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	4	16	16	16	16	N	0	7	27	27	27	27
NNE	0	4	17	17	17	17	NNE	0	4	12	12	12	12
NE	0	4	15	15	15	15	NE	0	104	390	390	390	390
ENE	0	4	16	16	16	16	ENE	0	15	55	55	55	55
E	0	0	0	0	0	0	E	0	0	0	0	0	0
ESE	0	0	0	0	0	0	ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	1	4	4	4	4	NW	0	7	25	25	25	25
NNW	0	4	13	13	13	13	NNW	0	13	47	47	47	47
TOTAL	0	21	81	81	81	81	TOTAL	0	150	556	556	556	556

2 to 3 Mile Zone							3 to 4 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	0	0	0	0	0	0
NNE	0	0	0	0	0	0	NNE	0	0	0	0	0	0
NE	0	2	7	7	7	7	NE	0	0	0	0	0	0
ENE	0	5	18	18	18	18	ENE	0	0	0	0	0	0
E	0	0	0	0	0	0	E	0	0	0	0	0	0
ESE	0	0	0	0	0	0	ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	47	52	65	80	99	122
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	3	10	10	10	10	NW	0	2	9	9	9	9
NNW	0	9	34	34	34	34	NNW	0	2	9	9	9	9
TOTAL	0	19	69	69	69	69	TOTAL	47	56	83	98	117	140

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 12 of 24)

Daily Transient-Winter Holiday Weekend

4 to 5 Mile Zone							5 to 10 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	2585	3612	4627	5560	6684	7951
NNE	0	0	0	0	0	0	NNE	241	300	520	520	520	520
NE	0	0	0	0	0	0	NE	234	292	505	505	505	505
ENE	0	0	0	0	0	0	ENE	0	0	0	0	0	0
E	0	0	0	0	0	0	E	0	0	0	0	0	0
ESE	0	0	0	0	0	0	ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	681	736	740	824	998	1200	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0	NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0	NNW	0	0	0	0	0	0
TOTAL	681	736	740	824	998	1200	TOTAL	3060	4204	5652	6585	7709	8976

CUMULATIVE TRANSIENT POPULATION
(miles from site)

YEAR	0-1	0-2	0-3	0-4	0-5	0-10
1976	0	0	0	47	728	3788
1980	21	171	190	246	982	5186
1990	81	637	706	789	1529	7181
2000	81	637	706	804	1628	8213
2010	81	637	706	823	1821	9530
2020	81	637	706	846	2046	11,022

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 13 of 24)

Overnight Transient-Summer Weekday

0 to 1 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE						
SSE	NO TRANSIENT POPULATION					
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

1 to 2 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE						
SSE	NO TRANSIENT POPULATION					
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

2 to 3 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE						
SSE	NO TRANSIENT POPULATION					
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

3 to 4 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	0	0	0	0	0
E	13	70	70	70	70	70
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	80	88	110	138	170	208
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0
TOTAL	93	158	180	208	240	278

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 14 of 24)

Overnight Transient-Summer Weekday

4 to 5 Mile Zone							5 to 10 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	520	708	945	1107	1302	1525
NNE	0	0	0	0	0	0	NNE	748	974	1253	1438	1659	1913
NE	0	0	0	0	0	0	NE	241	320	472	519	576	641
ENE	0	0	0	0	0	0	ENE	26	36	45	55	66	80
E	275	275	275	275	275	275	E	24	26	26	28	34	41
ESE	0	0	0	0	0	0	ESE	183	184	184	185	187	189
SE	0	0	0	0	0	0	SE	450	450	450	450	450	450
SSE	240	297	314	341	379	423	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	70	70	70	70	70	70	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0	NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0	NNW	0	0	0	0	0	0
TOTAL	585	642	659	686	724	768	TOTAL	2192	2698	3375	3782	4274	4839

CUMULATIVE TRANSIENT POPULATION
(miles from site)

YEAR	0-1	0-2	0-3	0-4	0-5	0-10
1976	0	0	0	93	678	2870
1980	0	0	0	158	800	3498
1990	0	0	0	180	839	4214
2000	0	0	0	208	894	4676
2010	0	0	0	240	964	5238
2020	0	0	0	278	1046	5885

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 15 of 24)

Overnight Transient-Summer Weekend

0 to 1 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE						
SSE						
S		NO TRANSIENT POPULATION				
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

1 to 2 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE						
SSE						
S		NO TRANSIENT POPULATION				
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

2 to 3 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE						
SSE						
S						
SSW		NO TRANSIENT POPULATION				
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

3 to 4 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	0	0	0	0	0
E	13	70	70	70	70	70
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	161	175	220	274	337	413
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0
TOTAL	174	245	290	344	407	483

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 16 of 24)

Overnight Transient-Summer Weekend

4 to 5 Mile Zone							5 to 10 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	994	1346	1814	2113	2470	2879
NNE	0	0	0	0	0	0	NNE	1574	1832	2417	2788	3228	3737
NE	0	0	0	0	0	0	NE	449	590	896	967	1052	1150
ENE	0	0	0	0	0	0	ENE	52	73	90	109	133	160
E	275	275	275	275	275	275	E	48	52	51	57	69	82
ESE	0	0	0	0	0	0	ESE	191	192	192	194	198	203
SE	0	0	0	0	0	0	SE	450	450	450	450	450	450
SSE	306	373	409	459	524	601	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	70	70	70	70	70	70	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0	NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0	NNW	0	0	0	0	0	0
TOTAL	651	718	754	804	869	946	TOTAL	3758	4535	5910	6678	7600	8661

CUMULATIVE TRANSIENT POPULATION
(miles from site)

YEAR	0-1	0-2	0-3	0-4	0-5	0-10
1976	0	0	0	174	825	4583
1980	0	0	0	245	963	5498
1990	0	0	0	290	1044	6954
2000	0	0	0	344	1148	7826
2010	0	0	0	407	1276	8876
2020	0	0	0	483	1429	10,090

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 17 of 24)

Overnight Transient-Summer Holiday Weekend

0 to 1 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E		NO TRANSIENT POPULATION				
ESE						
SE						
SSE						
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

1 to 2 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E		NO TRANSIENT POPULATION				
ESE						
SE						
SSE						
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

2 to 3 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E		NO TRANSIENT POPULATION				
ESE						
SE						
SSE						
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

3 to 4 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	0	0	0	0	0
E	13	70	70	70	70	70
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	161	175	220	274	337	413
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0
TOTAL	174	245	290	344	407	483

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 18 of 24)

Overnight Transient-Summer Holiday Weekend

4 to 5 Mile Zone							5 to 10 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	1457	1992	2695	3133	3652	4252
NNE	0	0	0	0	0	0	NNE	2096	2784	3670	4227	4886	5647
NE	0	0	0	0	0	0	NE	655	856	1316	1411	1524	1654
ENE	0	0	0	0	0	0	ENE	80	112	138	168	204	246
E	400	400	400	400	400	400	E	72	77	77	85	103	123
ESE	0	0	0	0	0	0	ESE	200	202	201	204	209	215
SE	0	0	0	0	0	0	SE	556	556	556	556	556	556
SSE	676	679	790	931	1105	1312	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	100	100	100	100	100	100	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0	NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0	NNW	0	0	0	0	0	0
TOTAL	1176	1179	1290	1431	1605	1812	TOTAL	5116	6579	8653	9784	11134	12693

CUMULATIVE TRANSIENT POPULATION
(miles from site)

YEAR	0-1	0-2	0-3	0-4	0-5	0-10
1976	0	0	0	174	1350	6466
1980	0	0	0	245	1424	8003
1990	0	0	0	290	1580	10,233
2000	0	0	0	344	1775	11,559
2010	0	0	0	407	2012	13,146
2020	0	0	0	483	2295	14,988

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 19 of 24)

Overnight Transient-Winter Weekday

0 to 1 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE						
SSE		NO TRANSIENT POPULATION				
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

1 to 2 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE						
SSE		NO TRANSIENT POPULATION				
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

2 to 3 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE						
SSE		NO TRANSIENT POPULATION				
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

3 to 4 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	0	0	0	0	0
E	13	70	70	70	70	70
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0
TOTAL	13	70	70	70	70	70

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 20 of 24)

Overnight Transient-Winter Weekday

4 to 5 Mile Zone							5 to 10 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	9	9	0	9	0	0	N	200	280	357	431	517	617
NNE	0	0	0	0	0	0	NNE	206	288	369	443	530	631
NE	0	0	0	0	0	0	NE	48	65	92	104	119	136
ENE	0	0	0	0	0	0	ENE	10	14	17	21	26	31
E	0	0	0	0	0	0	E	10	11	11	12	14	17
ESE	0	0	0	0	0	0	ESE	3	3	3	4	4	5
SE	0	0	0	0	0	0	SE	0	0	0	0	0	0
SSE	0	28	28	31	38	45	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0	NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0	NNW	0	0	0	0	0	0
TOTAL	0	28	28	31	38	45	TOTAL	477	661	849	1015	1210	1437

CUMULATIVE TRANSIENT POPULATION
(miles from site)

YEAR	0-1	0-2	0-3	0-4	0-5	0-10
1976	0	0	0	13	13	490
1980	0	0	0	70	98	759
1990	0	0	0	70	98	947
2000	0	0	0	70	101	1116
2010	0	0	0	70	108	1318
2020	0	0	0	70	115	1552

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 21 of 24)

Overnight Transient-Winter Weekend

0 to 1 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE						
SSE		NO TRANSIENT POPULATION				
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

1 to 2 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE						
SSE		NO TRANSIENT POPULATION				
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

2 to 3 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE						
SSE						
S						
SSW		NO TRANSIENT POPULATION				
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

3 to 4 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	0	0	0	0	0
E	13	70	70	70	70	70
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0
TOTAL	13	70	70	70	70	70

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 22 of 24)

Overnight Transient-Winter Weekend

	4 to 5 Mile Zone						5 to 10 Mile Zone					
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	266	369	475	569	682	812
NNE	0	0	0	0	0	0	NNE	363	467	575	667	776	902
ENE	0	0	0	0	0	0	ENE	12	17	21	25	31	37
E	100	100	100	100	100	100	E	12	13	13	14	17	21
ESE	25	25	25	25	25	25	ESE	179	179	179	180	181	182
SE	0	0	0	0	0	0	SE	235	235	235	235	235	235
SSE	240	285	303	330	366	406	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	70	70	70	70	70	70	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0	NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0	NNW	0	0	0	0	0	0
TOTAL	435	480	498	525	561	601	TOTAL	1150	1392	1655	1870	2129	2426

CUMULATIVE TRANSIENT POPULATION
(miles from site)

YEAR	0-1	0-2	0-3	0-4	0-5	0-10
1976	0	0	0	13	448	1598
1980	0	0	0	70	550	1942
1990	0	0	0	70	568	2223
2000	0	0	0	70	595	2465
2010	0	0	0	70	631	2760
2020	0	0	0	70	671	3097

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 23 of 24)

Overnight Transient-Winter Holiday Weekend

0 to 1 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE		NO TRANSIENT POPULATION				
SSE						
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

1 to 2 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE		NO TRANSIENT POPULATION				
SSE						
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

2 to 3 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N						
NNE						
NE						
ENE						
E						
ESE						
SE						
SSE		NO TRANSIENT POPULATION				
S						
SSW						
SW						
WSW						
W						
WNW						
NW						
NNW						
TOTAL						

3 to 4 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0
NNE	0	0	0	0	0	0
NE	0	0	0	0	0	0
ENE	0	0	0	0	0	0
E	13	70	70	70	70	70
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	161	175	220	273	337	413
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0
TOTAL	174	245	290	343	407	483

TABLE 2.1-8
TRANSIENT POPULATION PROJECTIONS

(Sheet 24 of 24)

Overnight Transient-Winter Holiday Weekend

4 to 5 Mile Zone							5 to 10 Mile Zone						
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	0	0	0	0	0	0	N	546	781	1002	1202	1440	1715
NNE	0	0	0	0	0	0	NNE	788	1062	1337	1583	1875	2213
NE	0	0	0	0	0	0	NE	160	216	304	345	394	450
ENE	0	0	0	0	0	0	ENE	36	50	62	75	92	111
E	100	100	100	100	100	100	E	32	34	34	38	46	55
ESE	75	75	75	75	75	75	ESE	188	189	189	190	192	194
SE	0	0	0	0	0	0	SE	235	235	235	235	235	235
SSE	571	657	768	909	1078	1280	SSE	0	0	0	0	0	0
S	0	0	0	0	0	0	S	0	0	0	0	0	0
SSW	0	0	0	0	0	0	SSW	0	0	0	0	0	0
SW	70	70	70	70	70	70	SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0	WSW	0	0	0	0	0	0
W	0	0	0	0	0	0	W	0	0	0	0	0	0
WNW	0	0	0	0	0	0	WNW	0	0	0	0	0	0
NW	0	0	0	0	0	0	NW	0	0	0	0	0	0
NNW	0	0	0	0	0	0	NNW	0	0	0	0	0	0
TOTAL	816	902	1013	1154	1323	1525	TOTAL	1985	2567	3163	3668	4274	4973

CUMULATIVE TRANSIENT POPULATION
(miles from site)

YEAR	0-1	0-2	0-3	0-4	0-5	0-10
1976	0	0	0	174	990	2975
1980	0	0	0	245	1147	3714
1990	0	0	0	290	1303	4466
2000	0	0	0	343	1497	5165
2010	0	0	0	407	1730	6004
2020	0	0	0	483	2008	6981

TABLE 2.1-9
MAXIMUM PERMANENT AND TRANSIENT POPULATION DISTRIBUTION BY SECTOR-AREA

(Sheet 1 of 2)

0 to 1 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	9	35	35	35	35
NNE	0	25	93	93	93	93
NE	0	4	14	14	14	14
ENE	0	4	15	15	15	15
E	0	0	0	0	0	0
ESE	0	0	0	0	0	0
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	0	0	0	0	0	0
SW	0	0	0	0	0	0
WSW	0	0	0	0	0	0
W	0	0	0	0	0	0
WNW	0	0	0	0	0	0
NW	0	1	4	4	4	4
NNW	0	3	13	13	13	13
TOTAL	0	46	174	174	174	174

1 to 2 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	0	133	495	495	495	495
NNE	0	80	302	302	302	302
NE	0	274	1022	1022	1022	1022
ENE	0	49	179	179	179	179
E	0	0	0	0	0	0
ESE	3	4	4	4	5	5
SE	0	0	0	0	0	0
SSE	0	0	0	0	0	0
S	0	0	0	0	0	0
SSW	3	4	4	4	5	5
SW	45	47	47	53	64	77
WSW	12	13	13	14	17	21
W	9	10	12	14	16	21
WNW	3	3	3	3	3	3
NW	0	6	24	24	24	24
NNW	0	44	164	164	164	164
TOTAL	75	667	2269	2278	2296	2318

2 to 3 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	6	9	11	13	16	20
NNE	9	13	17	20	24	29
NE	42	66	106	124	144	165
ENE	9	14	26	27	30	32
E	0	0	0	0	0	0
ESE	9	10	10	11	13	15
SE	6	6	6	7	8	10
SSE	3	4	4	4	5	6
S	14	14	14	16	19	23
SSW	0	0	0	0	0	0
SW	12	12	13	14	17	21
WSW	3	4	4	4	5	6
W	12	19	23	28	35	42
WNW	6	9	11	13	16	20
NW	0	3	10	10	10	10
NNW	6	54	182	184	186	189
TOTAL	137	237	437	475	528	588

3 to 4 Mile Zone

Sector	1976	1980	1990	2000	2010	2020
N	23	33	41	50	61	74
NNE	40	57	71	87	106	127
NE	20	29	36	44	53	64
ENE	29	37	43	51	62	75
E	26	28	28	31	38	45
ESE	62	67	66	74	87	106
SE	26	28	28	31	38	45
SSE	12	13	13	14	17	21
S	3	4	4	4	5	6
SSW	978	1069	1339	1669	2057	2521
SW	9	10	10	11	14	16
WSW	6	7	9	10	12	15
W	20	29	36	44	53	64
WNW	23	31	39	47	57	69
NW	0	2	9	9	9	9
NNW	0	2	9	9	9	9
TOTAL	1277	1446	1781	2185	2678	3266

TABLE 2.1-9
MAXIMUM PERMANENT AND TRANSIENT POPULATION DISTRIBUTION BY SECTOR-AREA

(Sheet 2 of 2)

	4 to 5 Mile Zone							5 to 10 Mile Zone					
Sector	1976	1980	1990	2000	2010	2020	Sector	1976	1980	1990	2000	2010	2020
N	37	53	66	81	98	118	N	6966	9742	12,463	14,988	18,005	21,449
NNE	17	24	30	37	45	54	NNE	1815	2460	3,441	3,911	4,470	5,114
NE	104	144	181	221	268	324	NE	999	1311	1,996	2,155	2,344	2,562
ENE	20	29	36	44	53	64	ENE	144	201	249	302	368	443
E	26	28	28	31	38	45	E	189	203	202	223	270	324
ESE	84	90	90	100	120	145	ESE	549	591	589	653	790	948
SE	76	82	82	91	110	131	SE	115	124	123	136	165	198
SSE	3484	3772	3922	4452	5409	6525	SSE	726	781	780	863	1,043	1,252
S	185	199	198	219	265	319	S	98	106	105	117	141	169
SSW	51	55	55	61	74	88	SSW	180	194	193	214	259	311
SW	45	48	48	53	65	77	SW	87	94	94	104	125	150
WSW	3	4	4	4	5	6	WSW	115	144	165	194	235	283
W	14	20	25	30	37	44	W	79	112	140	171	208	251
WNW	31	44	55	67	82	98	WNW	196	275	344	420	510	614
NW	0	0	0	0	0	0	NW	348	491	613	749	910	1,095
NNW	20	29	36	44	53	64	NNW	362	510	638	779	946	1,140
TOTAL	4197	4621	4856	5535	6722	8102	TOTAL	12,968	17,339	22,135	25,979	30,789	36,303

CUMULATIVE POPULATIONS
(Miles from Site)

Year	0-1	0-2	0-3	0-4	0-5	0-10
1976	0	75	212	1489	5,686	18,654
1980	46	713	950	2396	7,017	24,356
1990	174	2443	2880	4661	9,517	31,652
2000	174	2452	2927	5112	10,647	36,626
2010	174	2470	2998	5676	12,398	43,187
2020	174	2492	3080	6346	14,448	50,751

2.2 NEARBY INDUSTRIAL, TRANSPORTATION AND MILITARY FACILITIES

2.2.1 LOCATIONS AND ROUTES

Investigation has been undertaken to locate all significant manufacturing plants; chemical plants; refineries; storage facilities; mining and quarrying operations; military bases; missile sites; transportation routes (air, land, and water); transportation facilities; oil and gas pipelines, drilling operations and wells; and underground gas storage facilities. The search included military firing ranges, and nearby airplane high and low-level flights and landing patterns (commercial, general aviation and military).

The CPNPP vicinity is essentially devoid of most of these features. Within the 10-mile area, there are no military bases, missile sites, military firing ranges, munitions facilities, airport approaches, chemical plants, and storage facilities, tank farms or upstream sources of corrosive or oil discharges. The nearest military bases are Carswell Air Force Base, approximately 38 miles north-northeast, and Fort Hood, approximately 65 miles south. There are no missile sites within 50 miles. The nearest manufacturing facility is a textile plant in Granbury, 10 miles north.

Principal transportation routes extending to within 10 miles of the Station site consist of two U. S. highways and one state highway, one railroad, eleven air routes (refueling tracks and Victor lanes), three gas transmission pipelines, and one crude oil transmission pipeline. Air routes out to more than 20 miles are shown on Figure 2.2-1; other transportation routes can be seen in Figure 2.1-5.

No heavily traveled highways pass close to the site. All nearby roads have one or two lanes and have relatively light traffic (Figure 2.1-5). The nearest highway is State Highway 144, 2.5 miles northeast. The closest approach to U. S. Highway 67 is approximately 4.5 miles south-southwest, and the nearest approach to U. S. Highway 377 is nine miles north-northeast. The Atchinson, Topeka and Santa Fe Railroad nearest approach is about 9.5 miles to the northwest.

2.2.2 DESCRIPTIONS

2.2.2.1 Description of Facilities

The only industrial, transportation, or military facilities within five miles of the site are the transportation corridors shown on Figures 2.1-5 and 2.2-1. Furthermore, there are no industrial, transportation or military facilities at greater distances which are significant to CPNPP from a safety standpoint.

2.2.2.2 Description of Products and Materials

The only hazardous materials (excluding local gas stations and materials not directly related to CPNPP) regularly manufactured, stored, used, or transported in the site vicinity are crude oil and natural gas transported through the pipelines described in Section 2.2.2.3.

2.2.2.3 Pipelines And Wells

The four pipelines traversing the site vicinity are described in Tables 2.2-1 and 2.2-2; their locations are shown in Figure 2.5.1-17. Two of the pipelines (the West Texas Gulf crude oil line

and the Lone Star Gas Company line) were relocated around Squaw Creek Reservoir to avoid the immediate Station and reservoir areas. The relocated routes are shown on Figure 2.1-2b.

Figure 2.5.1-17 also shows the location of gas and oil wells within five miles of CPNPP.

2.2.2.4 Waterways

Squaw Creek Reservoir (SCR) is a 3,272 acre cooling reservoir located on Squaw Creek (see Section 2.4), which is not used for navigation. A Safe Shutdown Impoundment (SSI) on the Panther branch of SCR impounds water for the Station Service Water System as described in Sections 2.4 and 9.2.5.

2.2.2.5 Aircraft

2.2.2.5.1 Airports

There are no airports within five miles of the Station. Furthermore, there are no airports with greater than 500 d^2 (“d” is the distance in miles from the Station) movements per year within 10 miles, nor are there any airports with projected operations in excess of 1000 d^2 movements per year within 50 miles.

The nearest landing field (Bar L Ranch) is a sod strip located six miles west-southwest of the site. There are several other sod strips within 20 miles of the site, but the only paved strips are Nassau Bay (private), Pecan Plantation (private), and the Granbury Municipal Airport. The Granbury Municipal Airport (11 miles north-northwest) has a lighted 2,000-foot paved runway, but there are no regularly scheduled commercial flights.

2.2.2.5.2 Air Routes

Eleven air routes pass within 10 miles of the site. Three of these routes are military refueling tracks (flight levels: 24,000 to 31,000 feet) having 10 nautical-mile wide paths (Figure 2.2-1). The outer limits of all three refueling tracks miss the Station site; their nearest approach to the site is the north edge of AR-102B (East), located 1.7 miles south. The north edge of AR-102B (West) is the next closest refueling track, 2.5 miles south. The closest approach of the south limit of AR-102 A (East) is 8.5 miles north of the Station.

The other air routes are Victor lanes which (Figure 2.2-1) are cleared for general, commercial and military aviation. Victor 163W and Victor 163 air lanes are the only routes which pass within 2 miles of the Station location.

The probability of an aircraft crashing into the plant (PFA) is estimated in the following manner:

$$PFA = C * N * X * (A/B)$$

where:

C = inflight crash rate (crashes per mile),

N = number of flights per year in the air sector,

X	=	flight distance in passing possible collision area,
A	=	effective area of plant, and
B	=	possible collision area

For CPNPP:

C	=	1.14 x 10-9 crash/mile,
N	=	130,104 flights/year,
X	=	12.63 miles
A	=	0.02 square miles,
B	=	314.16 square miles.

Therefore, P_{FA} = 1.91 x 10^{-7}. This probability is sufficiently low that an aircraft crash into the plant is not considered a design basis.

2.2.2.6 Projections of Industrial Growth

Industrial growth includes the Station and related pipelines, transmission lines, railroad spur, and access roads. With the exception of natural gas exploration, no industrial growth can reasonably be expected to occur in the site vicinity.

2.2.3 EVALUATION OF POTENTIAL ACCIDENTS

The nearby industrial, transportation, and military facilities described above were evaluated for their potential effects on the station in order to identify potential accidents to be considered as design basis events. In addition, the onsite storage of chlorine was evaluated for its effect on control room habitability as described in Section 6.4.

2.2.3.1 Determination of Design Basis Events

Events which potentially qualify as design basis events were categorized by the physical effects which accompany the accident.

2.2.3.1.1 Explosions

There are no offsite sources of explosive materials in the vicinity and transportation routes do not approach CPNPP within the distance prescribed by Reg. Guide 1.91 [8].

[redacted]

An explosion, therefore, is not considered a design basis event.

2.2.3.1.2 Flammable Vapor Clouds

The three natural gas pipelines in the site vicinity could be a source of flammable vapor clouds and were evaluated for their potential effects on the plant.

The gas wells in the site vicinity, described in Section 2.5.1, could also be a source of flammable vapor clouds and were evaluated for their potential effects on the plant. Since exploration in the area is still active, a hypothetical gas well was postulated using data available from the Texas Railroad Commission. A discussion of this hypothetical well is provided in Section 2.5.1.

2.2.3.1.3 Toxic Chemicals

Toxic chemicals which are stored and used onsite at CPNPP are evaluated in accordance with the criteria and guidance of Regulatory Guide 1.78 and NUREG 0570.

2.2.3.1.4 Fires

The only non-plant-related source of fire in the vicinity of CPNPP is the crude oil pipeline. The rupture of this pipeline was evaluated for its potential effect on the plant.

2.2.3.1.5 Collision with Intake Structure

The Service Water Intake Structure is located on the Safe Shutdown Impoundment (see Figure 1.2-1), which is not open to public transportation. Therefore, a significant collision with this structure is not considered a credible event.

2.2.3.1.6 Liquid Spills

The only source of liquid spills in the vicinity of CPNPP is the crude oil pipeline which was evaluated for its potential effect on the plant.

2.2.3.2 Effects of Design Basis Events

The design basis events identified above are:

1. Gas Pipeline and Gas Well Accidents

2. Accidental Release of Toxic Chemicals

3. Crude Oil Pipeline Rupture

Each of these is evaluated below.

2.2.3.2.1 Gas Pipeline and Gas Well Accidents

Potential accidents involving the release of natural gas from existing pipelines and postulated wells described in Section 2.2.2 do not pose a hazard to the plant. As shown below, in the event of an accident the concentration of gas at all plant air intakes is well below the lower flammability

limit. Also detonation of an unconfined natural gas-air mixture is not considered to be a credible event [1,2,3,4].

Each of the existing pipelines and a potential gas well were analyzed to determine the most limiting potential accident condition; the results of this analysis indicated that the most limiting release of natural gas would involve a break in the 36-inch Lo-Vaca natural gas pipeline. The analysis of this accident was performed using the following conservative assumptions:

1. [redacted]

2. Gas is released by a constant enthalpy process yielding a gas temperature for dispersion calculations of 40ºF (for a 60ºF initial gas temperature) due to the Joule-Thompson effect.

3. The flowrates out of the break is the maximum steady flow for single-ended break (572 m^3/sec) and a double-ended break (1144 m^3/sec).

4. Atmospheric dispersion factors were based on the 5-percentile meteorological conditions from onsite data analyses with a virtual source distance correction to account for initial finite source size.

5. A conservatively low wind speed of 1.0 m/sec was used.

6. Plume rise is in accordance with Briggs equation for stable (classes F and G) atmospheric conditions [5] and an air temperature of 100ºF.

A perfect gas prior to its escape from the broken pipe will expand and accelerate toward the break. As the gas expands, it will tend to cool down from its original equilibrium temperature. In doing so, a temperature gradient between the pipe and the flowing gas will be established. In addition, friction between the pipe wall and the flowing gas will tend to heat the gas slightly above the temperature it would possess in a frictionless expansion. In the first instance, small amounts of heat will flow from the pipe wall into the expanding gas and in the other, energy already possessed by the gas is simply transformed into heat and causes the gas temperature to rise slightly more. Thus, the gas gains a small amount of energy from the pipe wall during this process.

In the second part of the blowdown process, the gas expands through the break at sonic velocity and, if still above atmospheric pressure, continues to expand until it reaches atmospheric pressure. During this phase, the process is essentially adiabatic. No work is performed either during the expansion or the slowing down period. Consequently, the net energy possessed by the gas just prior to reaching the break, and after it slows down in the atmosphere, remains unchanged.

Since (1) no work has been performed by the escaping natural gas, (2) small quantities of heat have been transferred from the pipe to the gas, and (3) a transformation of energy has occurred by virtue of the fact that the gas is at a substantially lower pressure at the end of the blowdown, the energy gain from (2) above and the energy transformation indicated in (1) above must be present in the form of heat. Therefore, the slowed down natural gas in the atmosphere would be at a slightly higher temperature than the original temperature. The blowdown is therefore, in

essence, a throttling or isenthalpic process. Since natural gas is a real gas, not a perfect gas, the Joule-Thompson effect will cause the natural gas to be about 20ºF below that expected for a perfect gas after blowdown.

The above description of the process indicates that there is a tendency for a perfect gas after the blowdown and mixing phase to be at a slightly higher temperature than the original temperature. However, with real gases, this temperature increase is lessened or, perhaps, reversed slightly. Therefore, extra conservatism is introduced into the plume rise analysis by assuming that the natural gas does not mix thermally with air and is cooled isenthalpically 20ºF below the temperature it possessed prior to the break.

The flowrate was found using the American Gas Association gas pipeline formula [6] using an initial upstream pressure of 1050 psig, a final (downstream or break) pressure of 14.7 psia, and pipe length of 70 miles. This length is the distance from the break to both the upstream and downstream compressors.

Dispersion of potentially explosive gas vapors resulting from a gas pipeline rupture is governed by meteorological conditions existing in the locality at the time. This analysis used design basis accident meteorological assumptions determined for a radioactive release in the analysis of a flammable and/or explosive structure. The design basis accident assumption doses were calculated using conditions which conservatively calculate radioactive cloud concentrations, i.e., those conditions which minimize diffusion of the cloud. The conditions assume five percentile dispersion factors as an analysis basis conservatism. The Dispersion calculations also conservatively assumed that there was no momentum flux in the plume rise calculation. In reality, because the pipe is below grade, the gas would be expected to have a significant vertical velocity component. This would tend to carry the plume higher than calculated. Atmospheric dispersion factors and the model used for virtual source correction are discussed as part of the description of the gas well blowout hazard analysis at the end of this section (2.2.3.2.1).

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Though a sustained gas fire may occur at or near the gas well head, a gas well fire at the closest point where mineral exploration may be permitted has negligible heat effects on the nearest safety-related structure, and no effect on safety-related structures due to the release and delayed ignition of non-buoyant natural gas components such as ethane and propane. Conservatively estimating all the heat from a gas well blow out to be radiated isotropically, the resultant sustained incident energy on the surface of a sphere 2250 feet away gives a heat flux loading of about ten percent of the maximum solar insolation at the site. The heated air would rise clear of the plant at low wind speeds, while a strong wind is needed to keep the buoyant heated plume near the surface. These conditions imply ventilation and mixing sufficient to keep any temperature rise at the plant to a non-significant level.

Each Control Room fresh air intake is equipped with a smoke detector that will annunciate in the Control Room in the advent of elevated smoke levels. Their operation is discussed in Section 6.4.2.4 and 9.4.1.3. Thus, smoke effects from mineral explosion fires are responded to adequately in a manner similar to smoke from plant fires.

[redacted]

The atmosphere dispersion model used for the gas well blowout hazard analysis was the Gaussian plume model for centerline concentrations with ground level releases and the Pasquill-Gifford dispersion parameters for an assumed non-buoyant release. Atmosphere dispersion factors for an instantaneous release with a finite initial volume were calculated in accordance with Reg. Guide 1.78 [13]. Wind speed was selected to maximize the instantaneous concentration within the Control Room. Additional credit due to building wake effects was not included in the model. Also, the difference in height of the release point and Control Room inlet is not large enough to allow credit for an elevated release. Atmospheric dispersion factors for a continuous release are based on a 5-percentile meteorological conditions (such as Pasquill F at 1.0 meters/second) at the site. To establish these conditions, the 5-percentile x/Q's for each time period were first determined from the results of onsite dispersion modeling. See Section 2.3.4. Because approximately 30 percent of hourly observations at the plant site are in the Pasquill F

and G stability classes, a Pasquill F stability was assumed, and the wind speed was defined at the 5 percentile probability level of relative concentration. Having defined the 5-percentile wind speed and Pasquill Class for the three time periods of interest, x/Q values were then calculated at selected distances using these meteorological conditions. The parameters used were:

- Distance from plant to well: 2250 ft.
- Maximum postulated gas well blowout flow rate: 52.4 x 10^6 ft^3 day^{-1} (17.2 m^3 sec^{-1})
- Lower well gas flammability limit concentration: 4%
- Virtual source correction: 278 ft.

The assumption is that the concentration of the released gas at the break is limited to unity. To satisfy this requirement, the source is taken to be a virtual point located a distance away from the actual release point. From a table of the 5-percentile x/Q's for the plant, this value is found to occur at a distance of 278 ft. This then is effectively added to the plant-well separation distance as the virtual source correction term.

The flammable limit was calculated on a mole-fraction-weighted bases of all the components assuming they are mixed in the turbulent stream emitted from the well. The well gas composition used was:

Nitrogen	2.36 mole %
CO_2	0.55 mole %
Methane	73.97 mole %
Ethane	13.58 mole %
Propane	6.95 mole %
Iso-butane	0.88 mole %
N-butane	0.83 mole %
Iso-pentane	0.35 mole %
N-pentane	0.22 mole %
Hexanes plus	0.33 mole %

2.2.3.2.2 Accidental Release of Toxic Chemicals

A study has been performed to evaluate the potential for chlorine releases from offsite chlorine storage and transportation affecting control room habitability. This study revealed no chlorine storage locations or frequent chlorine transportation within a 5 mile radius of CPNPP in quantities that are large enough to require evaluation under the criteria of Regulatory Guide 1.78. Therefore, potential accidents involving the release of chlorine from offsite storage locations and transportation routes do not pose a significant hazard to control room habitability.

The circulating cooling water and service water systems will be chemically treated for control of biological growth with solutions of sodium hypochlorite and sodium bromide. The diluted sodium hypochlorite and sodium bromide solutions will not present a threat to control room habitability. No liquified chlorine will be stored within the site boundary in containers exceeding 150 lbs capacity. The only liquified chlorine that will be stored within the protected area will be in small quantities of 20 lbs or less to be used for laboratory purposes.

Other toxic chemicals which are stored and used onsite at CPNPP are evaluated for potential impact of their release upon control room habitability in accordance with the criteria and guidance of Regulatory Guide 1.78 and NUREG 0570. Toxic chemicals which are determined to be hazardous to control room habitability are controlled and detection instrumentation is provided, as appropriate.

2.2.3.2.3 Oil Pipeline Accidents

[redacted]

[redacted]

Gulf indicates that from experience the lower limit on immediate detection and isolation is 400 Bbl/hr.[10] Smaller leaks could be detected over a period of time and would result in the initiation of an immediate search for the leak. CPNPP personnel will monitor for oil accumulation in the three retaining ponds located between the pipeline and the westside of the SSI once per day ensuring that leaks smaller than 400 Bbl/hr do not go undetected for more than 32 hours.

[redacted]

[redacted]

[redacted]

Maximum Rate Case

[redacted]

Maximum Quantity Case

[redacted]

[redacted]

In order to prevent the spilled oil from reaching the SSI, three retaining ponds will be built between the pipeline and the SSI. These ponds will be designed to hold the maximum quantity of oil given above or 14,770 Barrels. Rain water accumulation in these ponds will be drained through an inverted weir to ensure capacity is available for the maximum oil spill quantity. These retaining ponds eliminate any potential hazards resulting directly or indirectly from the crude oil spilling onto the SSI surface.

With the crude oil being kept from the SSI by the retaining ponds, the only remaining potential impact on the plant would be from drifting vapor clouds. Potential toxic and flammable vapor effects have been considered as discussed below.

The crude oil carried in the pipe may contain hydrogen sulfide (H_2S) which is toxic gas. The pipeline operator has indicated that the maximum H_2S concentration is 80 ppm in air measured 2 3/4" above a crude oil sample at 60ºF [9,11]. Further information from Gulf indicated the best available measurement of H_2S concentration in the crude is 250 ppm obtained by mass spectrographic techniques, while 400 ppm is obtained by other techniques.[11]

A conservative calculation of H_2S concentration in the CPNPP control room was made assuming:

1. All H_2S was released instantaneously from a leak of 13,500 Bbl/hr of crude oil containing 400 ppm H_2S.

2. This formed a continuous source of H_2S which is blown toward the plant with worst 5 percentile site atmospheric dispersion.

3. The control room air intake sees the resulting plume centerline concentration (94mg/m^3) for 10 minutes (note that the pipeline leak flow only occurs for 2.5 minutes.)

4. Normal control room ventilation of 3000 CFM continues for the entire 10 minutes.

The resulting maximum concentration in the control room is 8.5 mg/m^3. This is less than the time weighted average threshold limit value of 15 mg/m^3 recommended by the American Conference of Governmental Industrial Hygienists.[12] The control room concentration and the outside air concentration are far below the R.G. 1.78[13] toxic limit of 750 mg/m^3.

Considering the conservative calculations and the adequate odor detection threshold of H_2S the oil pipeline is not a credible potential gas hazard.

Gulf Oil indicates that the crude oil in the pipeline may contain significant fractions of light hydrocarbons. The maximum light fraction concentrations are as follows:[14]

Methane	0.60%
Ethane	0.14%
Propane	0.92%
Butane	3.74%
Pentane	44.6%

As indicated above, the maximum oil spill quantity occurs for the 400 Bbl/hr spill rate. At this rate even if all the light fractions were vaporized instantaneously the maximum concentration at the nearest plant safety related structure would be 0.24% which is 15% of the mixture lower flammable limit of 1.6%. This result is for worst 5 percentile site meteorology and a distance of 2400 feet from the nearest retaining pond to the Service Water Intake Structure. This effectively assumes the spilled oil gets all the way to the retaining pond without losing any vapor, but when it does reach the pond all the volatile fraction is released immediately. This maximizes the vapor release rate and minimizes the source to plant distance.

For the maximum spill rate case two situations have been analyzed. The first is for vaporization from the oil accumulated in the retaining pond (conservatively assuming water in the pond). The second situation is for vaporization from the oil spill on land between the pipe and the retaining pond.

The rate of vaporization from the oil spill was determined from a heat balance equating the heat lost by evaporation to the heat gain from either the water or the soil plus heat from solar radiation.

The evaporation rate was determined from the mass transfer relationships of Bird, Stewart and Lightfoot.[15] The mass transfer coefficient was obtained from the heat/mass transfer analogy using forced convection flat plate correlations of Krieth.[16] The vapor phase composition was determined from the crude oil composition given above using two phase equilibrium ratios from Reference [17].

Heat transfer from water was determined assuming simple convection from the water at a maximum natural water temperature of 97ºF using a overall film coefficient of 100 Btu/hr ft^2 ºF. For a spill on land transient heat conduction from soil was considered utilizing a procedure which accounted for soil temperature variation with depth from a 135ºF initial surface temperature and

an initial oil temperature of 74ºF. Solar heat flux of 365 Btu/hr ft^2 was used. These temperatures are for worst case daytime summer conditions. Temperatures at other times would be much less.

The results of the analysis indicate that on water the oil reaches a maximum temperature of 86ºF with a maximum specific evaporation rate of 9.6 lb/hr ft^2. On land the oil reaches a maximum temperature of 77ºF with a corresponding specific evaporation rate of 6.8 lb/hr ft^2. These values are based on the initial oil composition and do not reflect the reduction in evaporation rate which occurs as the more volatile fractions are evaporated. Also the maximum conditions on land last for only a very short time due to the continued cooling of the soil.

[redacted]

Pond Area (ft^2)		Distance from SSWS INTAKE (ft)	Concentration as fraction of LFL
1	[redacted]	[redacted]	[redacted]
2	[redacted]	[redacted]	[redacted]
3	[redacted]	[redacted]	[redacted]

[redacted]

From the above discussion it is concluded that vapors released from oil spilled as a result of failure of the Gulf Oil pipeline do not result in a credible potential hazard to CPNPP. This conclusion and the ability of the retaining ponds to prevent crude oil liquid from reaching the SSI indicate that the Gulf Oil crude oil pipeline does not present a credible hazard to the CPNPP.

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TABLE 2.2-1
NATURAL GAS PIPELINE INFORMATION

[redacted]

TABLE 2.2-2

[redacted]

2.3 METEOROLOGY

2.3.1 REGIONAL METEOROLOGY

2.3.1.1 General Climate

The regional climatology of the site is described for the area bounded by 30 North, 100 West, 34 North, 96 West, shown in Figure 2.3-1. The Comanche Peak site is located approximately equidistant between Cleburne and Stephenville, Texas, west of the Brazos River. The site elevation is approximately 810 feet mean sea level (MSL). Over the region depicted in Figure 2.3-1, the terrain slopes gradually from 300 to 700 feet MSL in the southeast to 1,200 to 1,800 feet MSL in the northwest.

The climate of the region is continental and is characterized by rapid changes in temperature, marked extremes, and large daily and annual temperature ranges. The mean annual temperature decreases from southeast to northwest because of elevation and latitude changes. The general climate of the region is modified frequently by advancing warm moist air from the Gulf of Mexico, resulting in high humidities and cloudiness. Rainfall generally decreases from east to west and is heaviest in late spring and early summer.

In summer, the Bermuda High exerts a strong influence upon the weather of the region. It furnishes the tropical maritime air from the Gulf of Mexico which almost completely dominates the weather from May to September. This air mass is responsible for almost all of the thunderstorm activity in the region regardless of time of year. Occasionally, in summer, tropical continental air may move into West Texas from the high plateaus to the west. This air mass is characterized by very hot daytime temperatures and almost cloudless skies. Typically, summer has over 100 days with temperatures of 90°F or above and temperatures often exceed 100°F [1, 2, and 3]. Rainfall occurs during brief but sometimes intense showers and thunderstorms.

During the winter and early spring, outbreaks of polar continental air are the most common frontal activity. Although these fronts frequently have little weather associated with them, they often stall in Central and South Texas. Low ceiling and poor visibility may persist for three to four days or even longer over large areas [3]. On occasion, arctic air masses push through the region and cause some of the coldest temperatures. Cold spells, however, rarely last more than a few days. Normally, temperatures drop to 32°F or below about 30 days each year [1, 2]. Winter is the driest season, but one or two occurrences of snow and one or two occurrences of sleet or freezing rain may be expected in both January and February, the coldest months [3].

Pacific maritime cold fronts are more frequent in spring and fall than in winter or summer. These air masses usually bring clear skies to the region, although the weather along the leading edge of the front may be quite violent. Most of the dust storms of early spring and the violent thunderstorms during April, May, and June are associated with these frontal systems. Warm fronts are generally confined to the late fall and early spring months in this region. They are usually confined to the southern half of the region and move northward very slowly.

Spring is characterized by rapid changes of temperature, i.e., alternating periods of warm and cold conditions. On the average, thunderstorms are more frequent and more violent in the spring than any other season. Spring is normally the wettest season of the year. The fall is characterized by fair weather, low wind speeds, and moderate temperatures. It is the most pleasant season of the year.

Another major influence on the climate of this region is the so-called "dewpoint front," which marks the westward extent of the moist air from the Gulf of Mexico. This trough of low pressure can exist at all times of the year. In summer, it marks the westward extension of the Bermuda High, while in winter it forms behind the migratory high moving across Central Texas following a cold front. The movement of this trough eastward results in a shift to west or southwest winds and dryer weather [3].

Annually, the prevailing surface winds in the region are from the south to southeast while the average wind speed is about 12 miles per hour (mph) [2]. In winter there is a secondary wind direction maximum from the north to northwest due to frequent outbreaks of polar air masses.

Annual average relative humidity is approximately 65 percent in the region while the mean percentage of possible sunshine is about 70 percent [1, 2].

Severe weather in the region is usually associated with heavy thunderstorms (including tornadoes) and tropical cyclones. Property damage occurs from flooding and high winds. Damaging hail also occurs in the site region.

The interplay between synoptic scale phenomena and topography is small in the region of interest. The effect of terrain features on synoptic scale flow can readily be ascertained when a larger area, which takes in the high country of West Texas and Eastern New Mexico, is included; i.e., the principal effect is that the high country forms a natural barrier to the flow of air. Consequently, moist tropical air from the Gulf of Mexico and air from the arctic or polar sources, which flows uninhibited through the site region, is effectively blocked from the areas to the west of the mountains. The net result is wide fluctuations in rainfall, humidities, and annual sunshine over the larger area.

2.3.1.2 Regional Meteorological Conditions for Design and Operating Bases

2.3.1.2.1 General

Meteorological data are presented in this section for severe weather phenomena such as hurricanes, tornadoes, thunderstorms, lightning, hail, high air pollution, and ice storms. Also presented are the meteorological data used for evaluating the performance of the ultimate heat sink and design basis tornado parameters.

2.3.1.2.2 Hurricanes

Tropical cyclones including hurricanes lose strength rapidly as they move inland, and the greatest concern is potential damage from winds or flooding due to excessive rainfall. The tropical cyclone season for Texas extends from June to October; storms are more frequent in August and September, and rarely occur after the first of October. The average frequency of tropical cyclones that affected Texas for the period 1931 to 1960 is approximately two per year; and of these about one in four were of hurricane force, i.e., winds greater than 74 mph [4].

The Probable Maximum Hurricane (PMH) is discussed in Section 2.4. For the Comanche Peak site, the PMH sustained (10-minute average) wind speed at 30 feet above ground is computed to be 81 mph [47].

2.3.1.2.3 Tornadoes

During the period 1955 through 1967, 58 tornadoes (4.46 mean annual frequency) occurred within a one-degree square centered near the Comanche Peak site [5]. It should be noted that statistical data on severe local storms, tornadoes particularly, are highly dependent on human observation. For example, as population density increases, the number of tornado occurrences observed and accurately reported generally increases.

The probability (P) of a tornado hitting a point in a given year is:

$$P = (2.8209 \times t)/A \qquad 2.3\text{-}1$$

where A is the area (in square miles) of a one-degree latitude-longitude square centered at the point, and t is the mean annual frequency [6]. The return period is the reciprocal of P. Table 2.3-1 summarizes the results for the site and nearby areas for the period 1955 through 1967. In the area north of about 31 North latitude, there is a greater frequency of large tornadoes with wide paths and long trajectories.

Based on the 13-year period of record from 1955 - 1967, the mean seasonal and annual number of tornado occurrences for Texas are [5]:

Winter	4.7	Summer	44.8
Spring	71.1	Autumn	23.7
	Annual	143.6	

During the period from 1968-1977 there were approximately 64 recorded tornado occurrences within about 40 miles of the plant site [40], but none of these occurrences were in Somervell County. Estimated characteristics of these tornados, expressed in terms of the Fujita- Pearson (FPP) tornado scale [4], are summarized below:

Scale No.	Maximum Windspeed[a]			Path Length		Path Width	
	F Scale (mph)	Expected Damage	No. of Occurrences	P Scale (miles)	No. of Occurrences	P Scale	No. of Occurrences
0	40-72	Light	12	<1.0[b]	33	<18 yd[b]	23
1	73-112	Moderate	34	1.0-3.1	9	18-55 yd	14
2	113-157	Considerable	14	3.2-9.9	8	56-175 yd	11
3	158-206	Severe	4	10-31	5	176-556 yd	5
4	207-260	Devastating	0	32-91	0	0.3-0.9 mile	0
5	261-318	Incredible	0	100-315	0	1.0-3.1 mile	1
				Unknown	9	Unknown	10

a) Subjective estimate based on observed damage given in the literature.

b) Tornados given in the literature as short and narrow are included in these categories.

For example, a tornado having a wind speed of 200 mph, a path length of 10 miles, and a path width of 100 yds would be expressed on the FPP scale as 3, 3, 2. The above data indicate that most of the tornados in this area have a path length of less than 20 miles, a path width of less than 180 yards, and a maximum wind speed of less than 160 mph.

The design basis tornado parameters used in the design and operation of CPNPP are listed below:

Translational Speed	60 mph
Rotational Speed	300 mph
Maximum Wind Speed (sum of the translational and rotational speed)	360 mph
Maximum Pressure Drop	3.0 psi
Rate of Pressure Drop	1.0 psi/sec

Compliance with Regulatory Guide 1.76 [7] is discussed in Appendix 1A(B). Tornado loadings are discussed in Section 3.3.2.

2.3.1.2.4 Thunderstorms

Thunderstorms, from which damaging local weather can develop (tornadoes, hail, high winds, and flooding), occur about 46 days each year based on Fort Worth data [8]. The maximum frequency of thunderstorms occurs from April to June, while months November through February have few thunderstorms. The monthly and seasonal distributions are displayed in Table 2.3-2.

2.3.1.2.5 Lightning

A typical thunderstorm is believed to produce one to three cloud-to-ground flashes each minute. The number of lightning strikes per square mile has been determined from photographs, records of strikes to power lines, and from electrical lightning counters. The combined results of several studies indicate that the number of flashes to ground per square mile per year is equal to between 0.05 to 0.8 times the number of thunderstorm days per year [9].

Applying these results to the thunderstorm data for Fort Worth in Table 2.3-2, the seasonal and annual estimates of lightning strikes are:

Winter	0.2 - 3.2	Summer	08 - 12.8
Spring	0.9 - 14.4	Autumn	0.4 - 6.4
	Annual	2.3 - 36.0	

Thus, the annual expectancy of lightning strikes for a square mile area in the site vicinity is between 2 and 36.

The expected probability of lightning strikes to the safety-related structures at the site on a seasonal and annual basis are presented in Table 2.3-2A. Included in this Table is the attractive area of each building and building dimensions used in the Table's development. The number of thunderstorm days for each season and annually, presented in Table 2.3-2, as well as the attractive area of each building, geographic latitude of the site and building dimensions were used in the development of Table 2.3-2A [42].

2.3.1.2.6 Hail

Almost all localities in Texas experience damage from hail. While the most commonly reported hailstones are 1/2 to 3/4 inch in diameter, hailstones 3 to 3-1/2 inches in diameter are reported in Texas several times a year.

During the period 1955 through 1967, there were 42 reports of large hail (3/4 inch diameter or larger) occurrences within a one-degree square centered near the Comanche Peak site [5]. This gives a mean annual frequency of 3.2 potentially damaging hailstorms per year for the entire one-degree square. Fortunately, recurrence of damaging hail at a specific location is very infrequent. The annual frequency of hail at Fort Worth is less than 0.05 percent of the hours observed [3].

The monthly and seasonal breakdown of large-hail occurrences (3/4 inch diameter or larger) for the state of Texas is given in Table 2.3-2 [5]. Damaging hailstorms are most frequent during April, May, and June, the period of severe-thunderstorm activity.

2.3.1.2.7 Air Pollution Potential

Conditions in the region generally favor turbulent mixing. Two conditions which reduce mixing, increasing the air pollution potential, are surface inversions and stable air layers aloft.

The surface inversion is generally a short-term effect and surface heating on most days creates a uniform mixing layer by mid-afternoon. On the other hand, if warming caused by subsiding air occurs, the second condition, namely a subsidence inversion, may result. Since both conditions usually occur in conjunction with light winds, the air pollution potential is amplified.

Holzworth [10] has computed mean morning and afternoon mixing depths and corresponding wind speeds for several stations in Texas. There is considerable variation in mixing depths among Texas stations; but the mixing depths all display similar seasonal variation, the depth being greatest during the warm months and shallowest during the cold months.

Since no data were presented by Holzworth for stations within the site region, data for Midland and San Antonio are presented in Table 2.3-3. Isopleths of the total number of forecast-days of high air pollution potential in five years are given in Figure 2.3-2. The data indicate that stable periods with light wind conditions are generally of short duration in the region.

Based on a 30-year period of record (1936-1965), Korshover [11] tabulated the number of times stagnating anticyclones persisted for four or more and seven or more days. Occurrences of stagnation were determined primarily on the basis of a surface pressure-gradient analysis. In the general area of the site, there were only three stagnation cases which persisted for at least four days during the 30-year period; the total number of stagnation days was 14. There were not any stagnation cases which persisted for seven or more days. The three stagnation cases which persisted for at least four days occurred during the fall.

2.3.1.2.8 Precipitation

Maximum rainfall, estimated by statistical analysis of regional precipitation data, is given in Table 2.3-4 for return periods of one to 100 years and for rainfall durations of from one-half hour to one day [12].

Probable maximum precipitation (PMP), sometimes called maximum possible precipitation, for a given area and duration is the depth which can be reached but not exceeded under known meteorological conditions. For the site area, the PMP for 6, 12, 24, and 48 hours is 25.5, 31.3, 34.7, and 39.1 inches, respectively [13]. These values are based on a 64 square-mile area.

The maximum recorded point rainfall for durations of 5 minutes to 24 hours at Abilene, Fort Worth, and Waco, are give in Table 2.3-5 [14].

On the other hand, drought conditions (extended periods of widespread meager precipitation) are known to occur in Texas. The most severe this century in Texas occurred during 1954-1956 (see Section 2.4.11). Fort Worth precipitation records, which illustrate the regional conditions, indicate that the average annual precipitation for this three-year period was 21.1 inches, with only 18.55 inches occurring in 1956 [15]. Although this period represents the worst drought in Texas, there have been three occurrences of annual precipitation less than 18.55 inches during the 81-year period from 1895 - 1975 at Fort Worth [8, 16]. The extreme minimum annual precipitation recorded, 17.91 inches, occurred in 1921.

Extreme snowfalls for representative stations in the area are given in Table 2.3-6 [17, 18].

Ice storms, precipitation in the form of freezing rain and/or sleet, occur occasionally in the region during the period December through March. The annual frequency of freezing rain at Carswell Air Force Base Fort Worth is only 0.3 percent of the hours observed, but the percentages for December, January, February, and March are 0.3, 2.5, 0.5, and 0.1 percent, respectively [3]. Moderate to heavy ice storms can be quite damaging to utility lines and trees as well as being a serious traffic hazard.

The worst ice storm on record in the Fort Worth-Dallas area occurred on January 6-9, 1937 [19]. As much as two inches of ice formed on wire and did not disappear until the 12th. Communications were disrupted and highway traffic was extremely hazardous. The estimated probability of ice thickness ≥ 2 inches occurring somewhere in North Texas, Arkansas, or Oklahoma in any one year is 0.06 [20].

The 100-year return period snow and ice pack for the area in which the plant is located, in terms of snow load on the ground and water equivalent, is listed below [21]:

Snow Load	= 7 lbs/ft^2
Water Equivalent	= 1.3 inches

The maximum 24-hour and seasonal snowfall recorded (1898-1970) in Fort Worth is 12 and 15.3 inches, respectively [18]. If the maximum seasonal snowfall (water equivalent of 1.5 inches) occurred in one storm on the 100-year return period snow and ice pack, the total water equivalent would be only 2.8 inches. In the period from 1970 - 1978, the maximum seasonal snowfall in Fort Worth was 17.6 inches (1977 - 1978 season). Even assuming the maximum winter snowfall occurred in one storm on top of an already present 100-year return period snowpack of 13 inches, the total weight would only be approximately 16 lbs/ft^2. This value is far below the design load on all nuclear safety-related buildings of an eight-inch maximum uniform depth of water (weight of about 42 lbs/ft^2) in addition to the regular live loads (see Section 2.4.1.1).

The 48-hour Probable Maximum Winter Precipitation (PMWP) for a 64 square-mile area is estimated to be 28.8 inches [13]. Because of the southern location of the site, almost all of this PMWP occurs as liquid. The roof drainage utilizes an exterior system, whereby the openings in the parapet walls are actually combined relief and drainage openings. These parapet walls relief openings insure that the eight-inch level is not exceeded during the PMP. They are specifically located at all roof low points and extend from the roof low point elevation to the top of the parapet (approximate height four feet). Their location is shown in Figure 1.2-2, 1.2-3, 1.2-5, 1.2-39 and 2.4-2. The length of an opening is six feet.

The size of these openings and their location preclude:

1. the possibility of ice and snow build-up blocking them and

2. roof ponding.

All design features of the relief and drainage opening are shown in Figure 2.4-42.

2.3.1.2.9 Dust Storms

Blowing dust or sand may occur occasionally in West Texas where strong winds are more frequent and vegetation is sparse. While blowing dust or sand may reduce visibility to less than five miles over an area of thousands of square miles, dust storms that reduce visibility to one mile or less are quite localized and depend on soil type, soil condition, and vegetation in the immediate area. At Fort Worth during the six year period from 1970-1975, only 0.02 percent of the observations had visibilities of one mile or less due to dust [22].

2.3.1.2.10 Ultimate Heat Sink

The performance of the ultimate heat sink is discussed in Section 9.2.5. The meteorological parameters used in the analysis are presented in Tables 2.3-7A, 2.3-7B and 2.3-7C.

Three meteorological records were examined in the analysis. These records are data from the onsite station and data from two offsite stations, Dallas-Fort Worth Regional Airport (DFW) and Waco Madison Cooper Airport. DFW is approximately 59 miles northeast of CPNPP, with a ground elevation of 551 ft. The DFW record available on magnetic tape begins with May 1953. Until the end of 1973, DFW observations were taken at Love Field. Waco is approximately 53 miles southeast, with ground elevation of 501 ft. The Waco record begins with July 1948. At the time of the analysis, data through December 1991 at both stations were available. The data consists of hourly (or three-hourly for the period 1965-1980) air and dew point temperatures, windspeed and direction, cloud cover and atmospheric pressure. In addition to these variables, surface heat exchange computations require solar radiation, which can be determined from cloud cover.

The onsite data set is not as complete as the offsite data. For this reason, no direct use of the onsite meteorological data set was made in the analysis. However, the 1974 onsite data set (Table 2.3-7A), previously identified as resulting in high Safe Shutdown Impoundment (SSI) temperatures for years preceding 1978, is presented here for comparison to the data sets selected from the offsite records for SSI performance analysis (Tables 2.3-7B and 7C). The day with the highest water temperature, as computed from the onsite meteorological record as a response to atmospheric heating or cooling, is July 15, 1974.

The two offsite records were used to compute SSI temperatures under normal operating conditions for comparison to SSI routinely monitored intake temperatures. These comparison showed that the DFW meteorological data more accurately represented onsite conditions than the Waco data. The DFW data were used for the SSI performance analysis.

The entire DFW record (39 years) was then used to compute fully-mixed water temperatures responding to atmospheric heating or cooling and steady heat load similar to those used in the SSI analysis. From this long record of response temperatures, 1-, 5-, 10-, 20-, and 30-day average response temperature were computed. Maximum values of these average temperatures were then identified and ranked by year. From this table, 1990 was identified as the year that would produce the highest temperatures in the SSI for all durations. The meteorological data from 1990 are shown in Table 2.3-7B for the period of maximum SSI temperatures. This period includes data for both for the 24 hour transient analysis and for the peak SSI intake temperature analysis. The day with the highest water temperatures computed from this meteorological record is August 31, 1990.

A similar search was conducted for the maximum 30-day evaporation. The fully-mixed computation was used to determine evaporation rates. The period of 30-day maximum evaporation was identified by examining the entire 39 year record using a moving sum procedure. The maximum natural evaporation occurred in 1980. The meteorological data for this period are shown in Table 2.3-7C. The 30-day period with the greatest potential for evaporation is June 25, 1980 to July 25, 1980. In order to be conservative, the evaporation analysis was continued for nine days beyond the 30 day minimum specified in R.G.1.27. The additional data are also shown in the Table.

2.3.1.2.11 Extreme Winds

Estimated extreme winds (fastest mile) for the general area based on the Frechet distribution are [24]:

Return Period (Years)	Wind Speed (Miles Per Hour)
2	51
10	61
50	71
100	76

Fastest mile winds are sustained winds, normalized to 30 feet above ground and include all meteorological phenomena except tornadoes.

Wind loadings for the site are discussed in Section 3.3.1.

2.3.2 LOCAL METEOROLOGY

2.3.2.1 Normal and Extreme Values of Meteorological Parameters

2.3.2.1.1 General

In this section, the normal and extreme statistics of wind, temperature, water vapor, precipitation, fog, and atmospheric stability are described. Long-term data from proximal weather stations (see Figure 2.3-3) have been used to supplement the shorter-term onsite data.

2.3.2.1.2 Surface Winds

Percentage frequencies of surface wind (wind roses) at Love Field, Dallas, for the years 1951-1960 are shown on an annual and monthly basis in Table 2.3-11 [25]. The symbol “+” indicates that the value is less than one-half of one percent but greater than zero. According to the annual table, surface wind directions at Dallas are from the southeast, south-southeast, and south 45 percent of the time. These directions predominate during the individual months also, but to a lesser extent during November through March. The annual average wind speed (not shown in Table 2.3-11) is 11.0 miles per hour. The maximum average wind speed occurs in the spring, while the minimum occurs in the fall.

Monthly and annual onsite wind frequency distributions at the 10-meter level are included in Table 2.3-27, presented in Section 2.3.3 [26]. Similar to the offsite distribution, the surface wind is from the southeast, south-southeast, and south 40 percent of the time. The annual average wind speed is lower onsite, averaging 8.5 miles per hour.

The "fastest mile" of record (long-term) at Fort Worth and Dallas for each month is presented in Table 2.3-12 [8, 27].

Frequency distributions of wind direction persistence, determined from observations at three-hour intervals over a five-year period (1969- 1973) from Fort Worth, Texas [28], are presented in Table 2.3-13. Persistence values are given for both one sector and three sectors (indicated by wind sector +22.5º in Table). Persistence was maintained through calm or missing observations if it was maintained subsequent to them. Because of these criteria, persistence as given by the number of consecutive three-hour observations tends to have a bias towards long durations.

Monthly and annual wind direction persistence, determined from hourly onsite observations at the 10-meter level [26] are presented in Table 2.3-14. These distributions, which are independent of stability, indicate that most cases of persistence are less than 12 hours in duration. During the four-year period of record, there were only eight cases of persistence greater than 24 hours, five of which occurred in the NNW sector. In the average wind speeds given in Table 2.3-14, 99.99 indicates that the wind speeds were invalid.

2.3.2.1.3 Temperatures

Monthly and annual values of daily mean temperature and average and extreme daily maximum and minimum temperatures are shown in Table 2.3-15, based on data records for Fort Worth [8]. From these data, the annual mean temperature in the site area is 66°F. The monthly averages indicate that July and August are the hottest months and January the coldest month.

The monthly and annual diurnal distributions of temperature at the site are shown in Table 2.3-16 [26]. Values of the mean, absolute maximum and minimum, and average daily maximum and minimum temperature for each month are also presented. The annual mean temperature from the onsite data is 17.1°C (63°F), which is some 3°F lower than the long-term mean as given by Fort Worth data.

Table 2.3-16 indicates that there were 93.8 percent valid primary ΔT measurements (10-60m) during the 4-year period of record (5/15/72 - 5/14/76). Table 2.3-23 shows that there were a total of 95.8 percent valid delta temperature (ΔT) measurements during the same 4-year period of record, including secondary ΔT measurements when primary ΔT measurements were invalid. Therefore, only two percent secondary ΔT measurements (10-30m) were substituted in the data record for invalid primary ΔT measurements.

In order to justify the direct substitution of secondary ΔT measurements during periods when the primary ΔT measurements were invalid, a simultaneous comparison of stability classes calculated from both ΔT measurements was made. Seven random days, encompassing all seasons, were selected from the 4-year period for the comparison. The comparison showed that there was a good correlation between the two ΔT samples with a higher frequency of both the most stable (F and G) and unstable (A and B) occurrences using the secondary ΔT measurements. Since the relative concentrations for CPNPP were calculated for an assumed

ground-level release, maximum relative concentrations (other conditions being equal), would occur during Pasquill G stabilities, the next highest relative concentrations would occur during Pasquill F stabilities, and so on. During the 7-day period of comparison, there were considerably more F and G occurrences for secondary ΔT measurements than for primary ΔT measurements. Therefore, substitution of secondary ΔT measurements during periods when primary ΔT measurements were invalid (two percent of the time) is quite conservative.

See Section 2.3.2.1.7 for more information on atmospheric stability.

2.3.2.1.4 Water Vapor

Monthly and annual average relative humidity for four different times of day are given in Table 2.3-17 from 10 years of record at the Fort Worth weather station [8]. Based on these data the annual average relative humidity is estimated to be about 68 percent. Monthly and annual average dewpoint temperatures and extreme maximum and minimum dewpoint temperatures are shown in Table 2.3-18, based on 1970-1975 data from Fort Worth [22].

The monthly and annual diurnal distributions of dewpoint temperature and relative humidity at the site are shown in Table 2.3-16, based on four years of onsite measurements [26]. Values of the mean, absolute maximum and minimum, and average daily maximum and minimum for both parameters are also presented. The annual average relative humidity is 63 percent, or five percent lower than the estimated long-term average at Fort Worth.

2.3.2.1.5 Precipitation

Monthly and annual precipitation normals and the mean number of days with precipitation equal to or greater than 0.10 and 0.50 inches, estimated for Comanche Peak by averaging data from Rainbow, Stephenville, Cleburne, Dublin, and Fort Worth are presented in Table 2.3-19 [15]. These data indicate that the highest monthly average rainfall occurs in May with an annual average of 31.3 inches in the area. The number of days with measurable precipitation ($\geq$ 0.01 inches) is also presented in Table 2.3-19 based on 1954-1973 data from Fort Worth [8]. Monthly precipitation extremes (maximum and minimum), presented in Table 2.3-20 for several stations in the area, indicate that the largest rainfalls occur during April and May [8, 15].

Snow and sleet occur from December through March with an occasional snow flurry in late November or early April. Monthly and annual average totals of snow and sleet from 20 years of record at Fort Worth [8] are shown in Table 2.3-19. These data give an annual expectancy of 2.9 inches of snow. Extremes of snowfall at selected stations in the area were previously presented in Table 2.3-5.

Monthly and annual precipitation wind roses are presented in Table 2.3-21. These data are based on four years of data at Fort Worth concurrent with the onsite data record [29]. These data show that of the 5.8 percent of the time that precipitation occurred, the maximum frequency of precipitation occurred with north winds. (Onsite data were not used because most of the hourly onsite precipitation data are invalid.)

2.3.2.1.6 Fog

Heavy fog is that which reduces visibility to one-quarter mile or less. Average monthly and annual number of heavy fog days based on 20 years of data at Fort Worth are presented in

Table 2.3-19 [8]. These data indicate that most of the heavy fog days occur in winter with a few occurrences during the remainder of the year.

2.3.2.1.7 Atmospheric Stability

Based on data for the period 1957-1971 at Fort Worth, the monthly and annual frequency distributions of stability classes are shown in Table 2.3-22 [30]. The stability classes are based on the Pasquill classification [31] and are defined in Table 2.3-22. These data indicate that the frequency of stable classes reaches a peak during the late summer and early fall.

Monthly summaries of the diurnal distribution of stability and stability persistence are presented in Table 2.3-23 for the onsite period of record [26]. Stability is determined from the 10-60 meter delta temperature measurements onsite and the class intervals specified in NRC Regulatory Guide 1.23 [32]. The annual percentages by stability class are as follows:

A	B	C	D	E	F	G
3.2	1.4	2.2	22.7	40.4	19.9	10.2

These frequencies are not directly comparable to the long-term frequencies at Fort Worth, since each distribution is based on a different criteria for determining Pasquill stability classes.

2.3.2.1.8 Mixing Heights

The frequencies of seasonal and annual mixing heights are included and discussed in Section 2.3.1.2.7. Since onsite measurements of mixing depth are neither required nor made, monthly mixing depths from upper air data at Carswell AFB, Fort Worth (5/72-10/73) and Stephenville, Texas (11/73-4/76), and surface observations from the National Weather Service (NWS) station in Fort Worth, concurrent with the onsite data record, are presented in Table 2.3.24 [33]. The method used for determining mixing depths is the same as described by Holzworth [10] with observations identified as P (precipitation), C (cold air advection), and M (missing) excluded from the record. Inclusion of P and C types would tend to increase the mean mixing depths given in Table 2.3-24.

2.3.2.1.9 Representativeness of the Onsite Data

To demonstrate that the onsite data sample is representative of a long term climatological average, concurrent data from Fort Worth (May 1972 through April 1976) were compared to a longer data record for Fort Worth (January through December, 1957-1971). The wind frequency distribution and the stability class frequency distribution and mean wind speeds are presented in Table 2.3-25.

Generally, the wind frequencies and stability distributions are in excellent agreement. The largest difference in wind frequency is only three percent and occurs in the south sector. One notable difference is the higher frequency of calms during the four-year period. The only significant differences in the stability class distributions occur in the “D” and “F” and “G” classes. For the four-year period, there are approximately five percent less “D” occurrences and five percent more “F” and “G” occurrences. The mean wind speeds are also in good agreement, averaging about one knot less during the four-year period.

Generally, the comparison implies that the Comanche Peak onsite data are representative of longer-term climatological conditions. The differences that do occur indicate that diffusion estimates will probably be higher than normal (conservative) for the four-year period of record.

2.3.2.2 Potential Influence of the Plant and Its Facilities on Local Meteorology

2.3.2.2.1 General

Potential modifications of the local meteorology at the site resulting from the construction and operation of the plant are believed to be small. The Reactor Complex is located approximately 450m west-northwest of the meteorological tower. The top of the dome is 69m above the level of the base of the meteorological tower. The Reactor Complex meets the requirements of the Standard Review Plan (46). Additionally wind was recorded from the west-northwest sector approximately 2.1% of all recordings; thus, any effect that the Reactor Complex does exhibit on our overall meteorological measurements program will be minimal. See Section 2.3.3.2 for a description of the Meteorological Instrumentation Building.

In addition, no other structures are in such proximity to the tower that will cause a significant alteration of the meteorological data. This is based upon the criteria that no structure equal to or greater than the height of a measuring level is closer than 10 times that measuring level to the tower, or that all sensors are at least 5 times the building height away from any building that is equal to or greater than the measuring levels.

The fill dirt pile located east-northeast of the meteorological towers is actually a mound of topsoil and will be distributed as required over the finish grade of the site. The topsoil mound is approximately 3000 feet from the primary meteorological tower location. Top of the pile is E1. 865'-9" approximate and the lower measure level on the tower E1. 870' approximate. Due to the linear distance away from the tower, and the relative height of the mound, the effects of the mound on meteorological measurements will be minimal. Additionally, wind was recorded from the ENE direction only 4% of all recorded winds (FSAR Table 2.3-21); therefore, for overall purposes, even if the topsoil mound did exhibit effects on measurements, the effect on cumulative total measurements would be minimal.

In sum, the Containment Building and associated facilities are expected to have some small influence on the local air flow; specifically, mechanical turbulence is expected downwind of the plant, due to building wake effects.

2.3.2.2.2 Impact of Squaw Creek Reservoir

Filling of Squaw Creek Reservoir commenced on February 15, 1977 with completion in May 1979. The potential impacts of the Squaw Creek Reservoir upon onsite meteorlogy are discussed in the Dames & Moore Report [34] which supports the conclusion that the reservoir will have a minimal effect upon local meteorology. Although no specific monitoring program is proposed to examine such effects, various meteorological measurements are sampled as discussed in 2.3.3.1.1.

The effects of the reservoir on wind speed, wind direction and vertical temperature gradient should be minimal. Small increases in the wind speed would be expected because the surface frictional coefficient of the air-water interface would be different from that which is now existent at elevation 770' MSL (reservoir elevation). Since Squaw Creek Reservoir has a maximum fetch of

about 4 1/2 miles, wind speeds may increase slightly for wind directions along the maximum fetch (southeast-northwest orientation). Small changes in the wind direction would also be expected due to variations of the surface frictional coefficient.

During winds from the northwest, northeast, and east-northeast, some modification of atmospheric conditions may occur: first as the trajectory moves over the reservoir surface, and subsequently as it returns to land, passes the tower and the reactor building, and then to the site boundary and some distance beyond. At all times with these wind directions the tower is likely to record higher wind speeds than prevail through the balance of a trajectory to the site boundary and beyond. As the trajectory returns to land, the reduction in wind speed due to the friction of land surfaces will be accompanied by increased turbulence. As a result of the offsetting process, the resultant dispersion values are not significantly altered.

On clear nights during light onshore winds from the above wind directions, the thermal stability of the air column may increase while the air column moves from the tower toward the site boundary and beyond. However, unless wind speeds are below about 3 mph, the overwater trajectory is not likely to have been of sufficient duration for significant modifications in its thermal stability to occur. In cases where the wind speed exceeds 3 mph, the tower will observe the air column stability near its overland equilibrium value and its readings will be representative of the thermal stability which will prevail throughout the trajectory to the site boundary and beyond.

With wind speeds of 3 mph or less in these directions, departures from overland stability values will be sensed at night by the tower, and the air column will move toward its more stable overland values during the trajectory from the reservoir shore to the site boundary and beyond. Conditions when the tower observed data may be somewhat unrepresentative and more favorable than the actual dispersion conditions downwind of the reactor building include the following:

1. When the wind direction is from the northwest, northeast, and east-northeast, and

2. The wind speed is 3 mph or less, and

3. Overland thermal stabilities have equilibrium values of Pasquill E, F, or G, and

4. During nighttime hours.

The onsite meteorological tower data for the 4-year period of record shows that conditions one through three occur concurrently only about 2.5 percent of the time. If daytime conditions were eliminated, the percentage would be somewhat smaller. By comparison, the combined frequency of occurrence of winds from these three directions is about 12 percent.

Thus, (1) 2.5 percent or less of the time, tower stability observations may be somewhat nonconservative when used to represent dispersion conditions at CPNPP, and (2) wind speeds may be higher than the representative overland values about 12 percent of the time, but downwind modifications to overland speeds are likely to be offset by compensatory increases in mechanically induced turbulence.

The effects of the reservoir on air temperatures in the area will be significant only when ventilation across the pond is at a minimum. The lack of ventilation would give air over the pond enough time to have its temperature measurably changed by the temperature of the surface

water for northwest or southeast winds. For low wind speeds, the maximum increase in air temperature would probably be large enough to have an effect upon thermal stability. It is estimated that the reservoir, due to heating of the air, would cause a decrease in the frequency of the more stable classifications and an increase in the frequency of the more unstable classifications. Thus, although overall changes are expected to be small, the Squaw Creek Reservoir should cause a slight improvement in diffusion meteorology due to enhanced ventilation and a reduction in the frequency of the very stable conditions.

Anticipated effects of the proposed Squaw Creek Reservoir on monthly average temperature, relative humidity, frequency of fogs for various visibility classes, and frequency of icing have been determined for the months of January and July (representing winter and summer conditions). Details of the methods used and the results are available in the Dames & Moore report [34] on the Squaw Creek Reservoir.

1. Temperature and Humidity Changes

   The night hours of both January and July experience the greatest modification in temperature and relative humidity. Largest modifications occur over the reservoir, with smaller effects over adjacent land area. The night hours of January and July show the greatest anticipated change of +1.2 degrees in temperature and the July nighttime hours have a 3.2 percent increase in relative humidity with 73 percent and 90 percent of the area affected, respectively. The daylight hours of July exhibit the smallest influence from the proposed reservoir.

2. Fogging - Frequency of Occurrence

   Conditional fog frequencies have been determined for various visibility classes for each of the following situations: (a) natural fogs unaffected by the reservoir, i.e., the baseline state, (b) natural fogs with visibilities altered by the reservoir, and (c) reservoir generated fogs.

   Natural fog (baseline) occurrences were determined from 3-hourly meteorological observations taken at the Dallas National Weather Service (NWS) station during the months of January and July over a 3-year period (1965-1967); occurrences were summarized by visibility classes. Natural fogs are not recorded by the NWS unless the visibility is seven miles or less. Onsite observations of fogs were not made.

   Data from the Dallas NWS station were selected to represent natural (baseline) fog occurrences at CPNPP on the basis of being the most representative data available. Fog occurrence at the Dallas NWS station is quite small [34]. Although these frequencies cannot be directly correlated to onsite fog frequencies, there are no known physical reasons that would contribute to markedly different baseline fog frequencies at CPNPP. The following meteorological characteristics are presented as evidence that baseline fog frequencies are similar or even less frequent onsite than at the Dallas NWS station:

   a. Pure radiation fog, which can be extremely localized, seldom occurs in the site area except for shallow patches [3].

b. Patchy or localized fog is more predominant, generally, in low lying area. Since CPNPP is located as much as 200 feet above adjacent terrain, baseline fog occurrences at the site should be less than at nearby low lying areas.

c. The site is not located adjacent to any major bodies of water (the Brazos River is over three miles away) that might increase local fog occurrences onsite.

d. Moisture levels decrease from East to West across much of Texas. Since CPNPP is located approximately 50 miles west of the Dallas NWS station, moisture conditions should be somewhat less favorable for fog formation onsite than at the Dallas NWS station.

Generally, except for July daylight hours, the presence of Squaw Creek Reservoir will decrease the visibility in naturally occurring fogs. In January, an increase of up to five percent is expected in the occurrence of fogs. July nighttime conditions show the least influence of the reservoir, with no change in the frequency of fog occurrence. During July daylight hours, a decrease of up to one percent in the occurrence of fog is expected.

3. Fogging - Visibility of One Mile or Less

Fog with visibility of one mile or less may be frequent enough to limit activities in the area. Daylight hours show the greatest increase of fog frequencies in this range of visibilities, +5 percent, and the largest area modified. During January daylight hours, the study also shows that Highway 144, East of the reservoir, should experience a three percent increase in occurrence of visibility restricted to one mile. Road 201, west of Squaw Creek Reservoir, should experience a one percent increase of fog visibility less than or equal to one mile. Highway 144 is expected to have an increase of one to two percent in fog frequency with visibility less than or equal to one mile during the night hours of January. This fog will extend for about 1.7 miles on the southeast side of the reservoir.

July daylight hours, for this visibility range, are expected to have a two percent increase in the maximum frequency of fogs. A one percent increase over natural fog frequencies is expected along Highway 144 north of the reservoir and along Roads 201, 204, and 51, west of Squaw Creek Reservoir. No modification is anticipated for the July night hours in this visibility class.

4. Icing

Potential icing conditions are specified by the occurrence of reservoir produced fog accompanied by subfreezing temperature. January night hours are anticipated to have a maximum of one percent increase in the frequency of icing. These conditions occur over or near the reservoir, and therefore have little effect on the area.

2.3.2.2.3 Topographical Description

A map of the Comanche Peak area for a distance of five miles from the site is shown in Figure 2.3-4. The eight radial lines correspond to the eight individual topographic cross-sections which appear in Figure 2.3-5 through 2.3-8. These figures indicate the maximum elevation versus distance from the plant in each sector. The site elevation is approximately 810 feet MSL.

The terrain varies from 600 to 1,000 feet MSL within five miles of the site, and is generally in this range out to 50 miles. General topographic features for a radius of fifty miles are shown in Figure 2.3-9.

Variable terrain has a potential to influence local diffusion characteristics. Terrain variations on the order of plus or minus 200 feet are not pronounced enough to cause any significant flow blocking. Two possible influences, though, cold air drainage and channeling, have been investigated. The occurrences of cold (more dense) air drainage down Squaw Creek was assessed by a comparison of wind direction frequencies between the 10-meter (850 ft. MSL) and 60-meter (1000 ft. MSL) levels (Figure 2.3-10) for a 131-day period. If drainage occurs, then marked increases of down-valley wind frequencies (ESE and SE) from the upper to the lower level would be expected. Marked changes in frequency do not appear in the data; therefore, it is concluded that cold air drainage along Squaw Creek is not significant. Though not significant, the occurrence of cold air drainage cannot be completely ruled out on the basis of a comparison of wind directions measured at approximately 850 and 1000 ft. MSL, since the Squaw Creek drainage basin lies below 700 ft. MSL. However, the Squaw Creek Reservoir has been filled since this comparison was made (see Section 2.3.2.2.2). This effectively modifies the topography over a large area surrounding CPNPP to a minimum elevation of 770 ft. MSL, or only about 40 feet less than site elevation. Thus, cold air drainage is unlikely.

Channeling of air flow, the other potential topographical effect, was studied by comparing 10-meter wind directions with nearby wind direction data from Dallas Love Field, where surroundings are relatively flat. A significant increase in wind direction frequencies for both up and down valley sectors (WNW, NW, NNW, ESE, and SE) should occur if channeling is an important influence. Approximately eight months of concurrent wind direction data, shown in Figure 2.3-11, indicate that channeling of the air along Squaw Creek is not a prominent effect.

The channeling and air-drainage study results are indicative of a relatively flat terrain. There is even less topographical variation after creation of the reservoir. This implies that there is less topographic effect on the local airflow and, therefore, a slight improvement in diffusion meteorology. In conclusion, the onsite data collected prior to, and after, the creation of the reservoir does not change appreciably.

2.3.2.3 Local Meteorological Conditions for Design and Operating Bases

Local meteorological data have not been used for design and operating basis considerations other than those conditions referred to in Sections 2.3.4 and 2.3.5. Design wind loadings, tornado loadings, and snow loadings are referred to under Regional Meteorology, Section 2.3.1.

2.3.3 ONSITE METEOROLOGICAL MEASUREMENTS PROGRAM

2.3.3.1 Pre-Operational Program

The pre-operational onsite meteorological program is designed to measure the parameters needed to evaluate the dispersive characteristics of the site for both the routine operational and the hypothetical accidental releases of radionuclides to the atmosphere.

2.3.3.1.1 Instrumentation and Recording Systems

The majority of the measurements are made on a 200-foot steel-framed tower which is located 1,500 feet east of the reactor complex (See Figure 2.3-12). The location of the tower in relation to the entire site area is shown in Figure 2.1-2. The terrain surrounding the tower is relatively hilly and is covered by widely scattered scrub brush, small mesquite, and cedar.

The following measurements are sampled on the tower:

1. Wind speed at two levels (10 and 60 meters)

2. Wind direction at two levels (10 and 60 meters)

3. Ambient temperature at three levels (10, 30, and 60 meters)

4. Ambient dewpoint temperature at two levels (10 and 60 meters)

5. Thermal stability, for two height intervals (10 to 30 meters, and 10 to 60 meters)

6. Wind direction variability (10 meters)

In addition to these measurements, precipitation and solar radiation (both total and net) are sampled near the base of the tower.

Descriptions of the instruments employed in these measurements are found in Tables 2.3-26.

To assure a high percentage of data recovery, duplicate recording systems are used. All variables are recorded in analog form on strip charts which record continuously, and digitally on magnetic tape which records ”one scan each minute.” The latter is the most common method of complying with criteria in Reg. Guide 1.23 for digital recording systems; that is, to record instantaneous values of each meteorological parameter once each minute. If the total number of minute observations during the hour for any parameter is less than 15, then that parameter is considered to be invalid for that hour. The magnetic tape is the primary recording system.

A comparison of analog and digital hourly average values was made to support the use of instantaneous values recorded once each minute to represent hourly average conditions. Comparisons of both wind speed and direction at the 10-meter level for a randomly selected 2-week period are summarized in Table 2.3-35. These data indicate overall agreement between the hourly average values from the analog and digital recording systems.

The digital recording system reduces each sensor output signal to a digital voltage form, with a range of 0 to 999 millivolts (mv) (except delta T, with a range of -999 to 999 mv), and records all variables on magnetic tape once per minute.

Data lost during outages or malfunctions of the digital recorder are reduced manually from the strip chart record. The hourly averages are logged for insertion into the meteorological record.

2.3.3.1.2 Maintenance and Calibration

To assure data quality and accuracy, a comprehensive calibration of the meteorological station components is performed at six month intervals. The procedure includes close visual inspection of all instrument sensors for wear, electronic component calibration, ambient temperature, and dewpoint comparison using mercury-type thermometers, and calibration of recorders.

Normal maintenance includes a comprehensive inspection of the station's electronic and mechanical equipment as part of an ongoing operation and maintenance program. Inspections are performed on a weekly frequency, as a minimum, but on average two operational inspections are performed per week. Station operating procedures call for, among other things, a manual check of the zero and full-scale positioning of the analog recorders, as well as a verification of the associated DC voltages displayed by the digital panel meter for the primary recording system.

The calibration and maintenance program is accomplished through the effort of experienced Luminant Power technicians.

Pre-operational data recovery and analysis was initiated on May 15, 1972. For the four year period ending May 14, 1976, about 96 percent recovery of primary variables (wind speed, wind direction, and delta temperature) was accomplished.

2.3.3.1.3 Data Processing

With the exception of precipitation and wind direction, hourly averages of the digital minute-by-minute observations are calculated from the following scalar equation:

$$\bar{B}_j = \frac{r_j}{n} \sum_{i=1}^{n} B_{ji} \qquad 2.3\text{-}2$$

where

B_j = the average hourly value for the j^{th} variable (engineering units)

n = the total number of minute observations during the hour normally 60, but if n <15, data for that hour are considered to be missing)

B_{ji} = the i^{th} minute observation of the j^{th} variable (millivolts)

r_j = the conversion factor to change the j^{th} variable into engineering units

Whereas most of the averages are scalar inform, the average wind directions are determined by the following averaging technique:

Each minute observation of wind vector (speed and direction) is broken into its components, u and v, according to

$$u_i = S_i \times \sin(\theta i - \pi)$$
$$v_i = S_i \times \cos(\theta i - \pi) \qquad 2.3\text{-}3$$

where

u_i = the east-west component of wind for the minute

v_i = the north-south component of wind for the minute

S_i = the scaler wind speed for the minute

θi = the wind direction for the minute

The u_i and v_i are added separately and the sums are divided by the total number of minute observations for the hour to establish the average components, u and v, i.e.:

$$\bar{u} = \frac{1}{n}\sum_{i=1}^{n} u_i \qquad 2.3\text{-}4$$

$$\bar{v} = \frac{1}{n}\sum_{i=1}^{n} v_i$$

where

$\bar{u}$ = the average east-west component of wind for the hour

$\bar{v}$ = The average north-south component of wind for the hour

n = the number of valid minute observations for the hour

The average wind direction is found by converting the average components into a vector direction, i.e.,

$$\bar{\theta} = \tan^{-1}(\bar{u}/\bar{v} + \pi) \qquad 2.3\text{-}5$$

where

$\bar{\theta}$ = the average vector wind direction during the hour

The precipitation accumulated during the hour is established by subtracting the amount of precipitation measured by the rain gauge at the beginning of the hour from the amount measured at the end of the hour.

Data analysis for both wind distribution and diffusion characteristics of the site require three basic atmospheric variables. These three variables together with the primary and secondary (back-up) measurements for each are as follows:

Horizontal wind speed:	primary, 10-meter level secondary, 60-meter level
Horizontal wind direction:	primary, 10-meter level secondary, 60-meter level
Delta temperature (ΔT)	primary T, 10 to 60 meters secondary T, 10 to 60 meters

The secondary measurement is needed only during periods of outage of the primary system, and is reduced to the appropriate level as follows: wind speed at 60 meters is converted to wind speed at 10 meters using the power law [35]:

$$V_{10} = V_{60}\left(\frac{10}{60}\right)^{S} \qquad 2.3\text{-}6$$

where

V_{10} = wind speed at 10 meters

V_{60} = wind speed at 60 meters

S = .26 for Pasquill classes A, B, C, and D or .50 for Pasquill classes E, F, and G

Wind direction at 60 meters is directly substituted for wind direction at 10 meters.

ΔT (redundant) between 10 and 60 meters is substituted for ΔT between 10 and 60 meters, as required, for classification of atmospheric stability in accordance with Table 2 of Regulatory Guide 1.23.

The final step in the data reduction program is the listing, in sequential order, of the concurrent, hourly-averaged values of the weather elements observed at the site. The data record provides the input data for all types of meteorological analyses needed to define the site atmospheric dispersive qualities. The hourly onsite data record used in the Section 2.3 analyses will be provided to the NRC separately from this report.

2.3.3.2 Operational Program

Prior to fuel load of Unit One, the meteorological measurements program of the Comanche Peak Nuclear Power Plant shall consist of the following:

1. A primary meteorological measurements program.

2. A backup meteorological measurements system.

3. A system for making near real-time predictions of the atmospheric effluent transport and diffusion.

4. A capability for remote interrogation, on demand, of the atmospheric measurements and prediction systems by the licensee, emergency response organizations, and the NRC Staff.

To accomplish these goals, “the pre-operational meteorological instrument system” has been modified. The current “operational meteorological measurements system” transmits the above mentioned meteorological parameters to a multi-channel digital recorder, METSYS Computer and the plant computer.

The operational program consists of a 60m multi-level primary meteorological tower located at plant grid coordinates N9519.44 ft. by E12111.75 ft. (el. 838 ft. - 9 in.) which is east of the Unit 1 and Unit 2 reactor buildings. The primary meteorological tower directly monitors or provides information to determine the following meteorological parameters:

- Wind speed at 10m and 60m;
- Wind direction at 10m and 60m;
- Ambient temperature at 10m;
- Delta-temperature between 10m and 60m (redundant channels at each level);
- Sigma theta at 10m;
- Precipitation near ground-level.

The primary tower is a 60m, guyed, open lattice type tower with an instrument elevator and instrumentation booms located at the 10m and 60m levels. These booms are oriented to the west. The aspirated temperature shields at 10m and 60m are oriented laterally to the north. The primary and backup tower instrument translators are located in an environmentally controlled building which is approximately 70 ft. West-Northwest of the primary tower.

The Meteorological Instrumentation Building was constructed near the base of the tower to support both primary and backup tower field instruments. It is 12 ft. wide by 16 ft. long by 9 ft. high with a steel floor and galvanized steel siding, roof and ceiling on a concrete slab. Environmental control in the summer is maintained by an air conditioning unit. In winter, environmental control is maintained by an electric heating system. The heating/AC unit is controlled by an automatic thermostat.

The operational program also consists of a separate 10m backup meteorological tower located approximately 75 ft. East-Northeast from the 60m primary tower. The backup tower monitors or determines the following parameters:

- Wind speed at 10m;
- Wind direction at 10m;
- Temperature at 10m;
- Sigma theta at 10m

The backup tower is a 10m free standing open lattice type tower with an instrumentation boom located on top of the tower at 10m. The aspirated temperature shield is orientated laterally to the north to further minimize the effects of direct sunlight on the measured temperature.

To ensure that meteorological data being collected by the backup tower at its location near the primary tower was representative of coincident data being recorded at the 10 meter level of the primary tower, a real-time data analysis consisting of a 3-month time period was performed. The real-time representativeness analysis consisted of statistical correlations for coincident wind speed, wind direction, and sigma-theta parameters from the two towers for the minimum time period specified above. The results of this analysis was used to demonstrate that meteorological data from the backup tower can be reliably substituted during loss-of-data periods from the primary tower.

The recording of meteorological data from both the primary and backup towers is accomplished by utilizing one digital and one auxiliary analog system. The recorder system is a digital paperless recorder on the meteorological instrument panel in the Control Room. All meteorological parameters from the primary tower, and wind speed, wind direction and sigma theta from the backup tower, are displayed on this recorder.

To ensure an acceptable data recovery of the precipitation measurements for the operational program, equipment was procured and is maintained to assure at least 90% annual data recovery. The primary system for recording precipitation data is checked at least once per week to assure its continued function.

Meteorological data from both towers is provided to the Met and plant computers. Signals from both meteorological towers are transmitted through shielded twisted pair cable to the digital to analog converter of the meteorological system receiver located in the Unit 1 Plant Computer Room.

Digital output of the Met and plant computers are located in the Unit 1 Plant Computer and Control Room. Digital output of the plant computers are also located in the Technical Support Center (TSC) and Emergency Operation Facility (EOF), where meteorological data consistent with the requirements of NUREG-0696 (45) are displayed.

The Met computer is designed to provide digital readout of meteorological data received from the primary and backup towers for all parameters. Both 15-minute and hourly-averaged data are generated. The 15-minute averaged data are derived from the meteorological parameters that are sampled every five seconds (except precipitation which is a totalized value). The hourly

averaged data are derived from the 15-minute averages. The 15-minute averaged data and the hourly-averaged data can be stored internally in the computer for a period of up to 10-years. The methodology for meteorological data processing as described in Section 2.3.3.1 was used on the meteorological data collected during the pre-operational monitoring program and for the data initially collected under the approved CPNPP operational meteorological monitoring program. The data averaging methodology has been updated with the installation of the Met computer. This updated data averaging methodology continues to meet the requirements of Regulatory Guide 1.23.

The plant computer is designed to provide digital readout of 15-minute averaged data from the primary meteorological tower. The 15-minute averaged data are based on a 5-second sampling rate. Trending data for the previous week are also available from the plant computer.

The following table shows the sampling time, averaging time and number of samples per averaging period for both the Met and plant computers:

Computer	Sampling Time (sec)	Averaging Time (min)	Number of Samples Per Averaging Period
Met	5	15	180
Met	(a)	60	(a)
Plant computer	5	15	180

a) The hourly average is derived from the 15-minute averages.

The operational program will be conducted in accordance with the requirements specified in Regulatory Guides 1.21 and 4.1 (36, 37), Second Proposed Revision 1 to Regulatory Guide 1.23 (44), and Revision 1 to NUREG-0654 (43). Descriptions of the instruments employed in the Operational meteorological measurements program are found in Table 2.3-34. Tables 2.3-34A and 2.3-34B provide information about meteorological instrumentation system accuracy.

2.3.3.3 Wind Roses By Pasquill Stability Classes

Monthly and annual wind roses for each Pasquill stability class (and all classes combined) for the four-year period of record onsite are shown in Table 2.3-27 [26]. These tables are based on wind distributions at the 10-meter level and the 10-60 meter ΔT measurements. During periods of outage of the primary variables, secondary wind and ΔT measurements were used as discussed in Section 2.3.3.1.3.

A discussion of the representativeness of the onsite data is provided in Section 2.3.2.1.9.

2.3.4 SHORT-TERM (ACCIDENT) DIFFUSION ESTIMATES

2.3.4.1 Objective

The onsite meteorological data record at the Comanche Peak site for the period May 15, 1972, through May 14, 1976, has been used to calculate dilution factors which can be anticipated in the event of an accidental release of radionuclides into the atmosphere. The one-hour dilution factors are calculated at the site boundary (exclusion area); for longer time periods the factors are calculated at the outer boundary of the low population zone (LPZ).

2.3.4.2 Calculations

Diffusion calculations for accidental or short-term releases of radionuclides were initially performed in accordance with the criteria provided in Regulatory Guide 1.4 [38]. Short term diffusion estimates were subsequently recalculated to incorporate the modeling features of NRC Draft Regulatory Guide 1.XXX [48]. It was assumed that the releases emanate from a point source at ground level; i.e., no advantage is realized from effluent emissions from elevated release points. During downwind transport, the effluent plume is assumed to spread according to a Gaussian dispersion model.

2.3.4.2.1 The Diffusion Model for Two Hours or Less

The analytical procedure for evaluating the 0-2 hour accident period is based on a revision of the model described in NRC Regulatory Guide 1.4; the revision incorporates the modeling features of NRC Draft Reg. Guide 1.XXX [48]. The changes reflect variations in atmospheric diffusion factors that occur as a function of wind direction and varying site boundary distance. Allowances are made for meandering plumes during light winds and stable atmospheric conditions. The model is distance and direction-dependent. The hourly χ/Q values used to represent the 0-2 hour accident period were determined in the following manner.

During neutral and stable conditions when the wind speed at the lower level is less than 6 meters per second (mps) the relative concentration is computed as:

$$\frac{\chi}{Q} = \frac{1}{\bar{u} \quad \pi \Sigma_y \sigma z} \qquad \text{2.3-7}$$

provided it is less than the greater value calculated from either

$$\frac{\chi}{Q} = \frac{1}{\bar{u}(\pi \sigma_y \sigma_z + cA)} \qquad \text{2.3-8}$$

or

$$\frac{\chi}{Q} = \frac{1}{\bar{u}(3\pi \sigma_y \sigma_z)} \qquad \text{2.3-9}$$

where,

χ/Q = relative concentration at ground level (s/m^3)

$\bar{u}$ = hourly average wind speed at 10 m level (mps)

Σ_y = lateral plume spread (m) (a function of atmospheric stability, wind speed, and downwind distance from the release). For distances up to 800 meters, $\Sigma_y = M\sigma_y$; where M is a function of atmospheric stability and wind speed. For distances greater than 800 meters,

$$\Sigma_y = (M-1)\sigma_y(@800m) + \sigma_y$$

A = minimum cross-sectional area of the reactor containment structure (3200 m^2) assuming that:
width of containment building = 140 feet
height of spring line above grade = 190.5 feet
radius of dome circle = 70 feet

c = building shape factor (taken as 0.5)

σ_y = lateral plume spread (m) at a given distance and stability

σ_z = vertical plume spread (m) at a given distance and stability.

During all other atmospheric stability and/or wind speed conditions, χ/Q is the greater value calculated from Equations 2.3-8 and 2.3-9.

Plume meander was accounted for by modifying the lateral diffusivity, σ_y. The meander function (M) is evaluated as follows:

For Pasquill stabilities A-C at all wind speeds or all stabilities when wind speed > 6 mps; M = 1. For wind speed $\leq$2 mps;

Stab D; M = 2

Stab E; M = 3

Stab F; M = 4

Stab G; M = 6

For wind speed between 2 and 6 mps, M is evaluated by a curve fitting technique and multiplied by σ_y.

The direction dependent 5- and 50-percentile χ/Q's by sector were calculated by the following procedure. The 5- and 50-percentile values were determined by normalizing the frequency of wind into the sector of interest. The 5-percentile χ/Q value is the point in a given sector χ/Q

cumulative frequency distribution which is equalled or exceeded (5 x 6.25/f) percent of the time, where f is the frequency in percent of winds in the sector. Similary, the 50-percentile value is the point in a given sector χ/Q cumulative frequency distribution which is equalled or exceeded (50 x 6.25/f) percent of the time. Calm conditions were included in the calculations by setting the wind speed to the threshold value of the wind direction sensor (0.75 mph) and distributing them among the 16 direction sectors in proportion to the directional frequencies in each stability class of wind speeds of 2 mph or less. This is a slightly larger speed class interval than the 1.5 mph limit recommended by Reg. Guide 1.XXX [48], but is justified due to the relatively small number of observations in the lowest wind speed class (≤1 mph) at CPNPP.

2.3.4.2.2 Estimated Values of One-Hour Dilution Factors

The minimum Exclusion Area Boundary (EAB) distances in each sector are presented in Table 2.3-28. For each wind direction sector, the minimum EAB distance was assumed to be the minimum distance within a 45 degree direction sector, centered on the direction sector of interest. See Section 2.1.2 for a discussion of the exclusion area boundary parameters.

The highest 5-percentile concentration in any sector is 1.6 x 10^{-4} s/m^3 and occurs northwest of the plant. This maximum χ/Q was calculated at a distance of 2080m although the actual minimum EAB distance in the NW sector is 2106m. This is conservative. The highest 50-percentile concentration is 4.5 x 10^{-5} s/m^3 and occurs north-northwest of the plant.

2.3.4.2.3 Diffusion Estimates for Periods Greater Than Two Hours

Determination of χ/Q's for time periods of 0-8 hours, 8-24 hours, 1-4 days, and 4-30 days was accomplished by graphical interpolation between 2-hour χ/Q's in each sector and the annual average χ/Q's in each sector, both at the LPZ distance (4 miles). Hourly 5- and 50-percentile χ/Q's for each sector were computed at the LPZ using the same technique as described above for the 5- and 50-percentile χ/Q's by sector at the EAB (hourly χ/Q's were used to represent the 0-2 hour χ/Q's). The annual average χ/Q's used in the graphical interpolation are those given in Table 2.3-33 at the LPZ distance of 4 miles. For each sector, the hourly 5-percentile χ/Q's and the annual average χ/Q's, both at the distance of the LPZ, were plotted on a log-log coordinate graph with ordinate values representing χ/Q and abscissa values being hours.

These two points, (χ/Q_1, 2 hours) and (χ/Q annual, 8760 hours) were connected by a straight line and values of χ/Q for periods of 8, 16, 72 and 624 hours were extracted. These χ/Q's represent the 0-8 hour, 8-24 hour, 1-4 day, and the 4-30 day accident period 5-percentile χ/Q's per sector at the LPZ distance. Similar graphical interpolation was used to determine 50-percentile χ/Q's for each accident period.

The 5- and 50-percentile χ/Q's for each accident period at the LPZ are given in Tables 2.3-37 and 2.3-38 for each of the 16 meteorological sectors.

2.3.4.2.4 Representativeness and Topographic Effects

As discussed in Section 2.3.2.1.9, the onsite data sample was considered to be conservatively representative of meteorological conditions at the site. The notable differences observed during the onsite period of record were a higher frequency of calm wind speeds and a higher frequency

of stable conditions. These conditions have undoubtedly increased the magnitude of the χ/Q values given in Section 2.3.4 above those to be expected over a longer climatological interval.

Topographic effects at the site were discussed in Section 2.3.2.2.3. The results were indicative of a flat terrain with no appreciable effects on short-term diffusion estimates. After creation of the Squaw Creek Reservoir, a slight improvement is expected in diffusion meteorology due to both reduced topographic variation and the ameliorative effects of a heated reservoir on the frequency of very stable conditions.

2.3.5 LONG-TERM (ROUTINE) DIFFUSION ESTIMATES

2.3.5.1 Objective

The onsite meteorological record (5/15/72 to 5/14/76) is used to provide realistic estimates of annual average atmospheric dilution factors to a distance of 50 miles from the plant for use in calculating the dispersion through air pathways of radionuclides released in routine plant operations. As indicated in Section 2.3.3, the hourly onsite data record will be provided to the NRC separately from this report.

2.3.5.2 Calculations

The average annual dilution factors which are applicable to routine venting or other routine gaseous-effluent releases have been evaluated from the data record using the technique presented in Regulatory Guide 1.111 [39]. The equation used is a sector-spread equation, namely:

$$\chi/Q\ (i, D) = \frac{T}{mBD}\ \frac{\sqrt{2}}{\sqrt{n}}\ \sum_{1}^{n} \frac{1}{\bar{u}\ (i)\ (\sigma_z{}^2(p, D) + cV^2/\pi)^{1/2}} \qquad 2.3\text{-}10$$

where,

$\chi/Q(i,D)$ = dilution factor (seconds/meter^3) at distance D, in affected direction Sector i

m = number of valid hourly observations in the data record

n = number of occurrences in the data record affecting direction Sector i

i = wind direction Sector index

p = Pasquill stability class index

$\sigma_z(p,D)$ = hourly average vertical dispersion coefficient of the plume (meters) for a given Pasquill class, at distance D

c = building wake shape factor (taken as 0.5)

V	=	vertical height of the reactor containment structure (79.4 meters)
B	=	horizontal plume spread factor (taken as $\pi/8$ radians)
$\bar{u}(i)$	=	hourly average wind speed (meters/second) affecting direction Sector i
D	=	distance from reactor containment structure
T	=	terrain correction factor; open terrain, valley flow, or other factor for χ/Q adjustment (distance dependent)

The wake factor (cV^2/π) influence is limited such that the resultant χ/Q may not be reduced greater than a factor of $\sqrt{3}$, i.e., [π/Q] wake $\geq$ [$1/\sqrt{3}(\chi/Q)$ no wake]. Calm conditions are included in the calculations by setting the wind speed to one-half the threshold value of the speed or direction sensor and distributing them among the 16 direction sectors in proportion to the directional frequencies of the one and two mph speed class intervals in the appropriate stability class.

Equation 2.3-10 is the straight-line trajectory model defined in NRC Regulatory Guide 1.111 assuming a ground-level release mode; that is, the release occurs at an elevation less than or equal to the adjacent building height. Since the site is basically in open terrain with gently rolling hills, the T factor in Equation 2.3-10 is the open terrain correction factor given in Reg. Guide 1.111[39].

Annual average dilution factors to a distance of 50 miles from the plant are shown in Table 2.3-33. The maximum value at the actual EAB is 3.3×10^{-6} seconds/meter^3 and occurs north-northwest of the plant at a distance of 1.29 miles. There are no higher values beyond the site boundary since for ground level releases concentrations monontonically decrease from the release point to all locations downwind.

Long-term dilution factor estimates for distances out to five miles are displayed in Figure 2.3-18. Estimates out to 50 miles are illustrated in Figure 2.3-19.

The annual average dilution factors given in this section are likely to be quite conservative for the reasons given in Section 2.3.4.2.4.

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TABLE 2.3-1
TORNADO POINT PROBABILITY WITHIN A GIVEN YEAR AT SELECTED LOCATIONS (1955-1967)[a]

Square Location	Significance	Annual Frequency, $\bar{t}$	Probability P	Return Period (Years)
Plant Site		4.46	0.00313	320
Adjacent (East)	Area Comparison	3.54	0.00248	403
Adjacent (South)	Area Comparison	3.23	0.00241	415
Adjacent (West)	Area Comparison	2.08	0.00146	685
Adjacent (Northwest)	Maximum in Texas	5.23	0.00371	269
North of Oklahoma City	Maximum in U.S.	8.00	0.00588	170

a) Period of record is in parentheses on this and succeeding tables when applicable.

TABLE 2.3-2
AVERAGE NUMBER OF THUNDERSTORM DAYS[a] AND LARGE-HAIL[b] DAYS

Period	Thunderstorms Fort Worth (1954-1973)	Large Hail Texas (1955-1967)
January	1	<1/2
February	2	2
March	4	7
April	7	25
May	7	30
June	6	18
July	5	4
August	5	1
September	4	2
October	3	3
November	2	1
December	1	<1/2
Winter	4	2
Spring	18	62
Summer	16	23
Autumn	9	6
Annual	46	93

a) Defined as day on which thunder is heard at station.

b) 3/4-inch diameter and larger.

TABLE 2.3-2A
SEASONAL AND ANNUAL ESTIMATES OF LIGHTNING STRIKES TO
SAFETY-RELATED STRUCTURES

Name of Safety-Related Structure	Winter	Spring	Summer	Autumn	Annual
Auxiliary Building	0.019	0.084	0.074	0.042	0.214
Reactor Building (Each Unit)	0.074	0.332	0.295	0.166	0.848
Electrical and Control Building	0.011	0.051	0.046	0.026	0.131
Safeguards Building (Each Unit)	0.018	0.079	0.071	0.040	0.203
Diesel Building (Each Unit)	0.007	0.030	0.027	0.015	0.077
Fuel Building	0.018	0.082	0.073	0.041	0.209
Service Water Intake Structure	0.002	0.010	0.009	0.005	0.024
Condensate Storage Tank	0.003	0.015	0.014	0.008	0.039
Reactor Makeup Water Storage Tank	0.002	0.007	0.007	0.004	0.019
Refueling Water Storage Tank	0.003	0.015	0.014	0.008	0.039

(Attractive Areas and Building Dimensions.)

Name of Safety Related Structure	Height[a] (meters)	Length (meters)	Width (meters)	Attractive Area (kilometers)
Auxiliary Building	32.31	58.52	34.75	0.0272
Reactor Building	79.25	42.67	42.67	0.1078
Electrical and Control Building	23.16	50.60	36.58	0.0167
Safeguards Building[b]	32.92	40.01	40.01	0.0258
Diesel Building	20.73	39.01	9.75	0.0098
Fuel Building	32.92	43.28	41.45	0.0266
Service Water Intake Structure	8.84	32.46	14.63	0.0031
Condensate Storage Tank	15.24	15.24	15.24	0.0050
Reactor Makeup Water Storage Tank	10.97	9.14	9.14	0.0024
Refueling Water Storage Tank	15.24	15.24	15.24	0.0050

a) Maximum heights of each building were generally used.

b) Due to the shape of this building, it was partitioned into two sections. The values for length and width are adjusted values.

TABLE 2.3-3
MEAN SEASONAL AND ANNUAL MIXING DEPTHS AND WIND SPEEDS AT
TEXAS STATIONS NEAREST THE REGION (1960-1964)

	Midland		San Antonio	
	Mixing Depth (meters)	Wind Speed (meters/sec)	Mixing Depth (meters)	Wind Speed (meters/sec)
I. Morning				
Winter	290	5.7	459	5.8
Spring	429	7.5	748	6.5
Summer	606	7.2	915	5.7
Autumn	419	6.0	654	5.5
Annual	436	6.6	694	5.9
II. Afternoon				
Winter	1276	7.8	1112	6.8
Spring	2449	9.0	1552	7.2
Summer	2744	6.7	2119	6.0
Autumn	1887	6.7	1572	6.1
Annual	2089	7.5	1589	6.5

TABLE 2.3-4
ESTIMATED RAINFALL (INCHES) FOR THE SITE AREA

	Average Return Period (Years)						
Duration	1	2	5	10	25	50	100
30 min	1.15	1.49	1.95	2.24	2.62	3.00	3.27
1 hr	1.50	1.82	2.40	2.84	3.34	3.75	4.20
2 hrs	1.74	2.18	2.95	3.45	4.06	4.60	5.10
3 hrs	1.93	2.43	3.24	3.85	4.47	5.15	5.64
6 hrs	2.35	2.90	3.88	4.60	5.45	6.05	6.85
12 hrs	2.95	3.38	4.60	5.45	6.45	7.25	8.20
24 hrs	3.10	3.90	5.30	6.30	7.45	8.45	9.45

TABLE 2.3-5
MAXIMUM RECORDED POINT RAINFALL FOR SELECTED STATIONS IN THE REGION

	Abilene (1906-1961)		Ft. Worth (1899-1961)		Waco (1941-1961)	
Duration	Amount (Inches)	Date	Amount (Inches)	Date	Amount (Inches)	Date
5 min.	0.68	5/18/42	0.71	5/20/28[(a)]	0.75	6/5/61[(b)]
10 min.	1.25	5/18/42	1.04	5/20/28[(a)]	1.15	6/5/61[(b)]
15 min.	1.76	5/18/42	1.40	8/22/16[(a)]	1.55	7/18/47[(c)]
30 min.	2.75	5/18/42	1.98	8/22/16[(a)]	2.35	7/18/47[(c)]
1 hr	3.47	7/31/11	3.35	9/05/32	3.15	6/19/47
2 hrs	4.42	5/22/08	5.59	9/05/32	4.20	6/19/47
3 hrs	4.53	5/11/28	5.99	9/04/32	4.20	6/19/47
6 hrs	6.26	5/11/28	6.93	9/04/32	4.44	5/12/53
12 hrs	6.56	5/11/28	9.04	9/04/32	4.64	5/12/53
24 hrs	6.78	5/22/08[(d)]	9.57	9/04/32	7.18	5/11/53[(e)]

a) Period of record is 1903 through 1961.

b) Period of record is 1953 through 1961.

c) Period of record is 1947 through 1961.

d) Period of record is 1886 through 1961.

e) Period of record is 1894 through 1961.

TABLE 2.3-6
EXTREME SNOWFALLS AT SELECTED STATIONS IN THE REGION

	Abilene (1886-1970)		Ft. Worth (1998-1970)		Waco (1899-1970)	
Period	Amount (Inches)	Date	Amount (Inches)	Date	Amount (Inches)	Date
24 hrs	8.0	1/15/19 1/16/19[a]	12.1	1/15/64 1/16/64	13.0	2/26/24
Calendar Month	9.5	2/90	12.1	1/64	13.0	12/29[a]
Season	18.4	1918-19	15.3	1963-64	15.0	1929-30

	(1940-1968)		(1954-1968)		(1943-1968)	
Month	Amount	Year	Amount	Year	Amount	Year
January	6.6	1966	12.1	1964	7.0	1949
February	8.4	1956	2.9	1966[a]	4.8	1966
March	5.7	1962	2.5	1962	1.0	1962[a]
April	T	1950[a]	0.0	--	0.0	--
October	T	1967	0.0	--	0.0	--
November	8.1	1968	T	1968[a]	T	1968[a]
December	4.3	1946	2.6	1963	2.0	1946

T, trace <01 in.

a) Amount also occurred on earlier date(s)

TABLE 2.3-7
THIS TABLE HAS BEEN DELETED

TABLE 2.3-7A
ONSITE METEOROLOGICAL DATA

(Sheet 1 of 11)

DATE	HOUR	AIR TEMP, F	DEWPOINT, TEMP, F	WINDSPEED, MPH	SOLAR RADIATION, BTU FT^2DAY^{-1}
7/13/74	0	75.9	70.0	4.0	0
	3	73.9	69.1	0.9	0
	6	72.0	69.1	0.0	27
	9	78.1	71.1	2.5	3133
	12	87.1	68.0	4.7	6105
	15	91.9	64.0	5.6	5973
	18	93.9	61.0	4.7	2363
	21	87.1	63.0	4.0	0
7/14/74	0	82.0	63.0	4.0	0
	3	78.1	62.1	1.6	0
	6	75.0	63.0	1.6	16
	9	82.9	66.9	3.1	3053
	12	91.9	61.0	4.0	6307
	15	97.0	60.1	4.0	6174
	18	98.1	60.1	3.1	2389
	21	89.1	64.0	5.6	0
7/15/74	0	75.9	70.0	8.7	0
	3	73.0	70.0	4.0	0
	6	71.1	66.9	2.5	0
	9	80.1	66.9	4.0	3053
	12	88.0	64.9	4.7	6105
	15	93.9	63.0	6.3	5946
	18	93.0	63.0	7.8	2363
	21	87.1	64.9	4.0	0
7/16/74	0	80.1	66.9	4.0	0
	3	75.9	68.0	2.5	0
	6	73.0	68.0	0.9	0
	9	81.0	71.1	1.6	1487
	12	89.1	64.9	6.3	5707
	15	93.0	64.0	6.3	4995
	18	93.0	63.0	6.3	1911
	21	84.0	68.0	11.0	11

TABLE 2.3-7A
ONSITE METEOROLOGICAL DATA

(Sheet 2 of 11)

DATE	HOUR	AIR TEMP, F	DEWPOINT, TEMP, F	WINDSPEED, MPH	SOLAR RADIATION, BTU FT^2DAY^{-1}
7/17/74	0	75.9	68.0	4.0	0
	3	73.0	68.0	1.6	0
	6	70.0	68.0	1.6	32
	9	78.1	70.0	5.6	2920
	12	87.1	64.9	5.6	5075
	15	91.0	62.1	8.7	5866
	18	88.0	64.9	11.9	2363
	21	82.0	66.9	5.6	0
7/18/74	0	75.9	61.0	2.5	0
	3	73.9	64.0	1.6	0
	6	70.0	64.9	1.6	32
	9	78.1	69.1	4.7	2989
	12	86.0	66.0	6.3	4969
	15	93.9	63.0	4.7	6017
	18	93.0	60.1	6.3	2654
	21	82.0	63.0	5.6	0
7/19/74	0	75.9	64.0	7.2	0
	3	73.9	64.0	2.5	0
	6	73.0	68.0	3.1	27
	9	80.1	66.9	6.3	2947
	12	90.0	64.0	5.6	6068
	15	95.0	57.0	6.3	6078
	18	97.0	55.9	5.6	2230
	21	89.1	61.0	6.3	16
7/20/74	0	81.0	60.1	9.4	0
	3	79.0	62.1	3.1	0
	6	78.1	63.0	2.5	16
	9	84.9	64.9	6.3	2947
	12	95.0	61.0	4.0	6366
	15	98.1	59.0	5.6	5707
	18	98.1	57.9	5.6	2256
	21	91.0	59.0	4.7	37

TABLE 2.3-7A
ONSITE METEOROLOGICAL DATA

(Sheet 3 of 11)

DATE	HOUR	AIR TEMP, F	DEWPOINT, TEMP, F	WINDSPEED, MPH	SOLAR RADIATION, BTU FT^2DAY^{-1}
7/21/74	0	84.0	57.9	4.0	0
	3	82.0	61.0	4.7	0
	6	78.1	59.0	1.6	16
	9	88.0	60.1	4.7	2989
	12	98.1	55.9	4.7	6137
	15	100.9	53.1	6.3	5893
	18	100.9	52.0	6.3	2458
	21	93.0	55.9	4.0	0
7/22/74	0	84.9	61.0	4.0	53
	3	82.9	63.0	5.6	27
	6	79.0	62.1	2.5	27
	9	89.1	62.1	5.6	2845
	12	99.0	57.0	4.7	6158
	15	102.9	55.9	5.6	5866
	18	100.9	57.9	6.3	1539
	21	93.9	62.1	5.6	106
7/23/74	0	87.1	64.0	4.0	53
	3	82.9	64.0	4.7	53
	6	81.0	63.0	1.6	43
	9	90.0	64.9	5.6	2999
	12	99.0	61.0	4.7	6052
	15	102.9	57.0	7.2	5866
	18	102.0	57.9	7.8	2389
	21	93.9	61.0	4.0	133
7/24/74	0	88.0	64.9	4.7	95
	3	84.0	64.9	15.7	53
	6	81.0	64.9	8.7	43
	9	87.1	66.0	8.7	2580
	12	96.1	62.1	8.7	4979
	15	99.0	61.0	7.8	3849
	18	95.0	63.0	11.9	1794
	21	91.0	64.9	13.4	133

TABLE 2.3-7A
ONSITE METEOROLOGICAL DATA

(Sheet 4 of 11)

DATE	HOUR	AIR TEMP, F	DEWPOINT, TEMP, F	WINDSPEED, MPH	SOLAR RADIATION, BTU FT^2DAY^{-1}
7/25/74	0	86.0	63.0	13.4	80
	3	84.0	64.9	7.8	53
	6	79.0	69.1	7.2	27
	9	78.1	73.0	6.3	1396
	12	93.0	68.0	12.5	6041
	15	100.0	62.1	9.4	6026
	18	102.0	57.9	7.2	1794
	21	93.9	62.1	13.4	133
7/26/74	0	88.0	62.1	11.0	122
	3	84.9	60.1	5.6	80
	6	82.0	62.1	9.4	106
	9	87.1	64.9	23.5	2856
	12	95.0	64.0	7.8	6371
	15	97.0	64.9	4.0	3053
	18	73.9	71.1	6.3	53
	21	77.0	71.1	4.7	0
7/27/74	0	75.9	72.0	0.0	0
	3	75.0	71.1	3.1	0
	6	73.0	71.1	0.9	0
	9	81.0	73.9	3.1	2999
	12	91.0	70.0	4.7	6052
	15	96.1	68.0	5.6	5378
	18	93.9	69.1	8.7	1991
	21	86.0	64.9	5.6	0
7/28/74	0	82.0	72.0	3.1	0
	3	79.0	72.0	3.1	0
	6	77.0	72.0	2.5	0
	9	87.1	75.9	1.6	2920
	12	95.0	75.0	2.5	6185
	15	98.1	75.0	4.7	5707
	18	98.1	73.9	5.6	1858
	21	90.0	71.1	6.3	0

TABLE 2.3-7A
ONSITE METEOROLOGICAL DATA

(Sheet 5 of 11)

DATE	HOUR	AIR TEMP, F	DEWPOINT, TEMP, F	WINDSPEED, MPH	SOLAR RADIATION, BTU $FT^2 DAY^{-1}$
7/29/74	0	84.0	71.1	4.7	0
	3	80.1	71.1	4.0	0
	6	75.9	70.0	3.1	0
	9	89.1	73.9	1.6	3053
	12	95.0	60.1	4.7	5458
	15	100.0	87.1	5.6	5909
	18	99.0	87.1	5.6	733
	21	77.0	66.9	11.0	0
7/30/74	0	75.0	68.0	3.1	0
	3	70.0	68.0	6.3	0
	6	70.0	70.0	2.5	0
	9	72.0	69.1	4.0	1062
	12	75.0	69.1	3.1	2527
	15	82.9	66.9	4.7	2325
	18	82.9	66.9	4.7	637
	21	80.1	68.0	4.0	0
7/31/74	0	77.0	68.0	0.0	0
	3	75.0	70.0	1.6	0
	6	72.0	69.1	1.6	0
	9	77.0	69.1	3.1	1327
	12	86.0	64.9	3.1	5707
	15	90.0	64.0	5.6	5707
	18	90.0	64.0	7.2	929
	21	82.0	69.1	7.2	0
8/1/74	0	75.0	70.0	7.2	0
	3	72.0	70.0	3.1	0
	6	70.0	70.0	3.1	0
	9	78.1	70.0	6.3	2150
	12	89.1	66.9	7.2	5197
	15	81.0	69.1	4.0	1630
	18	72.0	69.1	7.2	101
	21	72.0	70.0	7.2	0

TABLE 2.3-7A
ONSITE METEOROLOGICAL DATA

(Sheet 6 of 11)

DATE	HOUR	AIR TEMP, F	DEWPOINT, TEMP, F	WINDSPEED, MPH	SOLAR RADIATION, BTU FT^2DAY^{-1}
8/2/74	0	70.0	70.0	4.7	0
	3	71.1	70.0	3.1	0
	6	71.1	70.0	2.5	0
	9	77.0	69.1	5.6	1858
	12	89.1	73.9	2.5	4247
	15	86.0	70.0	10.3	6238
	18	86.0	64.9	7.2	1168
	21	80.1	64.9	4.7	0
8/3/74	0	75.0	66.9	2.5	0
	3	73.9	70.0	4.7	0
	6	72.0	69.1	1.6	0
	9	75.9	71.1	4.0	1529
	12	80.1	60.1	7.8	1746
	15	84.9	55.0	8.7	2756
	18	84.0	52.0	11.0	1593
	21	77.0	50.0	7.2	0
8/4/74	0	73.0	46.9	0.0	0
	3	70.0	48.9	2.5	0
	6	68.0	51.1	0.0	0
	9	75.0	51.1	4.7	1991
	12	81.0	54.0	5.6	5176
	15	86.0	57.9	5.6	5644
	18	86.0	57.0	4.0	865
	21	82.0	61.0	4.0	0
8/5/74	0	77.0	64.9	4.0	0
	3	73.9	66.9	1.6	0
	6	72.0	68.0	2.5	0
	9	73.9	69.1	4.7	1301
	12	79.0	64.0	7.8	1248
	15	78.1	64.0	6.3	743
	18	69.1	66.9	7.8	207
	21	68.0	66.0	2.5	0

TABLE 2.3-7A
ONSITE METEOROLOGICAL DATA

(Sheet 7 of 11)

DATE	HOUR	AIR TEMP, F	DEWPOINT, TEMP, F	WINDSPEED, MPH	SOLAR RADIATION, BTU FT^2DAY^{-1}
8/6/74	0	68.0	66.9	4.7	0
	3	66.9	66.9	3.1	0
	6	64.0	64.0	6.3	0
	9	66.9	64.9	2.5	345
	12	72.0	63.0	4.7	1555
	15	75.0	63.0	4.0	1497
	18	75.9	64.9	7.2	797
	21	72.0	69.1	4.0	0
8/7/74	0	69.1	69.1	4.7	0
	3	66.9	66.9	1.6	0
	6	66.9	66.9	0.9	0
	9	71.1	69.1	3.1	1762
	12	73.9	71.1	4.0	3483
	15	82.0	68.0	6.3	3971
	18	82.9	69.1	9.4	1741
	21	77.0	70.0	4.7	0
8/8/74	0	72.0	71.1	6.3	0
	3	71.1	71.1	5.6	0
	6	73.0	70.0	4.7	0
	9	71.1	71.1	7.2	547
	12	71.1	71.1	11.0	945
	15	79.0	72.0	13.4	1858
	18	82.9	72.0	14.1	1603
	21	79.0	75.0	11.9	0
8/9/74	0	75.0	75.0	7.8	0
	3	73.9	75.0	7.8	0
	6	75.0	73.9	8.7	0
	9	78.1	73.9	12.5	1757
	12	86.0	71.1	15.0	4587
	15	91.0	70.0	13.4	3823
	18	91.0	70.0	14.1	1858
	21	84.9	73.9	11.9	0

TABLE 2.3-7A
ONSITE METEOROLOGICAL DATA

(Sheet 8 of 11)

DATE	HOUR	AIR TEMP, F	DEWPOINT, TEMP, F	WINDSPEED, MPH	SOLAR RADIATION, BTU FT^2DAY^{-1}
8/10/74	0	80.1	72.0	12.5	0
	3	77.0	73.9	7.8	0
	6	77.0	73.9	5.6	0
	9	78.1	75.0	9.4	1375
	12	82.9	73.9	11.0	2123
	15	70.0	69.1	7.8	239
	18	71.1	69.1	3.1	865
	21	68.0	68.0	6.3	0
8/11/74	0	68.0	68.0	6.3	0
	3	66.0	64.9	7.2	0
	6	66.0	64.0	2.5	0
	9	72.0	71.1	1.6	1401
	12	78.1	70.0	5.6	2458
	15	82.9	73.0	7.2	4066
	18	86.0	72.0	3.1	1491
	21	81.0	73.0	3.1	0
8/12/74	0	77.0	72.0	3.1	0
	3	75.0	75.0	3.1	0
	6	77.0	73.9	6.3	0
	9	75.9	77.0	4.7	765
	12	84.0	73.9	6.3	3982
	15	89.1	71.1	6.3	4895
	18	90.0	66.0	4.7	1885
	21	84.0	68.0	1.6	0
8/13/74	0	73.0	73.0	4.7	0
	3	71.1	72.0	2.5	0
	6	72.0	68.0	2.5	0
	9	79.0	78.1	5.6	2750
	12	87.1	75.0	6.3	5314
	15	91.0	70.0	4.7	4640
	18	87.1	73.9	4.7	823
	21	82.9	73.9	4.0	0

TABLE 2.3-7A
ONSITE METEOROLOGICAL DATA

(Sheet 9 of 11)

DATE	HOUR	AIR TEMP, F	DEWPOINT, TEMP, F	WINDSPEED, MPH	SOLAR RADIATION, BTU FT^2DAY^{-1}
8/14/74	0	78.1	73.0	9.4	0
	3	73.9	73.9	3.1	0
	6	71.1	68.0	2.5	0
	9	80.1	77.0	5.6	2724
	12	89.1	73.0	7.8	6105
	15	91.9	70.0	4.7	4577
	18	93.0	70.0	7.2	1707
	21	86.0	71.1	6.3	0
8/15/74	0	79.0	73.0	4.0	0
	3	73.9	73.9	3.1	0
	6	71.1	68.0	4.0	0
	9	80.1	75.9	5.6	2788
	12	89.1	73.9	7.8	5973
	15	93.0	70.0	7.8	5776
	18	93.0	69.1	8.7	1848
	21	86.0	68.0	6.3	0
8/16/74	0	79.0	70.0	5.6	0
	3	77.0	75.0	6.3	0
	6	78.1	73.0	4.0	0
	9	80.1	75.9	7.2	2893
	12	88.0	73.0	7.2	6212
	15	93.0	69.1	6.3	5548
	18	95.0	66.0	15.7	1869
	21	86.0	68.0	11.0	0
8/17/74	0	81.0	70.0	7.2	0
	3	77.0	75.0	6.3	149
	6	73.9	75.0	2.5	133
	9	81.0	75.9	5.6	3079
	12	90.0	72.0	11.0	5999
	15	93.9	70.0	11.0	5309
	18	95.0	66.9	7.8	2060
	21	86.0	70.0	4.7	80

TABLE 2.3-7A
ONSITE METEOROLOGICAL DATA

(Sheet 10 of 11)

DATE	HOUR	AIR TEMP, F	DEWPOINT, TEMP, F	WINDSPEED, MPH	SOLAR RADIATION, BTU $FT^2 DAY^{-1}$
8/18/74	0	82.0	72.0	5.6	53
	3	79.0	73.0	6.3	186
	6	75.0	75.0	6.3	133
	9	82.0	77.0	11.9	3122
	12	91.0	72.0	10.3	6238
	15	95.0	69.1	9.4	5840
	18	96.1	66.9	5.6	2097
	21	87.1	69.1	3.1	175
8/19/74	0	82.0	69.1	4.7	133
	3	79.0	70.0	5.6	80
	6	75.0	73.9	9.4	80
	9	82.9	75.0	7.2	3026
	12	91.0	70.0	9.4	6105
	15	95.0	68.0	9.4	5574
	18	96.1	66.9	7.8	1746
	21	87.1	66.0	6.3	16
8/20/74	0	82.9	72.0	7.2	0
	3	79.0	77.0	7.2	16
	6	75.0	75.9	7.2	16
	9	82.0	73.9	8.7	3053
	12	91.0	70.0	11.0	6105
	15	95.0	68.0	10.3	5553
	18	93.9	68.0	9.4	1699
	21	87.1	71.1	7.2	0
8/21/74	0	80.1	71.1	4.7	0
	3	75.0	73.9	3.1	0
	6	73.0	66.9	2.5	0
	9	79.0	73.0	5.6	3026
	12	89.1	66.0	9.4	5978
	15	93.9	63.0	7.2	5335
	18	95.0	63.0	7.2	1673
	21	87.1	66.0	5.6	0

TABLE 2.3-7A
ONSITE METEOROLOGICAL DATA

(Sheet 11 of 11)

DATE	HOUR	AIR TEMP, F	DEWPOINT, TEMP, F	WINDSPEED, MPH	SOLAR RADIATION, BTU FT^2DAY^{-1}
8/22/74	0	80.1	66.9	3.1	0
	3	75.9	70.0	2.5	0
	6	73.0	72.0	0.0	0
	9	82.0	78.1	0.0	2813
	12	90.0	73.0	0.0	5707
	15	82.0	72.0	2.5	797
	18	82.0	73.9	5.6	133
	21	77.0	70.0	0.0	0
8/23/74	0	75.0	69.1	2.5	0
	3	72.0	66.9	2.5	0
	6	73.0	69.1	4.7	0
	9	81.0	73.0	0.0	2389
	12	88.0	73.9	3.1	5113
	15	95.0	75.0	3.1	4226
	18	93.0	73.0	7.2	1062
	21	81.0	66.9	7.8	0

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 1 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^2DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
8/26/90	0	82.9	66.9	0.0	0	0	29.38
	1	81.0	66.9	0.0	0	0	29.37
	2	81.0	66.9	0.0	0	0	29.37
	3	78.1	68.0	0.0	0	0	29.38
	4	78.1	68.0	0.0	0	0	29.38
	5	75.9	68.0	0.0	0	0	29.39
	6	75.0	66.9	0.0	0	0	29.41
	7	78.1	66.9	0.0	701	0	29.42
	8	84.9	68.0	6.7	2446	0	29.43
	9	88.0	69.1	6.7	4224	0	29.44
	10	91.9	70.0	0.0	5736	0	29.45
	11	95.0	69.1	0.0	6831	0	29.44
	12	98.1	68.0	4.9	6644	4	29.43
	13	99.0	68.0	4.3	6232	5	29.41
	14	99.0	66.0	0.0	5785	5	29.39
	15	100.0	66.0	4.9	5248	4	29.38
	16	100.0	63.0	0.0	4122	3	29.37
	17	100.0	64.0	0.0	2462	3	29.36
	18	98.1	66.0	3.4	792	3	29.36
	19	93.0	66.0	0.0	0	3	29.35
	20	90.0	64.9	0.0	0	0	29.36
	21	87.1	64.9	0.0	0	0	29.38
	22	86.0	64.9	0.0	0	0	29.38
	23	84.9	64.9	0.0	0	0	29.38
8/27/9	00	82.0	66.0	0.0	0	2	29.38
	1	82.0	66.0	0.0	0	2	29.38
	2	81.0	66.0	0.0	0	3	29.37
	3	81.0	64.9	0.0	0	7	29.37
	4	79.0	66.0	0.0	0	6	29.37
	5	81.0	66.0	0.0	0	6	29.38
	6	75.0	66.9	0.0	0	0	29.40

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 2 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU $FT^2 DAY^{-1}$	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	7	79.0	69.1	0.0	686	0	29.42
	8	87.1	69.1	0.0	2366	2	29.42
	9	91.9	64.0	0.0	4097	2	29.42
	10	95.0	63.0	0.0	5719	0	29.43
	11	99.0	62.1	0.0	6813	0	29.42
	12	100.0	62.1	0.0	7347	1	29.39
	13	100.0	64.0	0.0	7370	1	29.37
	14	102.0	63.0	0.0	6703	2	29.36
	15	102.0	64.0	0.0	5676	2	29.33
	16	102.0	64.0	0.0	4232	2	29.31
	17	99.0	64.9	0.0	2561	1	29.30
	18	99.0	64.0	3.4	810	0	29.31
	19	96.1	66.0	0.0	0	0	29.30
	20	93.0	66.9	0.0	0	0	29.31
	21	91.0	68.0	0.0	0	0	29.32
	22	87.1	69.1	0.0	0	0	29.33
	23	87.1	68.0	0.0	0	0	29.33
8/28/90	0	84.9	68.0	0.0	0	0	29.33
	1	84.9	69.1	0.0	0	0	29.33
	2	82.9	69.1	0.0	0	0	29.32
	3	82.0	68.0	0.0	0	0	29.32
	4	82.0	68.0	0.0	0	0	29.31
	5	78.1	69.1	0.0	0	0	29.32
	6	75.9	68.0	0.0	0	0	29.33
	7	78.1	69.1	0.0	671	0	29.34
	8	84.9	71.1	0.0	2411	0	29.35
	9	89.1	70.0	0.0	4190	0	29.35
	10	93.9	70.0	0.0	5701	0	29.36
	11	97.0	66.0	2.5	6794	0	29.35
	12	98.1	64.9	3.4	7374	0	29.34

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 3 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^{2}DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	13	98.1	63.0	0.0	7395	0	29.32
	14	99.0	64.9	4.9	6855	0	29.30
	15	100.0	66.0	3.4	5797	0	29.28
	16	100.0	66.0	6.7	4282	1	29.26
	17	99.0	62.1	4.3	2542	0	29.26
	18	97.0	64.0	3.4	778	0	29.25
	19	93.9	64.0	0.0	0	0	29.25
	20	89.1	66.0	0.0	0	0	29.27
	21	88.0	66.0	0.0	0	0	29.29
	22	86.0	66.0	0.0	0	0	29.30
	23	84.9	66.9	0.0	0	0	29.30
8/29/90	0	82.9	68.0	0.0	0	0	29.29
	1	82.9	69.1	2.5	0	0	29.29
	2	82.0	61.0	0.0	0	0	29.29
	3	81.0	69.1	0.0	0	0	29.29
	4	79.0	69.1	0.0	0	0	29.30
	5	77.0	70.0	0.0	0	0	29.30
	6	77.0	69.1	0.0	0	0	29.31
	7	78.1	70.0	0.0	657	0	29.32
	8	84.0	71.1	0.0	2394	0	29.33
	9	88.0	71.1	0.0	4172	0	29.34
	10	93.9	70.0	0.0	5684	0	29.35
	11	96.1	68.0	0.0	6775	0	29.35
	12	98.1	68.0	6.7	7305	1	29.33
	13	99.0	66.9	0.0	7371	0	29.30
	14	99.0	66.9	2.5	6827	0	29.28
	15	100.0	66.9	0.0	5728	1	29.26
	16	100.0	66.0	4.3	4164	2	29.24
	17	99.0	64.9	3.4	2489	1	29.24
	18	98.1	64.9	3.4	746	0	29.23

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 4 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^{2}DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	19	93.0	66.9	0.0	0	0	29.23
	20	89.1	68.0	0.0	0	0	29.25
	21	88.0	68.0	0.0	0	0	29.27
	22	87.1	68.0	3.4	0	0	29.28
	23	84.9	69.1	0.0	0	0	29.30
8/30/90	0	82.0	68.0	3.4	0	0	29.29
	1	82.0	69.1	3.4	0	0	29.29
	2	81.0	68.0	0.0	0	0	29.29
	3	82.0	68.0	0.0	0	0	29.29
	4	79.0	68.0	0.0	0	0	29.29
	5	77.0	68.0	0.0	0	0	29.30
	6	78.1	68.0	0.0	0	0	29.30
	7	79.0	69.1	0.0	641	0	29.31
	8	84.9	69.1	0.0	2376	0	29.32
	9	91.9	69.1	0.0	4155	0	29.32
	10	93.9	69.1	2.5	5666	0	29.33
	11	98.1	66.9	3.4	6756	0	29.33
	12	98.1	68.0	4.3	7284	1	29.31
	13	100.9	64.9	0.0	7155	2	29.29
	14	100.9	63.0	3.4	6755	1	29.27
	15	102.0	61.0	4.9	5733	0	29.25
	16	102.0	60.1	0.0	4239	0	29.23
	17	100.9	61.0	4.3	2468	0	29.22
	18	99.0	62.1	0.0	641	4	29.22
	19	93.0	62.1	0.0	0	4	29.22
	20	90.0	62.1	3.4	0	5	29.23
	21	89.1	64.0	4.3	0	4	29.24
	22	87.1	64.9	0.0	0	3	29.26
	23	84.9	66.9	4.9	0	2	29.27

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 5 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^2DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
8/31/90	0	82.9	66.9	4.9	0	3	29.27
	1	84.0	66.0	4.3	0	3	29.27
	2	82.0	66.0	0.0	0	2	29.26
	3	79.0	64.9	0.0	0	2	29.27
	4	80.1	66.9	0.0	0	2	29.27
	5	79.0	68.0	0.0	0	2	29.28
	6	78.1	66.0	0.0	0	1	29.29
	7	78.1	68.0	0.0	627	0	29.31
	8	87.1	69.1	0.0	2358	0	29.32
	9	91.9	66.0	4.3	4136	0	29.33
	10	95.0	68.0	3.4	5647	0	29.34
	11	99.0	66.9	7.6	6736	0	29.33
	12	100.9	64.9	4.3	7262	1	29.31
	13	102.9	64.9	6.7	7131	2	29.28
	14	106.0	61.0	4.3	6594	2	29.26
	15	105.1	63.0	3.4	5552	2	29.24
	16	102.9	61.0	4.3	3957	3	29.23
	17	104.0	59.0	4.9	2287	3	29.22
	18	100.9	60.1	3.4	523	6	29.22
	19	95.0	61.0	3.4	0	3	29.24
	20	89.1	64.0	3.4	0	0	29.25
	21	88.0	64.0	0.0	0	0	29.28
	22	87.1	62.1	0.0	0	2	29.30
	23	87.1	66.0	0.0	0	2	29.30
9/1/90	0	87.1	66.0	0.0	0	3	29.31
	1	86.0	66.9	4.3	0	2	29.30
	2	82.9	66.9	0.0	0	2	29.30
	3	80.1	66.0	6.7	0	2	29.30
	4	79.0	66.0	4.3	0	1	29.31
	5	77.0	64.9	4.3	0	1	29.32

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 6 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU $FT^2 DAY^{-1}$	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	6	77.0	66.0	0.0	0	2	29.33
	7	79.0	66.9	0.0	576	3	29.34
	8	84.0	69.1	4.3	1960	5	29.34
	9	86.0	70.0	0.0	3877	3	29.35
	10	90.0	69.1	6.7	4714	5	29.35
	11	91.0	68.0	6.7	6323	3	29.36
	12	91.9	68.0	0.0	4966	7	29.35
	13	93.0	66.0	4.3	5589	6	29.33
	14	99.0	64.9	4.3	4594	7	29.31
	15	98.1	60.1	10.7	5336	3	29.29
	16	97.0	57.0	13.4	4166	0	29.27
	17	97.0	55.0	14.1	2391	0	29.28
	18	93.9	51.1	11.6	583	4	29.30
	19	90.0	54.0	4.9	0	5	29.32
	20	84.9	55.9	0.0	0	4	29.34
	21	86.0	59.0	9.2	0	4	29.36
	22	82.0	66.0	10.1	0	4	29.38
	23	78.1	66.0	0.0	0	2	29.39
9/2/90	0	75.9	66.9	0.0	0	3	29.39
	1	73.9	66.9	0.0	0	5	29.39
	2	73.0	66.0	0.0	0	3	29.39
	3	72.0	66.0	0.0	0	3	29.40
	4	70.0	66.0	0.0	0	3	29.41
	5	70.0	66.0	0.0	0	3	29.43
	6	70.0	66.0	0.0	0	0	29.43
	7	72.0	66.9	0.0	597	0	29.44
	8	77.0	68.0	0.0	2322	0	29.45
	9	82.0	66.0	0.0	4100	0	29.47
	10	84.9	64.9	4.3	5609	0	29.48
	11	87.1	64.0	0.0	6695	0	29.48

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 7 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^{2}DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	12	91.0	63.0	6.7	7217	1	29.46
	13	91.0	62.1	3.4	7222	1	29.44
	14	93.0	63.0	8.3	6536	2	29.42
	15	93.0	61.0	7.6	5487	2	29.40
	16	93.9	62.1	8.3	4021	2	29.39
	17	93.9	62.1	9.2	2291	2	29.39
	18	91.0	62.1	4.9	603	2	29.39
	19	89.1	63.0	3.4	0	3	29.41
	20	86.0	64.0	0.0	0	4	29.43
	21	86.0	64.9	9.2	0	5	29.45
	22	82.9	66.0	4.3	0	2	29.46
	23	80.1	66.9	4.3	0	0	29.45
9/3/90	0	77.0	66.9	4.3	0	2	29.45
	1	75.9	66.9	0.0	0	3	29.44
	2	75.9	68.0	0.0	0	2	29.45
	3	75.9	66.9	0.0	0	2	29.46
	4	75.0	68.0	0.0	0	5	29.47
	5	75.9	68.0	0.0	0	6	29.48
	6	73.9	68.0	0.0	0	6	29.49
	7	75.9	70.0	0.0	548	3	29.51
	8	82.0	70.0	0.0	2289	1	29.52
	9	84.9	69.1	0.0	4054	1	29.53
	10	88.0	68.0	4.9	5554	1	29.54
	11	88.0	68.0	4.9	5980	4	29.53
	12	90.0	66.9	4.3	5546	6	29.52
	13	93.0	66.9	6.7	5548	6	29.50
	14	93.0	64.9	10.1	4553	7	29.48
	15	95.0	64.9	0.0	3816	7	29.46
	16	93.9	66.0	6.7	2788	7	29.45
	17	93.0	66.9	4.3	1937	5	29.44

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 8 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU $FT^2 DAY^{-1}$	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	18	93.0	64.9	4.9	527	4	29.45
	19	90.0	64.0	4.3	0	3	29.45
	20	87.1	66.9	3.4	0	3	29.48
	21	84.9	66.0	0.0	0	2	29.49
	22	82.9	66.9	3.4	0	0	29.49
	23	82.0	66.9	0.0	0	0	29.50
9/4/90	0	82.0	66.9	6.7	0	0	29.50
	1	80.1	66.9	6.7	0	0	29.51
	2	77.0	68.0	4.9	0	0	29.51
	3	75.9	66.9	0.0	0	0	29.53
	4	75.9	68.0	0.0	0	0	29.52
	5	75.0	68.0	0.0	0	0	29.54
	6	73.0	68.0	0.0	0	1	29.56
	7	77.0	68.0	0.0	568	0	29.58
	8	82.9	70.0	0.0	2286	0	29.60
	9	88.0	69.1	0.0	4062	0	29.60
	10	91.0	68.0	0.0	5570	0	29.60
	11	91.9	66.0	4.9	6609	1	29.60
	12	93.0	66.9	8.3	6794	3	29.58
	13	93.9	66.0	3.4	6465	4	29.56
	14	96.1	66.0	7.6	5957	4	29.54
	15	96.1	64.9	6.7	5238	3	29.52
	16	97.0	64.9	4.9	3816	3	29.50
	17	96.1	64.9	7.6	2258	1	29.48
	18	93.9	64.9	0.0	557	0	29.48
	19	91.0	64.0	0.0	0	1	29.48
	20	87.1	64.0	0.0	0	1	29.49
	21	86.0	64.9	0.0	0	2	29.50
	22	82.0	64.9	0.0	0	0	29.52
	23	81.0	66.0	0.0	0	2	29.53

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 9 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^{2}DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
9/5/90	0	81.0	66.0	0.0	0	2	29.52
	1	80.1	66.0	0.0	0	5	29.52
	2	80.1	66.0	0.0	0	5	29.53
	3	82.0	64.9	0.0	0	4	29.52
	4	75.9	66.0	0.0	0	3	29.52
	5	75.0	66.0	0.0	0	2	29.53
	6	75.0	64.9	0.0	0	1	29.53
	7	77.0	66.0	0.0	550	1	29.54
	8	84.0	66.9	0.0	2252	1	29.56
	9	88.0	68.0	4.3	4017	1	29.55
	10	91.9	68.0	2.5	5514	1	29.55
	11	97.0	64.9	2.5	6631	0	29.54
	12	98.1	64.9	0.0	7145	1	29.52
	13	99.0	66.0	4.9	7000	2	29.50
	14	99.0	64.0	4.3	6445	2	29.47
	15	100.0	64.0	0.0	5384	2	29.44
	16	98.1	64.0	0.0	3596	4	29.42
	17	99.0	62.1	0.0	2219	1	29.40
	18	97.0	61.0	0.0	494	3	29.40
	19	93.0	66.0	0.0	0	7	29.39
	20	88.0	64.9	0.0	0	3	29.40
	21	88.0	66.0	4.3	0	8	29.42
	22	84.9	66.9	0.0	0	10	29.42
	23	84.0	68.0	0.0	0	10	29.41
9/6/90	0	82.0	68.0	0.0	0	10	29.41
	1	81.0	68.0	0.0	0	10	29.40
	2	81.0	66.9	0.0	0	10	29.40
	3	79.0	68.0	0.0	0	8	29.39
	4	78.1	66.0	0.0	0	8	29.40
	5	75.0	66.9	0.0	0	8	29.40

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 10 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^2DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	6	75.0	66.9	0.0	0	7	29.40
	7	77.0	69.1	0.0	413	6	29.40
	8	82.0	68.0	0.0	2117	3	29.41
	9	88.0	68.0	0.0	3788	3	29.40
	10	93.0	68.0	0.0	5386	2	29.40
	11	96.1	66.9	0.0	6436	2	29.39
	12	98.1	64.9	4.3	6980	2	29.37
	13	99.0	64.9	4.3	6972	2	29.35
	14	100.0	64.9	6.7	6414	2	29.32
	15	100.0	64.0	7.6	5349	2	29.30
	16	100.0	64.0	3.4	3741	3	29.28
	17	99.0	64.0	6.7	2064	3	29.27
	18	97.0	64.0	8.3	414	5	29.26
	19	93.0	64.0	4.3	0	3	29.26
	20	89.1	64.9	2.5	0	2	29.27
	21	89.1	64.9	4.9	0	2	29.28
	22	87.1	64.9	3.4	0	5	29.29
	23	87.1	63.0	7.6	0	7	29.30
9/7/90	0	86.0	63.0	7.6	0	6	29.31
	1	84.0	63.0	7.6	0	4	29.31
	2	82.9	63.0	9.2	0	6	29.31
	3	80.1	64.0	4.9	0	6	29.32
	4	78.1	64.0	4.3	0	8	29.32
	5	78.1	64.9	4.3	0	8	29.33
	6	75.9	66.0	2.5	0	8	29.33
	7	77.0	68.0	0.0	306	8	29.33
	8	81.0	70.0	6.7	1302	8	29.33
	9	84.9	70.0	6.7	3067	6	29.34
	10	91.0	70.0	4.9	4936	4	29.34
	11	93.0	68.0	4.3	3846	8	29.35

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 11 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU $FT^2 DAY^{-1}$	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	12	96.1	66.9	3.4	2499	10	29.33
	13	98.1	64.0	4.9	2495	10	29.31
	14	99.0	63.0	7.6	2293	10	29.29
	15	98.1	61.0	4.9	3186	8	29.26
	16	98.1	62.1	7.6	2681	7	29.23
	17	97.0	61.0	10.7	1802	5	29.22
	18	95.0	62.1	8.3	437	3	29.23
	19	90.0	62.1	0.0	0	2	29.23
	20	88.0	63.0	0.0	0	10	29.26
	21	86.0	63.0	0.0	0	10	29.27
	22	86.0	64.0	0.0	0	10	29.28
	23	84.9	63.0	0.0	0	10	29.28
9/8/90	0	81.0	64.0	0.0	0	9	29.28
	1	82.9	64.0	0.0	0	9	29.28
	2	82.9	64.9	8.3	0	9	29.28
	3	84.0	66.9	4.3	0	9	29.29
	4	82.9	68.0	4.9	0	8	29.30
	5	82.0	69.1	2.5	0	9	29.30
	6	79.0	69.1	0.0	0	9	29.31
	7	79.0	69.1	0.0	178	10	29.32
	8	81.0	70.0	2.5	774	10	29.32
	9	82.9	70.0	6.7	1886	9	29.32
	10	89.1	71.1	6.7	2598	9	29.33
	11	91.0	70.0	6.7	2297	10	29.32
	12	93.0	68.0	6.7	2490	10	29.31
	13	88.0	64.9	4.9	2484	10	29.31
	14	82.0	70.0	0.0	2281	10	29.31
	15	79.0	71.1	7.6	1896	10	29.30
	16	75.9	73.0	7.6	1363	10	29.28
	17	75.9	73.9	0.0	739	10	29.28

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 12 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU $FT^2 DAY^{-1}$	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	18	77.0	73.9	4.3	152	10	29.29
	19	75.9	75.0	6.7	0	10	29.29
	20	77.0	73.9	0.0	0	10	29.30
	21	75.9	73.9	6.7	0	10	29.33
	22	73.9	72.0	4.9	0	10	29.33
	23	75.0	72.0	0.0	0	10	29.33
9/9/90	0	73.9	71.1	0.0	0	10	29.33
	1	73.9	71.1	0.0	0	9	29.33
	2	72.0	71.1	0.0	0	10	29.34
	3	73.0	71.1	0.0	0	10	29.34
	4	73.0	71.1	0.0	0	10	29.33
	5	73.0	72.0	0.0	0	10	29.33
	6	73.0	72.0	0.0	0	9	29.33
	7	73.9	73.0	0.0	235	9	29.34
	8	75.0	73.0	0.0	1280	8	29.35
	9	77.0	73.0	0.0	1877	9	29.37
	10	78.1	72.0	2.5	1913	10	29.38
	11	80.1	71.1	4.9	2289	10	29.40
	12	79.0	71.1	10.7	2481	10	29.38
	13	75.9	70.0	8.3	2474	10	29.37
	14	79.0	69.1	8.3	2270	10	29.36
	15	79.0	69.1	4.3	2547	9	29.34
	16	79.0	69.1	0.0	1348	10	29.33
	17	78.1	68.0	4.9	724	10	29.32
	18	77.0	69.1	0.0	142	10	29.33
	19	75.9	69.1	6.7	0	9	29.33
	20	73.9	70.0	4.3	0	9	29.35
	21	73.0	70.0	0.0	0	8	29.36
	22	72.0	70.0	0.0	0	7	29.36
	23	72.0	69.1	0.0	0	8	29.37

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 13 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^2DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
9/10/90	0	73.9	71.1	3.4	0	10	29.37
	1	73.9	71.1	0.0	0	10	29.37
	2	73.0	71.1	0.0	0	9	29.37
	3	72.0	70.0	0.0	0	9	29.36
	4	71.1	69.1	0.0	0	6	29.34
	5	72.0	70.0	0.0	0	10	29.36
	6	70.0	69.1	0.0	0	6	29.37
	7	71.1	70.0	0.0	328	7	29.38
	8	73.0	70.0	0.0	760	10	29.39
	9	73.9	69.1	4.3	1380	10	29.39
	10	72.0	70.0	4.9	1906	10	29.41
	11	72.0	71.1	8.3	2280	10	29.42
	12	73.9	71.1	8.3	2471	10	29.40
	13	79.0	70.0	6.7	2463	10	29.38
	14	81.0	69.1	4.3	3766	8	29.35
	15	77.0	71.1	0.0	2529	9	29.33
	16	80.1	66.9	6.7	2225	8	29.31
	17	81.0	66.9	13.4	1382	7	29.30
	18	78.1	66.9	7.6	288	6	29.31
	19	73.9	66.9	4.9	0	5	29.33
	20	72.0	66.9	0.0	0	3	29.34
	21	72.0	66.9	4.3	0	4	29.36
	22	71.1	68.0	0.0	0	5	29.36
	23	72.0	68.0	3.4	0	10	29.36
9/11/90	0	71.1	68.0	6.7	0	10	29.35
	1	71.1	68.0	4.9	0	10	29.34
	2	70.0	68.0	8.3	0	10	29.33
	3	70.0	68.0	8.3	0	10	29.31
	4	70.0	68.0	4.9	0	10	29.31
	5	70.0	68.0	8.3	0	10	29.32

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 14 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^{2}DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	6	69.1	69.1	7.6	0	10	29.33
	7	69.1	69.1	6.7	164	10	29.34
	8	69.1	69.1	9.2	753	10	29.34
	9	70.0	69.1	8.3	1372	10	29.35
	10	71.1	70.0	10.7	1897	10	29.36
	11	72.0	69.1	10.1	2271	10	29.36
	12	77.0	70.0	10.1	2462	10	29.35
	13	75.0	69.1	8.3	2452	10	29.34
	14	73.9	71.1	2.5	2244	10	29.32
	15	73.9	70.0	4.3	1855	10	29.31
	16	78.1	71.1	4.9	1784	9	29.28
	17	79.0	70.0	4.9	941	9	29.29
	18	78.1	70.0	0.0	165	9	29.29
	19	75.9	69.1	0.0	0	10	29.30
	20	75.0	71.1	0.0	0	10	29.31
	21	72.0	70.0	0.0	0	10	29.32
	22	72.0	70.0	0.0	0	10	29.33
	23	73.0	71.1	0.0	0	10	29.33
9/12/90	0	71.1	70.0	0.0	0	5	29.33
	1	71.1	70.0	0.0	0	8	29.32
	2	71.1	71.1	0.0	0	10	29.32
	3	71.1	71.1	0.0	0	8	29.31
	4	72.0	72.0	0.0	0	10	29.32
	5	72.0	71.1	0.0	0	10	29.33
	6	72.0	71.1	0.0	0	10	29.34
	7	73.0	72.0	0.0	158	10	29.36
	8	73.0	71.1	0.0	746	10	29.37
	9	73.9	71.1	0.0	1365	10	29.38
	10	75.9	71.1	0.0	2556	9	29.39
	11	81.0	71.1	2.5	3775	8	29.38

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 15 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^{2}DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	12	82.9	71.1	4.3	4091	8	29.37
	13	84.9	69.1	2.5	4073	8	29.35
	14	86.0	66.9	2.5	3725	8	29.33
	15	82.9	70.0	9.2	1842	10	29.31
	16	82.0	70.0	6.7	2177	8	29.31
	17	84.0	69.1	3.4	1324	7	29.30
	18	82.0	69.1	0.0	187	8	29.31
	19	80.1	71.1	0.0	0	8	29.31
	20	79.0	71.1	2.5	0	10	29.32
	21	77.0	72.0	0.0	0	8	29.33
	22	75.9	71.1	0.0	0	3	29.35
	23	73.9	70.0	0.0	0	3	29.35
9/13/90	0	73.9	70.0	0.0	0	3	29.35
	1	73.0	70.0	0.0	0	3	29.34
	2	71.1	69.1	0.0	0	3	29.34
	3	71.1	70.0	0.0	0	2	29.33
	4	71.1	70.0	0.0	0	6	29.33
	5	71.1	70.0	0.0	0	3	29.34
	6	71.1	70.0	0.0	0	4	29.35
	7	71.1	71.1	0.0	154	10	29.36
	8	73.9	72.0	0.0	740	10	29.37
	9	75.0	72.0	0.0	1357	10	29.38
	10	75.9	73.9	0.0	1881	10	29.38
	11	80.1	72.0	0.0	3049	9	29.38
	12	79.0	71.1	3.4	3303	9	29.36
	13	80.1	73.0	7.6	3287	9	29.35
	14	80.1	73.0	4.3	2219	10	29.33
	15	84.0	72.0	4.3	3050	8	29.30
	16	84.9	72.0	2.5	2152	8	29.28
	17	87.1	71.1	2.5	1296	7	29.28

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 16 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^{2}DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	18	84.0	70.0	2.5	263	4	29.28
	19	81.0	70.0	0.0	0	2	29.28
	20	78.1	71.1	4.3	0	5	29.30
	21	75.9	71.1	0.0	0	2	29.32
	22	75.9	71.1	4.3	0	2	29.33
	23	75.9	71.1	0.0	0	1	29.33
9/14/90	0	73.9	71.1	3.4	0	1	29.33
	1	73.0	71.1	0.0	0	1	29.34
	2	73.0	71.1	0.0	0	4	29.34
	3	73.9	73.0	2.5	0	10	29.34
	4	73.9	73.0	0.0	0	10	29.34
	5	75.0	73.0	0.0	0	10	29.35
	6	73.9	73.0	0.0	0	10	29.36
	7	75.0	72.0	0.0	202	9	29.37
	8	80.1	72.0	0.0	1427	7	29.38
	9	81.0	72.0	2.5	2252	8	29.40
	10	82.9	72.0	0.0	3647	7	29.40
	11	87.1	72.0	4.3	3036	9	29.40
	12	88.0	71.1	3.4	3289	9	29.38
	13	91.0	68.0	2.5	4035	8	29.36
	14	93.0	68.0	2.5	3682	8	29.34
	15	95.0	68.0	4.3	3026	8	29.32
	16	93.9	66.9	0.0	2126	8	29.31
	17	90.0	70.0	3.4	880	9	29.30
	18	89.1	70.0	4.3	126	9	29.30
	19	84.9	71.1	0.0	0	8	29.31
	20	82.0	72.0	0.0	0	3	29.32
	21	80.1	72.0	0.0	0	3	29.33
	22	78.1	71.1	6.7	0	3	29.34
	23	78.1	72.0	0.0	0	3	29.32

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 17 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU $FT^2 DAY^{-1}$	CLOUD COVER, TENTHS	PRESSURE, IN Hg
9/15/90	0	75.9	71.1	0.0	0	2	29.32
	1	75.0	71.1	0.0	0	2	29.32
	2	75.0	71.1	0.0	0	2	29.32
	3	73.9	71.1	0.0	0	2	29.31
	4	72.0	70.0	0.0	0	2	29.31
	5	71.1	70.0	0.0	0	2	29.32
	6	72.0	70.0	0.0	0	5	29.32
	7	73.0	71.1	0.0	195	9	29.35
	8	78.1	73.9	0.0	1210	8	29.35
	9	86.0	72.0	0.0	3212	5	29.35
	10	89.1	70.0	2.5	5015	3	29.34
	11	91.0	69.1	2.5	5721	4	29.33
	12	93.0	66.9	4.3	5792	5	29.31
	13	93.9	66.0	2.5	5759	5	29.29
	14	96.1	63.0	2.5	5249	5	29.26
	15	96.1	62.1	3.4	4606	4	29.23
	16	96.1	63.0	4.9	2452	7	29.21
	17	93.9	63.0	3.4	1061	8	29.20
	18	90.0	64.0	3.4	114	9	29.20
	19	84.9	64.9	0.0	0	10	29.20
	20	82.9	63.0	0.0	0	10	29.21
	21	82.0	64.9	0.0	0	10	29.22
	22	81.0	66.9	2.5	0	10	29.22
	23	80.1	68.0	3.4	0	10	29.22
9/16/90	0	77.0	69.1	2.5	0	10	29.22
	1	77.0	70.0	0.0	0	10	29.22
	2	75.9	70.0	0.0	0	10	29.22
	3	75.0	70.0	0.0	0	9	29.23
	4	75.9	71.1	0.0	0	10	29.22
	5	75.0	71.1	0.0	0	9	29.23

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 18 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU $FT^2 DAY^{-1}$	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	6	75.0	71.1	0.0	0	8	29.24
	7	73.9	71.1	0.0	271	7	29.25
	8	82.9	73.0	0.0	1398	7	29.26
	9	87.1	73.0	0.0	2920	6	29.27
	10	90.0	71.1	4.3	4062	6	29.27
	11	93.0	70.0	2.5	3713	8	29.27
	12	95.0	66.0	6.7	3260	9	29.24
	13	95.0	64.9	0.0	3240	9	29.22
	14	95.0	63.0	7.6	2950	9	29.20
	15	95.0	66.9	8.3	1785	10	29.18
	16	93.9	68.0	8.3	1244	10	29.17
	17	91.9	66.0	8.3	621	10	29.19
	18	91.0	66.9	8.3	76	10	29.20
	19	88.0	66.0	0.0	0	10	29.22
	20	87.1	69.1	6.7	0	10	29.26
	21	82.9	68.0	14.1	0	10	29.30
	22	79.0	68.0	4.9	0	10	29.26
	23	78.1	66.0	0.0	0	10	29.26
9/17/90	0	75.9	66.9	0.0	0	9	29.25
	1	73.9	66.9	0.0	0	10	29.27
	2	75.0	68.0	0.0	0	10	29.30
	3	73.9	66.9	0.0	0	10	29.30
	4	75.0	68.0	0.0	0	10	29.30
	5	73.9	68.0	0.0	0	9	29.31
	6	73.9	68.0	0.0	0	9	29.31
	7	75.0	69.1	2.5	182	9	29.33
	8	78.1	72.0	3.4	711	10	29.35
	9	80.1	73.9	6.7	1326	10	29.36
	10	82.0	73.0	13.4	2499	9	29.37
	11	84.9	73.0	9.2	2998	9	29.37

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 19 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^2DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	12	87.1	72.0	8.3	2399	10	29.36
	13	88.0	70.0	10.1	2382	10	29.34
	14	90.0	69.1	9.2	2931	9	29.32
	15	91.9	69.1	9.2	3447	7	29.30
	16	91.0	69.1	8.3	2050	8	29.30
	17	88.0	69.1	4.9	820	9	29.30
	18	88.0	69.1	7.6	68	10	29.31
	19	75.0	72.0	7.6	0	10	29.32
	20	77.0	75.0	0.0	0	10	29.35
	21	75.9	75.0	0.0	0	9	29.37
	22	75.9	73.0	0.0	0	10	29.38
	23	75.0	73.0	0.0	0	8	29.39
9/18/90	0	75.0	72.0	0.0	0	7	29.39
	1	73.9	73.0	0.0	0	3	29.39
	2	73.9	73.0	0.0	0	5	29.38
	3	73.0	72.0	0.0	0	4	29.38
	4	73.0	72.0	0.0	0	5	29.39
	5	73.0	73.0	0.0	0	9	29.39
	6	73.0	73.0	0.0	0	8	29.40
	7	73.9	73.0	0.0	216	8	29.42
	8	77.0	73.9	4.9	1541	6	29.43
	9	81.0	73.9	4.9	2567	7	29.44
	10	84.0	73.0	7.6	4023	6	29.44
	11	87.1	72.0	7.6	5647	4	29.43
	12	90.0	71.1	8.3	6424	3	29.41
	13	91.9	69.1	9.2	6376	3	29.39
	14	93.0	69.1	4.9	5793	3	29.36
	15	93.9	69.1	6.7	4494	4	29.34
	16	93.9	68.0	7.6	2903	5	29.32
	17	93.0	68.0	9.2	1514	4	29.31

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 20 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^{2}DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	18	91.0	68.0	9.2	168	2	29.31
	19	87.1	69.1	4.9	0	1	29.33
	20	84.0	70.0	0.0	0	4	29.35
	21	84.0	70.0	4.9	0	3	29.36
	22	82.0	72.0	0.0	0	3	29.38
	23	81.0	72.0	0.0	0	1	29.38
9/19/90	0	81.0	72.0	4.3	0	4	29.37
	1	79.0	72.0	4.3	0	2	29.36
	2	78.1	72.0	4.3	0	7	29.35
	3	78.1	72.0	6.7	0	5	29.35
	4	77.0	72.0	4.3	0	2	29.33
	5	75.9	73.0	0.0	0	0	29.35
	6	73.9	72.0	0.0	0	1	29.37
	7	75.9	73.0	0.0	355	1	29.39
	8	80.1	73.0	4.9	1977	1	29.40
	9	82.9	72.0	4.9	3646	2	29.40
	10	87.1	71.1	10.1	5091	2	29.40
	11	87.1	69.1	10.7	4276	7	29.40
	12	89.1	71.1	4.9	4628	7	29.39
	13	91.9	69.1	6.7	6343	3	29.36
	14	93.0	71.1	4.9	5756	3	29.31
	15	93.9	70.0	9.2	4457	4	29.28
	16	93.9	70.0	9.2	2332	7	29.26
	17	93.0	69.1	9.2	1123	7	29.26
	18	90.0	68.0	3.4	126	5	29.27
	19	86.0	66.9	0.0	0	7	29.29
	20	84.9	70.0	0.0	0	6	29.30
	21	82.9	70.0	3.4	0	5	29.29
	22	79.0	70.0	0.0	0	2	29.32
	23	81.0	71.1	7.6	0	4	29.35

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 21 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^2DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
9/20/90	0	80.1	71.1	4.3	0	9	29.35
	1	75.9	72.0	0.0	0	10	29.34
	2	75.9	72.0	0.0	0	9	29.34
	3	75.9	72.0	0.0	0	6	29.34
	4	75.0	71.1	3.4	0	7	29.34
	5	75.0	71.1	0.0	0	9	29.34
	6	73.9	71.1	0.0	0	9	29.35
	7	75.0	71.1	2.5	120	10	29.35
	8	77.0	72.0	2.5	689	10	29.35
	9	80.1	72.0	0.0	1302	10	29.36
	10	82.0	73.0	7.6	1820	10	29.36
	11	84.9	72.0	9.2	2186	10	29.35
	12	87.1	73.0	9.2	2366	10	29.34
	13	88.0	72.0	9.2	2345	10	29.32
	14	88.0	69.1	9.2	2126	10	29.30
	15	91.0	69.1	10.1	1726	10	29.27
	16	73.0	70.0	7.6	1182	10	29.31
	17	73.0	71.1	0.0	561	10	29.26
	18	75.0	72.0	0.0	46	10	29.27
	19	75.0	71.1	0.0	0	10	29.28
	20	75.0	72.0	0.0	0	10	29.30
	21	75.9	72.0	0.0	0	10	29.31
	22	75.0	71.1	0.0	0	8	29.31
	23	75.0	72.0	0.0	0	8	29.32
9/21/90	0	77.0	72.0	0.0	0	8	29.30
	1	75.0	72.0	0.0	0	6	29.31
	2	75.0	73.0	0.0	0	4	29.32
	3	75.9	73.0	0.0	0	9	29.32
	4	75.9	73.9	0.0	0	9	29.33
	5	75.9	73.9	4.9	0	6	29.33

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 22 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^2DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	6	75.9	73.9	4.9	0	9	29.33
	7	77.0	73.9	7.6	225	7	29.33
	8	79.0	75.0	10.1	1137	8	29.34
	9	82.0	73.9	10.1	2158	8	29.34
	10	82.9	73.9	11.6	2450	9	29.34
	11	84.0	73.9	10.7	2175	10	29.36
	12	82.9	73.0	7.6	2354	10	29.36
	13	82.9	73.0	0.0	2333	10	29.34
	14	82.0	71.1	7.6	2112	10	29.34
	15	82.0	71.1	7.6	1711	10	29.33
	16	82.0	71.1	4.9	1167	10	29.32
	17	81.0	70.0	7.6	547	10	29.33
	18	78.1	70.0	8.3	40	10	29.34
	19	75.9	71.1	4.3	0	10	29.34
	20	75.0	71.1	0.0	0	10	29.35
	21	75.0	71.1	0.0	0	10	29.37
	22	73.9	71.1	4.3	0	10	29.39
	23	75.9	73.0	0.0	0	10	29.39
9/22/90	0	73.0	71.1	0.0	0	8	29.40
	1	73.9	72.0	3.4	0	10	29.40
	2	73.9	72.0	0.0	0	10	29.40
	3	73.9	73.0	3.4	0	10	29.40
	4	73.9	73.0	4.3	0	10	29.41
	5	73.9	71.1	8.3	0	10	29.42
	6	73.9	71.1	6.7	0	10	29.43
	7	73.0	69.1	4.3	111	10	29.44
	8	73.9	68.0	6.7	912	9	29.46
	9	77.0	66.9	10.1	2502	7	29.47
	10	78.1	64.0	9.2	3507	7	29.48
	11	82.9	61.0	4.9	4738	6	29.48

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 23 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^{2}DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	12	84.9	57.9	7.6	5127	6	29.48
	13	87.1	57.0	7.6	4517	7	29.46
	14	84.9	57.0	8.3	4085	7	29.45
	15	88.0	55.0	4.9	2829	8	29.44
	16	87.1	53.1	10.7	1151	10	29.43
	17	84.9	55.0	15.0	532	10	29.45
	18	82.0	55.0	14.1	34	10	29.47
	19	80.1	57.0	0.0	0	10	29.47
	20	75.9	55.9	3.4	0	10	29.48
	21	73.0	57.0	0.0	0	10	29.50
	22	71.1	57.0	0.0	0	7	29.53
	23	70.0	57.0	0.0	0	7	29.54
9/23/90	0	68.0	59.0	0.0	0	7	29.55
	1	68.0	59.0	6.7	0	7	29.56
	2	70.0	55.0	6.7	0	8	29.58
	3	66.9	51.1	7.6	0	10	29.59
	4	66.0	48.0	10.1	0	5	29.61
	5	63.0	46.9	10.7	0	2	29.63
	6	62.1	46.0	11.6	0	1	29.65
	7	61.0	43.0	10.7	303	1	29.67
	8	62.1	42.1	15.0	1892	1	29.69
	9	64.9	37.9	14.1	3551	2	29.71
	10	66.9	37.9	14.1	5086	1	29.71
	11	69.1	37.9	10.7	6115	1	29.70
	12	71.1	37.0	14.1	6616	1	29.69
	13	72.0	37.0	11.6	6590	0	29.67
	14	73.0	37.9	13.4	5954	0	29.65
	15	75.0	37.0	11.6	4802	0	29.62
	16	73.9	37.9	13.4	3222	1	29.60
	17	73.0	37.9	10.7	1439	2	29.59

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 24 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^2DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
	18	70.0	37.9	8.3	75	3	29.60
	19	63.0	39.9	6.7	0	2	29.59
	20	59.0	42.1	4.3	0	3	29.60
	21	61.0	42.1	4.9	0	4	29.61
	22	57.9	44.1	4.3	0	10	29.62
	23	55.0	44.1	3.4	0	9	29.61
9/24/90	0	55.9	44.1	4.9	0	10	29.60
	1	57.0	42.1	4.3	0	10	29.60
	2	55.9	43.0	0.0	0	10	29.60
	3	54.0	43.0	3.4	0	9	29.60
	4	54.0	43.0	0.0	0	8	29.60
	5	55.0	43.0	4.3	0	9	29.60
	6	54.0	44.1	3.4	0	8	29.60
	7	57.0	46.0	0.0	171	8	29.62
	8	60.1	46.0	0.0	1099	8	29.62
	9	64.9	44.1	6.7	2115	8	29.62
	10	66.9	37.9	4.9	2973	8	29.62
	11	70.0	39.9	4.9	4174	7	29.60
	12	72.0	39.9	4.9	3869	8	29.58
	13	75.0	39.9	9.2	5020	6	29.55
	14	77.0	37.9	4.9	3453	8	29.52
	15	75.0	41.0	7.6	2253	9	29.50
	16	73.0	39.9	8.3	1120	10	29.48
	17	73.0	37.9	3.4	503	10	29.47
	18	72.0	41.0	3.4	31	9	29.46
	19	69.1	45.0	3.4	0	10	29.45
	20	68.0	45.0	3.4	0	8	29.45
	21	66.9	46.0	4.3	0	8	29.44
	22	66.9	46.9	4.3	0	10	29.44
	23	68.0	46.9	4.3	0	10	29.44

TABLE 2.3-7B
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 25 of 25)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^2DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE, IN Hg
9/25/90	0	66.9	48.0	4.9	0	8	29.42
	1	64.0	46.9	6.7	0	3	29.41
	2	61.0	48.9	4.9	0	2	29.41
	3	61.0	48.9	6.7	0	1	29.40
	4	62.1	48.9	7.6	0	1	29.40
	5	62.1	50.0	7.6	0	7	29.41
	6	61.0	50.0	7.6	0	4	29.40
	7	62.1	51.1	6.7	277	1	29.40
	8	66.9	50.0	13.4	1861	0	29.40
	9	72.0	51.1	8.3	3596	0	29.41
	10	75.9	50.0	8.3	5064	0	29.40
	11	81.0	50.0	8.3	6094	0	29.39
	12	82.9	51.1	10.1	6591	0	29.37
	13	84.0	53.1	8.3	6515	0	29.35
	14	84.9	54.0	8.3	5871	0	29.33
	15	86.0	55.9	6.7	4714	0	29.31
	16	86.0	55.9	7.6	3154	0	29.29
	17	86.0	55.0	7.6	1395	0	29.29
	18	82.9	54.0	8.3	53	0	29.29
	19	77.0	55.9	4.3	0	0	29.29
	20	77.0	55.9	8.3	0	0	29.30
	21	72.0	55.9	6.7	0	0	29.31
	22	71.1	57.0	8.3	0	0	29.32
	23	69.1	57.0	7.6	0	0	29.33

TABLE 2.3-7C
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 1 of 11)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^2DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE IN Hg
6/25/80	0	87.1	69.1	9.2	0	0	29.22
	3	84.0	73.0	10.1	0	0	29.22
	6	79.0	73.0	4.3	173	0	29.28
	9	91.9	73.9	9.2	4984	0	29.32
	12	100.9	72.0	13.4	7959	0	29.31
	15	108.0	66.0	10.1	6546	0	29.28
	18	105.1	64.0	9.2	1773	0	29.26
	21	93.0	61.0	9.2	0	0	29.27
6/26/80	0	84.0	64.0	6.7	0	0	29.29
	3	82.0	68.0	7.6	0	0	29.28
	6	81.0	66.9	9.2	168	1	29.29
	9	97.0	70.0	10.1	4976	0	29.32
	12	106.0	66.9	6.7	7956	0	29.32
	15	111.9	60.1	7.6	6548	0	29.28
	18	108.0	57.0	8.3	1776	0	29.27
	21	96.1	61.0	7.6	0	0	29.28
6/27/80	0	90.0	64.9	8.3	0	0	29.28
	3	86.0	66.0	8.3	0	0	29.27
	6	82.9	66.0	6.7	160	2	29.27
	9	98.1	66.9	7.6	4968	0	29.29
	12	108.0	64.9	4.9	7953	0	29.28
	15	111.9	64.0	7.6	6550	0	29.22
	18	109.0	62.1	10.7	1778	0	29.18
	21	97.0	63.0	8.3	0	0	29.21
6/28/80	0	91.0	66.0	10.7	0	0	29.23
	3	86.0	70.0	10.1	0	0	29.20
	6	82.0	70.0	6.7	159	0	29.23
	9	93.0	71.1	10.7	4960	0	29.27
	12	102.9	69.1	9.2	7950	0	29.26
	15	109.9	66.0	8.3	6551	0	29.22
	18	107.1	64.0	10.7	1780	0	29.19

TABLE 2.3-7C
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 2 of 11)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^{2}DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE IN Hg
	21	93.9	64.0	10.1	0	0	29.23
6/29/80	0	89.1	69.1	11.6	0	0	29.26
	3	84.0	69.1	10.7	0	0	29.24
	6	79.0	71.1	4.9	138	4	29.29
	9	91.0	71.1	6.7	4661	3	29.34
	12	100.0	68.0	7.6	7740	2	29.34
	15	106.0	64.9	7.6	6510	1	29.29
	18	105.1	59.0	10.1	1781	0	29.27
	21	91.0	63.0	6.7	0	0	29.30
6/30/80	0	88.0	64.9	9.2	0	0	29.33
	3	82.0	68.0	4.9	0	0	29.35
	6	79.0	69.1	4.9	140	3	29.36
	9	91.0	70.0	10.7	4942	0	29.40
	12	102.0	66.0	10.7	7944	0	29.38
	15	106.0	62.1	6.7	6511	1	29.33
	18	104.0	61.0	9.2	1782	0	29.29
	21	91.9	64.0	7.6	0	0	29.31
7/1/80	0	87.1	66.9	7.6	0	0	29.32
	3	84.0	72.0	8.3	0	0	29.32
	6	81.0	72.0	6.7	144	0	29.35
	9	93.9	71.1	10.1	4922	0	29.39
	12	104.0	64.9	11.6	7941	0	29.36
	15	109.0	62.1	7.6	6554	0	29.30
	18	105.1	63.0	10.1	1783	0	29.28
	21	95.0	64.9	7.6	0	0	29.30
7/2/80	0	89.1	66.9	8.3	0	0	29.35
	3	86.0	69.1	8.3	0	0	29.34
	6	81.0	69.1	6.7	139	0	29.37
	9	95.0	68.0	7.6	4924	0	29.40
	12	106.0	66.9	9.2	7937	0	29.39

TABLE 2.3-7C
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 3 of 11)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU $FT^2 DAY^{-1}$	CLOUD COVER, TENTHS	PRESSURE IN Hg
	15	109.9	61.0	7.6	6554	0	29.32
	18	106.0	57.9	10.7	1783	0	29.29
	21	95.0	64.0	10.7	0	0	29.33
7/3/80	0	86.0	63.0	4.9	0	0	29.31
	3	75.9	61.0	0.0	0	0	29.31
	6	80.1	64.9	7.6	133	0	29.36
	9	93.0	66.9	6.7	4915	0	29.37
	12	102.0	64.9	6.7	7933	0	29.35
	15	109.0	59.0	9.2	6554	0	29.29
	18	104.0	61.0	10.1	1781	0	29.28
	21	95.0	69.1	10.1	0	0	29.30
7/4/80	0	88.0	70.0	4.3	0	0	29.34
	3	86.0	71.1	9.2	0	5	29.33
	6	82.0	68.0	8.3	126	1	29.36
	9	91.9	68.0	7.6	4905	0	29.39
	12	99.0	66.9	4.9	7929	0	29.38
	15	102.9	64.0	9.2	6554	0	29.33
	18	100.0	64.0	6.7	1781	0	29.31
	21	91.0	64.0	6.7	0	0	29.34
7/5/80	0	84.9	64.9	4.9	0	0	29.37
	3	82.9	66.0	9.2	0	0	29.36
	6	79.0	69.1	6.7	122	0	29.41
	9	90.0	71.1	8.3	4896	0	29.44
	12	97.0	66.0	9.2	7925	0	29.43
	15	100.9	64.9	9.2	6554	0	29.36
	18	100.9	60.1	8.3	1778	0	29.33
	21	91.0	68.0	8.3	0	0	29.36
7/6/80	0	87.1	66.9	4.3	0	0	29.39
	3	82.9	69.1	4.9	0	0	29.39
	6	81.0	70.0	4.9	117	0	29.43

TABLE 2.3-7C
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 4 of 11)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^{2}DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE IN Hg
	9	91.0	69.1	8.3	4886	0	29.46
	12	97.0	68.0	9.2	6634	5	29.45
	15	104.0	66.0	10.1	5871	4	29.39
	18	100.0	64.0	9.2	1776	0	29.35
	21	91.0	66.0	6.7	0	0	29.37
7/7/80	0	86.0	66.0	4.3	0	0	29.40
	3	82.0	66.9	4.9	0	0	29.40
	6	82.0	70.0	7.6	110	0	29.42
	9	91.9	69.1	13.4	4876	0	29.47
	12	100.0	68.0	4.3	7866	1	29.46
	15	102.0	68.0	9.2	5871	4	29.40
	18	100.0	66.0	10.1	1727	2	29.35
	21	91.9	69.1	7.6	0	1	29.35
7/8/80	0	89.1	69.1	6.7	0	0	29.40
	3	84.9	70.0	6.7	0	0	29.43
	6	81.0	70.0	4.3	102	2	29.44
	9	89.1	71.1	6.7	4359	4	29.44
	12	100.9	68.0	13.4	7091	4	29.44
	15	105.1	64.9	10.7	6507	1	29.38
	18	100.9	64.0	10.7	1769	0	29.34
	21	91.9	64.0	4.3	0	0	29.36
7/9/80	0	87.1	66.0	6.7	0	0	29.38
	3	80.1	64.9	4.3	0	0	29.38
	6	79.0	66.0	6.7	99	0	29.42
	9	95.0	68.0	7.6	4855	0	29.44
	12	100.9	66.0	4.9	7703	2	29.43
	15	105.1	61.0	7.6	6378	2	29.36
	18	102.0	61.0	6.7	1478	5	29.33
	21	93.0	62.1	8.3	0	2	29.36

TABLE 2.3-7C
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 5 of 11)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^2DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE IN Hg
7/10/80	0	86.0	63.0	4.3	0	5	29.40
	3	80.1	63.0	4.3	0	0	29.39
	6	80.1	68.0	6.7	94	0	29.41
	9	93.9	70.0	9.2	4813	1	29.46
	12	100.0	66.0	6.7	7442	3	29.43
	15	102.0	62.1	3.4	6503	1	29.37
	18	102.0	61.0	4.3	1759	0	29.33
	21	91.9	63.0	6.7	0	0	29.36
7/11/80	0	87.1	63.0	4.9	0	0	29.37
	3	80.1	64.0	4.3	0	0	29.36
	6	79.0	66.9	4.9	88	0	29.39
	9	95.0	69.1	9.2	4834	0	29.41
	12	102.0	64.0	9.2	7695	2	29.38
	15	105.1	61.0	9.2	6500	1	29.32
	18	102.0	61.0	8.3	1754	0	29.28
	21	95.0	63.0	6.7	0	0	29.30
7/12/80	0	89.1	64.9	4.9	0	0	29.33
	3	84.0	64.9	9.2	0	0	29.32
	6	80.1	64.9	4.3	74	4	29.37
	9	93.9	69.1	8.3	4823	0	29.40
	12	100.9	64.9	6.7	7895	0	29.37
	15	106.0	64.0	10.7	6539	0	29.31
	18	102.9	61.0	8.3	1748	0	29.28
	21	90.0	59.0	4.3	0	0	29.29
7/13/80	0	84.0	61.0	4.3	0	0	29.32
	3	82.9	66.0	9.2	0	0	29.34
	6	79.0	66.0	4.9	77	0	29.36
	9	91.9	64.9	9.2	4812	0	29.40
	12	100.0	63.0	10.1	7890	0	29.39
	15	106.0	57.9	10.7	6536	0	29.31

TABLE 2.3-7C
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 6 of 11)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^2DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE IN Hg
	18	104.0	57.0	9.2	1741	0	29.28
	21	91.0	57.0	4.9	0	0	29.30
7/14/80	0	82.0	62.1	4.3	0	0	29.33
	3	84.9	64.9	6.7	0	0	29.35
	6	80.1	66.0	9.2	72	0	29.37
	9	91.9	66.0	10.1	4801	0	29.40
	12	102.9	61.0	13.4	7885	0	29.39
	15	107.1	59.0	9.2	6532	1	29.33
	18	102.9	62.1	10.1	1733	0	29.31
	21	93.0	64.9	7.6	0	0	29.33
7/15/80	0	88.0	64.9	4.9	0	0	29.35
	3	84.9	68.0	7.6	0	0	29.37
	6	82.0	69.1	9.2	65	2	29.40
	9	91.0	69.1	9.2	4790	0	29.42
	12	100.0	68.0	9.2	7880	0	29.40
	15	106.0	63.0	13.4	6528	0	29.34
	18	102.0	61.0	11.6	1725	0	29.30
	21	91.9	62.1	6.7	0	0	29.32
7/16/80	0	88.0	63.0	6.7	0	0	29.34
	3	84.9	64.9	10.1	0	0	29.35
	6	80.1	66.9	4.9	62	0	29.36
	9	91.9	69.1	9.2	4778	1	29.38
	12	102.0	62.1	6.7	7874	0	29.37
	15	108.0	53.1	6.7	6522	1	29.30
	18	106.0	48.9	4.3	1716	0	29.25
	21	90.0	52.0	6.7	0	0	29.26
7/17/80	0	86.0	53.1	0.0	0	0	29.31
	3	80.1	55.0	4.9	0	0	29.29
	6	81.0	59.0	6.7	43	6	29.31
	9	95.0	57.0	6.7	2784	8	29.34

TABLE 2.3-7C
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 7 of 11)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^2DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE IN Hg
	12	104.0	55.0	9.2	4595	8	29.32
	15	108.0	54.0	6.7	4442	7	29.27
	18	106.0	53.1	6.7	1607	3	29.22
	21	95.0	54.0	6.7	0	0	29.25
7/18/80	0	86.0	57.0	4.9	0	0	29.27
	3	81.0	57.0	4.9	0	0	29.26
	6	81.0	57.9	6.7	52	0	29.29
	9	95.0	61.0	9.2	4756	0	29.31
	12	104.0	60.1	3.4	7862	0	29.31
	15	109.0	59.0	10.1	5834	4	29.27
	18	105.1	57.9	8.3	1685	1	29.23
	21	95.0	59.0	6.7	0	0	29.28
7/19/80	0	89.1	60.1	4.3	0	0	29.31
	3	86.0	62.1	6.7	0	0	29.33
	6	84.0	64.0	4.3	47	0	29.35
	9	91.9	66.9	8.3	4744	0	29.38
	12	100.9	64.0	6.7	7856	0	29.36
	15	102.0	63.0	9.2	6463	1	29.31
	18	100.0	60.1	8.3	1685	0	29.28
	21	91.0	60.1	4.3	0	0	29.28
7/20/80	0	88.0	63.0	4.3	0	0	29.30
	3	82.0	62.1	4.3	0	0	29.30
	6	81.0	64.9	4.3	43	0	29.31
	9	89.1	66.0	4.3	4732	0	29.33
	12	98.1	64.0	8.3	7391	3	29.31
	15	102.9	63.0	4.3	5823	4	29.26
	18	100.9	60.1	4.9	1631	2	29.24
	21	90.0	60.1	3.4	0	1	29.27

TABLE 2.3-7C
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 8 of 11)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^2DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE IN Hg
7/21/80	0	86.0	63.0	2.5	0	4	29.29
	3	82.0	64.0	2.5	0	4	29.29
	6	80.1	64.9	2.5	37	2	29.31
	9	93.0	66.9	4.9	3953	5	29.36
	12	100.9	63.0	10.7	6569	5	29.32
	15	91.0	69.1	6.7	4423	7	29.29
	18	93.0	64.9	0.0	582	10	29.28
	21	82.9	69.1	0.0	0	9	29.31
7/22/80	0	82.9	68.0	4.3	0	5	29.33
	3	81.0	68.0	2.5	0	10	29.34
	6	78.1	68.0	3.4	20	8	29.37
	9	86.0	70.0	4.9	2749	8	29.40
	12	97.0	68.0	9.2	6564	5	29.38
	15	102.0	62.1	11.6	5430	5	29.30
	18	100.0	59.0	7.6	1606	2	29.28
	21	87.1	54.0	0.0	0	0	29.33
7/23/80	0	82.0	54.0	4.3	0	0	29.35
	3	75.9	53.1	6.7	0	0	29.33
	6	73.9	53.1	7.6	30	0	29.34
	9	87.1	55.0	4.3	4696	0	29.36
	12	97.0	43.0	10.7	7830	0	29.34
	15	102.9	46.0	13.4	6475	0	29.28
	18	100.0	53.1	9.2	1635	0	29.24
	21	89.1	59.0	6.7	0	0	29.27
7/24/80	0	81.0	57.9	0.0	0	0	29.29
	3	75.0	55.9	3.4	0	0	29.28
	6	73.0	59.0	4.3	27	1	29.30
	9	88.0	61.0	10.1	4410	3	29.34
	12	95.0	57.0	10.7	7772	1	29.32
	15	100.0	53.1	10.7	6424	1	29.28

TABLE 2.3-7C
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 9 of 11)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^{2}DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE IN Hg
	18	97.0	51.1	8.3	1611	1	29.26
	21	89.1	51.1	4.9	0	0	29.28
7/25/80	0	79.0	55.0	2.5	0	0	29.30
	3	77.0	57.9	0.0	0	0	29.29
	6	77.0	62.1	2.5	22	3	29.31
	9	91.0	66.0	10.7	4550	2	29.35
	12	100.0	64.9	4.9	6545	5	29.33
	15	104.0	63.0	10.7	5785	4	29.28
	18	100.0	57.9	7.6	1564	2	29.26
	21	91.9	57.9	4.9	0	0	29.28
7/26/80	0	87.1	60.1	4.9	0	0	29.29
	3	84.9	64.9	7.6	0	0	29.29
	6	81.0	66.0	6.7	21	1	29.31
	9	91.0	66.9	7.6	4659	0	29.32
	12	100.9	63.0	7.6	7807	0	29.29
	15	105.1	60.1	9.2	3765	8	29.23
	18	88.0	66.9	4.9	557	10	29.22
	21	84.0	66.9	3.4	0	3	29.23
7/27/80	0	82.0	64.0	2.5	0	0	29.25
	3	80.1	64.0	0.0	0	6	29.26
	6	80.1	66.9	2.5	8	9	29.27
	9	88.0	70.0	6.7	2714	8	29.28
	12	97.0	70.0	4.3	6989	4	29.27
	15	88.0	71.1	4.9	4387	7	29.20
	18	86.0	71.1	9.2	1073	7	29.22
	21	75.9	66.9	2.5	0	0	29.27
7/28/80	0	75.0	68.0	6.7	0	5	29.30
	3	73.0	68.0	2.5	0	2	29.28
	6	73.0	66.9	0.0	14	0	29.30
	9	82.9	70.0	3.4	4634	0	29.33

TABLE 2.3-7C
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 10 of 11)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU FT^{2}DAY^{-1}	CLOUD COVER, TENTHS	PRESSURE IN Hg
	12	95.0	71.1	3.4	7740	1	29.32
	15	100.9	61.0	6.7	6384	1	29.28
	18	99.0	55.9	8.3	1466	3	29.28
	21	86.0	59.0	0.0	0	0	29.30
7/29/80	0	82.0	66.9	7.6	0	0	29.32
	3	75.0	66.9	2.5	0	0	29.33
	6	72.0	64.9	2.3	12	0	29.36
	9	88.0	69.1	2.5	4621	0	29.40
	12	98.1	57.0	6.7	7783	0	29.39
	15	102.0	57.0	9.2	6414	0	29.35
	18	99.0	57.9	7.6	1540	0	29.32
	21	84.9	60.1	4.3	0	0	29.33
7/30/80	0	80.1	61.0	4.3	0	0	29.36
	3	77.0	63.0	6.7	0	0	29.35
	6	77.0	66.0	7.6	10	0	29.37
	9	90.0	68.0	7.6	4608	0	29.39
	12	100.9	61.0	8.3	7774	0	29.37
	15	105.1	57.9	7.6	6402	0	29.30
	18	102.0	55.0	9.2	1521	0	29.28
	21	91.9	61.0	10.1	0	0	29.31
7/31/80	0	87.1	59.0	7.6	0	0	29.36
	3	81.0	63.0	6.7	0	0	29.36
	6	80.1	66.0	6.7	8	0	29.39
	9	91.9	63.0	9.2	4595	0	29.42
	12	102.9	50.0	13.4	7765	0	29.40
	15	106.0	48.9	7.6	6389	0	29.35
	18	102.0	46.9	10.1	1502	0	29.32
	21	86.0	50.0	4.9	0	0	29.35

TABLE 2.3-7C
OFFSITE METEOROLOGICAL DATA USED IN ULTIMATE HEAT SINK WATER SUPPLY PERFORMANCE EVALUATION

(Sheet 11 of 11)

DATE	HOUR	AIR TEMP.F	DEW-POINT TEMP.F	WIND-SPEED MPH	SOLAR RADIATION BTU $FT^2 DAY^{-1}$	CLOUD COVER, TENTHS	PRESSURE IN Hg
8/01/80	0	80.1	57.0	4.9	0	0	29.38
	3	72.0	57.0	4.9	0	0	29.37
	6	75.9	59.0	4.9	7	0	29.39
	9	90.0	61.0	4.9	4581	0	29.43
	12	100.0	54.0	9.2	7756	0	29.40
	15	102.9	51.1	6.7	6375	0	29.33
	18	100.9	48.9	8.3	1473	1	29.28
	21	86.0	53.1	4.9	0	0	29.29
8/02/80	0	82.0	57.9	4.9	0	0	29.30
	3	78.1	55.9	4.9	0	0	29.28
	6	75.9	59.0	8.3	5	0	29.31
	9	90.0	66.0	13.4	4568	0	29.30
	12	99.0	63.0	11.6	7746	0	29.27
	15	104.0	57.0	13.4	6321	1	29.20
	18	102.0	57.9	10.7	1452	1	29.16
	21	93.9	60.1	8.3	0	0	29.17

TABLE 2.3-8
DELETED

TABLE 2.3-9
DELETED

TABLE 2.3-10
DELETED

TABLE 2.3-11
PERCENT FREQUENCY DISTRIBUTION OF WIND AT LOVE FIELD
(1951-1960)

(Sheet 1 of 13)

Annual

Wind Direction	Wind Speed (Miles per Hour) 0-3	4-7	8-12	13-18	19-24	≥25	Total
N	1	1	2	2	1	+	6
NNE	+	1	2	1	+	+	5
NE	1	2	2	1	+	+	5
ENE	+	1	1	1	+	+	4
E	+	1	2	+	+	+	4
ESE	+	1	2	1	+	+	5
SE	1	3	5	3	1	+	13
SSE	+	2	5	6	2	+	16
S	1	2	5	6	2	+	16
SSW	+	1	1	2	1	+	6
SW	1	1	1	1	+	+	4
WSW	+	+	+	+	+	+	1
W	+	1	+	+	+	+	2
WNW	+	1	1	+	+	+	2
NW	1	1	1	1	1	+	4
NNW	+	1	1	2	1	+	5
Calm	2						2
TOTAL	9	21	32	28	9	1	100

TABLE 2.3-11
PERCENT FREQUENCY DISTRIBUTION OF WIND AT LOVE FIELD
(1951-1960)

(Sheet 2 of 13)

January

Wind Direction	Wind Speed (Miles per Hour) 0-3	4-7	8-12	13-18	19-24	≥25	Total
N	1	3	3	3	1	+	10
NNE	1	2	2	1	+	0	6
NE	1	2	1	+	0	0	5
ENE	+	1	1	+	0	0	2
E	+	1	1	+	0	0	2
ESE	+	1	1	+	+	0	3
SE	1	2	4	2	+	0	9
SSE	+	2	5	4	1	+	12
S	1	1	5	6	2	+	14
SSW	+	1	1	2	1	+	5
SW	1	1	1	1	+	+	4
WSW	+	+	+	+	+	0	1
W	1	1	1	+	+	0	2
WNW	+	1	1	1	+	+	3
NW	1	2	2	2	1	+	8
NNW	1	2	3	3	1	+	10
Calm	3						3
TOTAL	13	22	31	26	8	1	100

TABLE 2.3-11
PERCENT FREQUENCY DISTRIBUTION OF WIND AT LOVE FIELD
(1951-1960)

(Sheet 3 of 13)

February

Wind Direction	Wind Speed (Miles per Hour) 0-3	4-7	8-12	13-18	19-24	≥25	Total
N	1	2	3	2	1	+	9
NNE	1	2	2	2	+	0	7
NE	1	3	2	1	+	0	6
ENE	+	1	1	+	+	0	3
E	1	1	1	+	+	0	3
ESE	+	1	2	1	+	0	4
SE	1	2	4	2	1	+	10
SSE	+	1	3	5	1	+	11
S	1	2	3	4	2	+	12
SSW	+	1	1	1	1	+	4
SW	1	1	1	1	+	+	5
WSW	+	+	+	+	+	+	1
W	1	1	+	+	+	+	3
WNW	+	1	1	1	1	+	3
NW	1	2	2	2	1	+	8
NNW	1	2	2	3	1	+	9
Calm	2						2
TOTAL	10	21	30	26	10	2	100

TABLE 2.3-11
PERCENT FREQUENCY DISTRIBUTION OF WIND AT LOVE FIELD
(1951-1960)

(Sheet 4 of 13)

March

Wind Direction	Wind Speed (Miles per Hour) 0-3	4-7	8-12	13-18	19-24	≥25	Total
N	1	2	3	2	1	+	8
NNE	+	2	2	2	+	0	6
NE	1	2	3	1	+	0	6
ENE	+	1	2	1	+	+	4
E	+	1	2	1	+	0	4
ESE	+	1	2	2	+	+	5
SE	+	2	4	3	1	0	9
SSE	+	1	3	6	3	+	13
S	+	1	2	5	3	1	12
SSW	+	+	1	2	1	+	5
SW	+	1	1	1	+	+	4
WSW	+	+	+	1	+	+	2
W	+	1	1	1	1	+	3
WNW	+	+	1	1	1	+	4
NW	+	1	1	2	1	1	6
NNW	+	1	2	3	2	+	8
Calm	1						1
TOTAL	6	17	29	31	14	3	100

TABLE 2.3-11
PERCENT FREQUENCY DISTRIBUTION OF WIND AT LOVE FIELD
(1951-1960)

(Sheet 5 of 13)

April

Wind Direction	Wind Speed (Miles per Hour) 0-3	4-7	8-12	13-18	19-24	≥25	Total
N	+	1	2	2	1	+	7
NNE	+	2	2	2	1	+	7
NE	1	2	2	1	+	+	6
ENE	+	1	1	1	+	+	3
E	+	1	1	1	+	0	3
ESE	+	1	1	1	+	+	4
SE	+	1	4	5	1	+	12
SSE	+	+	3	8	5	1	17
S	+	1	2	7	5	1	16
SSW	+	+	1	2	1	+	5
SW	+	1	1	1	+	+	3
WSW	+	+	+	1	+	+	2
W	+	1	1	+	+	+	2
WNW	+	+	+	1	1	+	2
NW	+	1	1	1	1	+	4
NNW	+	1	2	1	1	+	5
Calm	1						1
TOTAL	4	13	26	36	18	3	100

TABLE 2.3-11
PERCENT FREQUENCY DISTRIBUTION OF WIND AT LOVE FIELD
(1951-1960)

(Sheet 6 of 13)

May

Wind Direction	Wind Speed (Miles per Hour) 0-3	4-7	8-12	13-18	19-24	≥25	Total
N	1	1	2	1	+	+	5
NNE	+	1	1	1	+	0	4
NE	1	2	2	1	+	+	5
ENE	+	1	2	1	+	+	4
E	+	1	2	+	+	+	4
ESE	+	1	2	1	+	0	5
SE	1	2	5	5	1	+	14
SSE	+	2	4	9	4	1	18
S	+	1	4	9	5	1	19
SSW	+	1	1	2	1	+	6
SW	+	1	1	1	+	0	3
WSW	+	+	+	+	+	+	1
W	+	1	1	+	+	+	2
WNW	+	+	1	+	+	+	1
NW	+	1	1	1	+	+	3
NNW	+	1	1	1	+	+	4
Calm	1						1
TOTAL	6	18	29	32	13	2	100

TABLE 2.3-11
PERCENT FREQUENCY DISTRIBUTION OF WIND AT LOVE FIELD
(1951-1960)

(Sheet 7 of 13)

June

Wind Direction	Wind Speed (Miles per Hour) 0-3	4-7	8-12	13-18	19-24	≥25	Total
N	+	1	1	+	+	+	2
NNE	+	1	1	1	+	+	3
NE	+	1	1	+	+	+	4
ENE	+	1	2	1	+	0	4
E	+	1	2	1	+	0	4
ESE	+	1	3	2	+	0	6
SE	+	2	6	6	1	+	16
SSE	+	2	6	10	4	+	23
S	+	2	5	9	5	1	22
SSW	+	1	2	3	1	+	7
SW	+	1	1	1	+	+	4
WSW	+	+	+	+	+	0	1
W	+	+	+	+	0	+	1
WNW	+	+	+	+	+	+	1
NW	+	+	+	+	+	0	1
NNW	+	+	+	+	+	0	1
Calm	+						+
TOTAL	4	14	32	36	13	1	100

TABLE 2.3-11
PERCENT FREQUENCY DISTRIBUTION OF WIND AT LOVE FIELD
(1951-1960)

(Sheet 8 of 13)

July

Wind Direction	Wind Speed (Miles per Hour)						
	0-3	4-7	8-12	13-18	19-24	≥25	Total
N	+	1	1	+	+	0	2
NNE	+	1	1	1	+	+	2
NE	+	2	1	+	+	0	4
ENE	+	1	2	1	+	+	4
E	+	2	2	1	+	0	5
ESE	+	2	3	1	+	0	6
SE	1	4	6	4	1	+	16
SSE	+	2	7	8	1	+	19
S	+	3	8	8	2	+	21
SSW	+	1	3	3	1	+	9
SW	1	2	3	2	+	0	6
WSW	+	1	1	1	+	0	2
W	+	+	+	+	+	0	1
WNW	+	+	+	+	+	0	1
NW	+	+	+	+	+	0	1
NNW	+	+	+	+	+	+	1
Calm	1						1
TOTAL	5	21	39	29	6	+	100

TABLE 2.3-11
PERCENT FREQUENCY DISTRIBUTION OF WIND AT LOVE FIELD
(1951-1960)

(Sheet 9 of 13)

August

Wind Direction	Wind Speed (Miles per Hour) 0-3	4-7	8-12	13-18	19-24	≥25	Total
N	+	1	1	+	+	0	2
NNE	+	1	1	1	+	0	3
NE	1	2	1	+	+	+	4
ENE	+	2	2	1	+	0	5
E	1	2	2	1	+	0	5
ESE	+	2	3	1	+	+	7
SE	1	4	8	5	+	0	17
SSE	+	2	8	8	1	+	21
S	+	3	9	6	1	+	19
SSW	+	1	2	2	+	+	6
SW	+	1	2	1	+	+	5
WSW	+	+	+	+	0	0	1
W	+	+	+	+	0	0	1
WNW	+	+	+	+	+	0	1
NW	+	+	+	+	0	0	1
NNW	+	+	+	+	+	+	1
Calm	1						1
TOTAL	6	22	42	26	3	0	100

TABLE 2.3-11
PERCENT FREQUENCY DISTRIBUTION OF WIND AT LOVE FIELD
(1951-1960)

(Sheet 10 of 13)

September

Wind Direction	Wind Speed (Miles per Hour)						
	0-3	4-7	8-12	13-18	19-24	≥25	Total
N	1	1	1	1	+	0	4
NNE	1	2	2	1	+	+	6
NE	1	4	3	1	+	0	10
ENE	1	2	2	1	+	0	5
E	1	3	4	+	+	0	8
ESE	+	2	4	1	+	+	8
SE	1	4	8	3	+	0	16
SSE	+	2	6	5	1	+	15
S	1	2	5	5	1	+	14
SSW	+	1	1	2	+	0	4
SW	1	1	1	+	+	+	3
WSW	+	+	+	+	0	0	1
W	+	+	+	+	+	0	1
WNW	+	+	+	+	+	0	1
NW	+	1	+	+	+	0	2
NNW	+	1	1	+	+	0	2
Calm	2						2
TOTAL	9	26	40	22	3	+	100

TABLE 2.3-11
PERCENT FREQUENCY DISTRIBUTION OF WIND AT LOVE FIELD
(1951-1960)

(Sheet 11 of 13)

October

Wind Direction	Wind Speed (Miles per Hour) 0-3	4-7	8-12	13-18	19-24	≥25	Total
N	1	2	2	2	+	+	7
NNE	1	2	2	1	+	+	5
NE	1	3	1	+	+	0	6
ENE	+	2	1	+	+	0	4
E	1	2	1	+	+	0	4
ESE	1	2	3	+	+	0	6
SE	1	5	7	3	+	+	17
SSE	+	2	6	4	1	+	13
S	1	2	4	4	1	+	13
SSW	+	1	1	2	+	+	4
SW	1	1	1	1	+	0	4
WSW	+	+	+	+	+	0	1
W	+	1	+	+	+	0	2
WNW	+	1	+	+	+	+	2
NW	1	1	1	1	+	+	5
NNW	+	1	2	1	+	+	5
Calm	3						3
TOTAL	13	28	34	20	4	1	100

TABLE 2.3-11
PERCENT FREQUENCY DISTRIBUTION OF WIND AT LOVE FIELD
(1951-1960)

(Sheet 12 of 13)

November

Wind Direction	Wind Speed (Miles per Hour) 0-3	4-7	8-12	13-18	19-24	≥25	Total
N	1	2	2	2	1	+	9
NNE	1	2	2	1	+	+	6
NE	1	3	1	+	+	0	6
ENE	+	1	1	+	0	0	3
E	1	2	1	+	+	0	4
ESE	+	1	1	+	0	0	3
SE	1	4	3	1	+	0	9
SSE	+	2	4	5	1	0	12
S	1	2	5	5	2	+	15
SSW	+	1	1	2	1	+	5
SW	1	1	1	1	+	+	4
WSW	+	1	+	+	+	0	2
W	1	1	+	+	+	+	2
WNW	+	1	1	1	+	+	3
NW	1	2	1	1	1	+	6
NNW	1	2	2	2	1	+	7
Calm	4						4
TOTAL	15	26	27	23	7	1	100

TABLE 2.3-11
PERCENT FREQUENCY DISTRIBUTION OF WIND AT LOVE FIELD
(1951-1960)

(Sheet 13 of 13)

December

Wind Direction	Wind Speed (Miles per Hour)						
	0-3	4-7	8-12	13-18	19-24	≥25	Total
N	1	2	2	2	1	+	8
NNE	+	1	1	1	+	+	4
NE	1	1	1	1	+	0	4
ENE	+	1	1	+	+	0	2
E	+	1	1	+	+	0	2
ESE	+	1	1	1	+	+	3
SE	1	3	3	2	+	0	9
SSE	+	2	5	5	1	+	14
S	1	2	4	5	1	+	13
SSW	+	1	2	2	1	+	6
SW	1	2	1	1	+	0	5
WSW	+	1	+	+	+	+	2
W	1	1	1	1	+	+	4
WNW	1	1	1	1	+	+	5
NW	1	2	2	2	1	+	9
NNW	+	2	2	3	1	+	8
Calm	2						2
TOTAL	12	24	29	27	7	1	100

\+ indicates percentages less than 0.5 but greater than zero.

TABLE 2.3-12
MONTHLY VARIATION OF EXTREME "FASTEST MILE" WINDS FOR FORT WORTH AND DALLAS

	Fort Worth (1954-1973)			Dallas (1941-1973)		
Month	Speed (MPH)	Direction	Year	Speed (MPH)	Direction[(a)]	Year
January	46	N	1957	50	W	1966
February	51	N	1962[(b)]	61	SW	1948
March	55	WNW	1954	59	W	1954
April	55	NW	1970	58	N	1961
May	55	SE	1955	51	S	1952
June	52	NW	1955	65	N	1954
July	65	N	1961	43	S	1948
August	73	N	1959	53	SE	1954
September	53	ESE	1961[(b)]	47	NW	1954
October	44	W	1957	61	NW	1960
November	50	NNW	1957	49	NW	1957
December	53	NW	1968	47	W	1957[(b)]
Year	73	N	1959	65	N	1954

a) Direction recorded to 8 compass points only.

b) Record also occurred in earlier year(s).

TABLE 2.3-13
WIND DIRECTION PERSISTENCE AT FORT WORTH (1969-1973)

(Sheet 1 of 2)

Wind Sector	Consecutive 3–Hourly Observations[a]											
	2	3	4	5	6	7	8	9	10	11	12	≥15
N	274	130	74	37	19	10	6	4	1	0	0	0
NNE	131	48	14	4	2	0	0	0	0	0	0	0
NE	64	21	5	4	0	0	0	0	0	0	0	0
ENE	40	4	1	1	1	0	0	0	0	0	0	0
E	121	33	12	3	1	0	0	0	0	0	0	0
ESE	126	37	8	2	1	1	1	0	0	0	0	0
SE	185	64	25	10	4	2	0	0	0	0	0	0
SSE	363	136	58	24	8	4	2	1	0	0	0	0
S	662	332	179	116	62	38	20	15	9	7	5	2
SSW	263	89	32	10	3	0	0	0	0	0	0	0
SW	68	12	4	1	0	0	0	0	0	0	0	0
WSW	30	8	1	1	1	0	0	0	0	0	0	0
W	56	22	8	3	2	0	0	0	0	0	0	0
WNW	35	11	3	2	0	0	0	0	0	0	0	0
NW	94	39	18	8	2	2	1	1	0	0	0	0
NNW	192	89	37	20	14	10	2	1	1	1	1	0
Total	2704	1075	479	246	120	67	32	22	11	8	6	2

TABLE 2.3-13
WIND DIRECTION PERSISTENCE AT FORT WORTH (1969-1973)

(Sheet 2 of 2)

Wind Sector ±22.5°	Consecutive 3–Hourly Observations[a]											
	2	3	4	5	6	7	10	15	20	25	30	≥40
N	276	182	131	95	65	44	13	3	1	1	0	0
NNE	118	76	49	41	28	19	6	1	0	0	0	0
NE	105	45	25	14	9	5	0	0	0	0	0	0
ENE	64	29	16	10	9	6	3	0	0	0	0	0
E	172	80	41	22	14	10	1	0	0	0	0	0
ESE	165	102	64	43	27	14	6	0	0	0	0	0
SE	235	157	99	67	42	32	14	1	1	0	0	0
SSE	348	259	201	148	117	90	43	14	5	2	2	0
S	323	253	200	166	141	111	77	45	23	9	3	1
SSW	263	183	133	97	76	49	32	13	6	3	1	0
SW	95	49	25	10	5	1	0	0	0	0	0	0
WSW	61	30	13	5	2	1	0	0	0	0	0	0
W	83	37	22	12	10	6	1	1	0	0	0	0
WNW	61	32	17	10	5	5	3	2	0	0	0	0
NW	91	67	48	31	28	22	8	2	0	0	0	0
NNW	191	111	56	37	23	18	5	0	0	0	0	0
Total	2651	1692	1140	808	601	433	212	82	36	15	6	1

a) Values in each sector are cumulative, beginning with the longest duration.

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 1 of 26)

JANUARY (1973 - 1976): 10-METER LEVEL

WIND DIRECTION PERSISTENCE - PASQUILL ALL

1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	12	10	6	6	1	0	1	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
NE	4	4	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	9	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	27	7	4	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	23	7	9	2	1	3	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	31	14	7	3	2	1	3	2	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0
SSW	21	11	8	4	2	2	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
SW	9	12	5	2	2	0	0	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
WSW	14	4	5	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	10	12	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	15	3	2	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	26	15	8	5	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	22	12	7	6	5	2	1	1	1	1	0	1	2	1	0	0	0	0	1	0	0	0	0	2
N	21	7	10	3	1	1	5	1	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 2 of 26)

JANUARY (1973 - 1976): 10-METER LEVEL

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3.39	3.35	4.20	3.60	99.99	0.	2.28	0.	3.56	0.	0.	0.	99.99	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	2.72	3.05	1.68	3.20	3.56	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.05	2.38	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	1.05	0.	3.23	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.31	2.28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.57	2.50	2.15	1.88	2.63	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	3.24	3.72	3.16	3.93	2.44	3.44	5.09	5.20	0.	4.32	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	3.74	4.93	4.55	4.01	4.59	2.84	6.12	5.24	0.	5.62	0.	0.	0.	0.	0.	7.55	0.	0.	0.	0.	0.	0.	0.	0.
SSW	4.78	4.60	5.30	4.94	6.24	6.40	0.	7.24	0.	0.	0.	0.	7.21	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	4.78	4.18	3.99	6.12	4.34	0.	0.	6.70	6.43	0.	0.	5.25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	3.05	3.80	4.66	2.04	0.	3.91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	3.23	3.07	0.	7.32	1.74	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	3.63	2.36	4.00	2.42	0.	3.24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.86	3.07	2.95	2.73	9.89	3.61	2.94	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.64	3.96	3.82	4.57	5.21	3.76	6.48	99.99	3.91	6.04	0.	4.89	4.66	9.24	0.	0.	0.	0.	6.58	0.	0.	0.	0.	8.56
N	4.87	3.59	5.14	4.65	99.99	10.45	6.02	4.77	0.	5.25	4.58	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 2976

TOTAL NO. OF INVALID OBSERVATIONS = 133

99.99 INDICATES INVALID DATA POINT

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 3 of 26)

FEBRUARY (1973 - 1976): 10-METER LEVEL

WIND DIRECTION PERSISTENCE - PASQUILL ALL

1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	9	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	1	3	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	3	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	8	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	15	4	2	5	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	22	13	7	1	2	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
S	33	11	8	9	7	3	0	0	1	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0
SSW	21	16	7	5	9	2	3	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
SW	12	9	2	3	2	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	11	1	1	2	2	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	9	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	14	4	3	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	25	18	6	2	1	3	2	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0
NNW	24	16	4	1	2	3	4	2	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0
N	15	7	8	2	2	1	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 4 of 26)

FEBRUARY (1973 - 1976): 10-METER LEVEL

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.58	2.55	0.	0.	0.	3.96	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	6.48	2.44	2.74	2.02	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.14	2.12	2.40	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	2.34	1.86	0.	0.	2.03	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	3.44	4.25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	3.06	2.86	2.02	3.56	0.	1.60	0.	2.72	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	3.57	3.57	3.75	2.31	7.06	4.55	5.26	3.45	0.	0.	0.	0.	0.	0.	0.	5.57	0.	0.	0.	0.	0.	0.	0.	0.
S	3.49	5.55	4.59	5.56	5.77	6.56	0.	0.	8.53	0.	9.80	0.	0.	0.	4.73	0.	7.31	0.	0.	0.	0.	0.	0.	0.
SSW	4.59	4.25	5.70	5.58	7.09	5.51	7.05	8.76	0.	0.	0.	0.	4.15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	4.31	5.69	4.38	6.10	4.87	0.	0.	6.16	0.	5.40	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	4.46	4.92	4.95	5.60	6.20	7.40	0.	0.	5.18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	4.19	11.03	1.12	0.	3.00	0/	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.60	4.95	6.40	6.06	5.27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	4.67	4.33	5.44	8.37	3.84	4.34	7.27	0.	0.	3.81	0.	0.	0.	0.	8.81	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	4.51	4.60	4.32	6.28	5.17	4.67	5.17	6.28	10.46	5.24	.82	4.03	8.37	0.	0.	0.	0.	8.13	0.	0.	0.	0.	0.	0.
N	4.35	4.69	5.71	3.28	6.31	5.10	0.	5.11	9.83	0.	0.	6.15	6.38	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	7.78

TOTAL NO. OF OBSERVATIONS = 2715

TOTAL NO. OF INVALID OBSERVATIONS = 124

99.99 INDICATES INVALID DATA POINT

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 5 of 26)

MARCH (1973 - 1976): 10-METER LEVEL

WIND DIRECTION PERSISTENCE - PASQUILL ALL

1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	16	4	3	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	6	6	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	10	3	2	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
E	16	0	3	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	15	11	8	2	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	27	21	6	5	3	3	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
SSE	25	22	10	11	5	2	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
S	32	14	10	9	3	3	1	1	2	0	0	3	0	0	0	0	0	0	0	0	1	0	0	0
SSW	17	11	2	2	4	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	14	6	1	4	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	13	5	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	5	6	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	13	1	3	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	15	10	4	6	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	14	6	8	1	0	3	3	1	1	2	1	1	0	0	0	1	0	0	0	0	0	0	0	0
N	12	7	6	2	2	1	1	0	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	0

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 6 of 26)

MARCH (1973 - 1976): 10-METER LEVEL

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3.72	5.85	6.11	0.	0.	5.06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	2.45	3.42	4.03	3.76	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.35	2.81	3.75	0.	4.24	0.	0.	0.	0.	0.	4.58	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	3.08	0.	3.77	99.99	0.	2.55	0.	4.06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.91	3.49	4.27	4.68	7.47	4.07	4.41	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	3.33	4.42	2.90	5.41	6.37	6.03	0.	2.71	0.	0.	6.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	3.15	0.	0.
SSE	4.86	5.72	4.20	5.69	5.53	5.79	2.68	5.53	0.	0.	9.65	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	6.21	6.70	5.85	6.60	6.41	7.57	13.41	5.23	8.87	0.	0.	7.95.	0.	0.	0.	0.	0.	0.	0.	0.	8.76	0.	0.	0.
SSW	6.25	7.90	9.11	7.06	8.25	10.36	0.	0.	0.	9.17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	4.17	5.51	5.58	4.95	10.91	0.	0.	0.	0.	0.	5.23	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	5.32	5.30	5.07	0.	8.35	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	3.56	5.87	5.61	5.53	6.26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	5.80	1.48	5.48	3.38	0.	0.	0.	0.	6.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	4.69	4.66	5.54	6.24	6.40	0.	6.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	5.63	3.18	5.60	9.72	0.	6.13	8.69	6.81	5.45	6.71	7.50	7.68	0.	0.	0.	6.27	0.	0.	0.	0.	0.	0.	0.	0.
N	4.38	7.59	6.27	4.09	8.02	4.37	6.31	0.	6.24	0.	5.90	0.	0.	0.	7.72	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS =2976

TOTAL NO. OF INVALID OBSERVATIONS =125

99.99I NDICATES INVALID DATA POINT

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 7 of 26)

APRIL(1973-1976):10-METERLEVEL

WIND DIRECTION PERSISTENCE - PASQUILL ALL

1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	6	8	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	12	7	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	10	1	2	1	1	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	12	12	4	1	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	28	9	6	1	3	2	1	1	1	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0
SE	21	18	10	6	5	3	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	26	17	9	7	1	5	2	2	1	1	2	0	0	0	0	0	1	0	0	0	0	0	0	1
S	16	12	8	4	3	1	3	3	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
SSW	15	2	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	10	1	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	5	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	4	4	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	13	7	6	3	2	1	1	1	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0
NNW	17	12	4	1	2	1	3	0	0	1	2	0	0	0	0	1	0	0	0	0	0	0	0	1
N	7	5	3	3	1	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 8 of 26)

APRIL (1973-1976): 10-METER LEVEL

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.47	3.68	2.31	5.83	6.61	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	3.23	3.28	0.	0.	0.	2.04	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.64	1.39	3.43	6.03	3.67	0.	4.00	0.	0.	4.80	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	4.80	4.17	3.18	2.15	6.73	4.24	4.89	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	3.70	4.52	5.93	2.66	4.84	4.93	6.07	7.66	8.31	8.64	0.	0.	0.	5.97	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	4.34	4.00	3.69	3.81	5.90	6.42	4.04	5.25	4.50	5.24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	4.22	4.69	5.46	5.83	11.50	7.43	8.10	8.86	7.61	7.93	8.16	0.	0.	0.	0.	0.	7.51	0.	0.	0.	0.	0.	0.	7.63
S	4.46	6.00	6.05	7.30	4.80	7.18	8.52	7.15	0.	6.93	0.	0.	0.	0.	0.	0	0.	6.72	0.	0.	0.	0.	0.	0.
SSW	4.15	2.40	6.66	7.38	5.08	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.40	2.92	6.72	0.	0.	0.	0.	0.	6.55	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	5.82	5.27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	2.78	0.	8.10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.05	3.72	6.26	3.64	0.	0.	7.20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	3.81	4.00	5.35	2.83	4.29	9.76	3.93	6.04	0.	7.18	3.80	0.	0.	0.	0.	0.	0.	7.15	0.	0.	0.	0.	0.	0.
NNW	3.95	4.31	4.56	5.96	4.30	7.73	6.65	0.	0.	6.47	6.57	0.	0.	0.	0.	6.36	0.	0.	0.	0.	0.	0.	0.	7.57
N	2.64	3.78	3.29	3.18	7.81	4.45	0.	6.69	0.	99.99	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 2880

TOTAL NO. OF INVALID OBSERVATIONS = 217

99.99 INDICATES INVALID DATA POINT

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 9 of 26)

MAY (1972 - 1976): 10-METER LEVEL

WIND DIRECTION PERSISTENCE - PASQUILL ALL

1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	9	3	3	3	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	6	4	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	16	7	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	10	5	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	24	13	4	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
SE	25	9	5	2	6	0	3	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	41	17	10	12	2	0	3	1	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
S	31	21	5	8	6	4	3	1	1	4	0	2	1	0	0	0	0	0	0	0	0	0	0	0
SSW	16	5	10	2	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	13	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	11	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	3	3	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	12	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	14	6	4	2	4	1	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0
NNW	18	4	2	2	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	16	3	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 10 of 26)

MAY (1972 - 1976): 10-METER LEVEL

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3.01	3.10	3.64	3.16	0.	0.	5.09	1.77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	3.10	3.20	2.93	6.48	.34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.13	2.02	4.17	0.	3.89	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	3.05	1.92	3.73	1.13	2.60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	3.08	2.32	3.34	0.	2.15	0.	0.	2.61	0.	0.	0.	8.18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.71	3.71	3.68	2.79	3.82	0.	3.88	3.02	0.	3.21	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	3.13	4.26	3.41	3.76	3.45	0.	5.18	8.61	4.03	0.	0.	5.39	0.	0.	0.	0.	0.	3.28	0.	0.	0.	0.	0.	0.
S	3.54	4.00	4.39	5.39	3.44	3.97	4.78	4.42	4.00	5.02	0.	5.24	5.41	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	4.26	2.76	4.89	4.53	4.39	5.18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	2.86	2.59	0.	4.92	7.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	2.93	0.	.34	4.85	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	5.34	5.13	0.	4.70	0.	0.	0.	0.	0.	0.	4.91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	3.68	2.28	4.13	4.36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.36	3.26	5.02	4.20	3.92	6.00	0.	0.	0.	0.	5.10	5.23	0.	0.	0.	4.70	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.68	3.25	4.39	12.84	0.	4.74	3.90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	3.11	5.92	3.20	6.30	3.75	4.34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 2955

TOTAL NO. OF INVALID OBSERVATIONS = 292

99.99 INDICATES INVALID DATA POINT

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 11 of 26)

JUNE (1972 - 1975): 10-METER LEVEL

WIND DIRECTION PERSISTENCE - PASQUILL ALL

1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	6	2	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	11	5	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	7	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	16	9	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	26	8	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	49	24	9	5	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	51	27	13	4	3	3	3	3	0	0	1	0	0	2	0	0	1	0	0	0	0	0	0	0
S	44	20	11	13	7	5	4	3	2	3	2	1	2	1	0	2	1	0	0	0	0	0	0	0
SSW	22	13	6	6	2	5	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
SW	11	13	2	1	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	8	2	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	7	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 12 of 26)

JUNE (1972 - 1975): 10-METER LEVEL

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3.77	3.81	3.73	3.48	2.86	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	3.04	3.81	3.35	0.	0.	0.	0.	3.66	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.54	2.34	4.02	3.04	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	3.03	2.69	2.40	0.	0.	0.	0.	4.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.57	3.03	2.74	2.90	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.83	3.20	2.73	2.28	5.30	0.	3.01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	3.14	3.11	2.89	5.25	4.98	6.29	6.13	4.49	0.	0.	9.07	0.	0.	6.48	0.	0.	3.18	0.	0.	0.	0.	0.	0.	0.
S	3.78	4.46	5.37	4.42	4.06	3.91	6.20	5.25	4.81	5.14	5.71	8.94	5.70	5.33	0.	7.01	6.86	0.	0.	0.	0.	0.	0.	0.
SSW	4.85	5.46	4.39	5.39	5.25	4.88	5.92	5.40	0.	0.	0.	6.40	0.	0.	0.	0.	2.96	0.	0.	0.	0.	0.	0.	0.
SW	2.63	3.69	3.89	4.81	0.	4.05	4.75	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	2.15	0.	2.91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	2.31	4.54	1.68	5.36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	1.56	0.	4.58	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	1.56	1.88	1.84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.15	0.	1.65	0.	0.	0.	0.	0.	0.	5.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	2.27	4.05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 2883

TOTAL NO. OF INVALID OBSERVATIONS = 142 99.99 INDICATES INVALID DATA POINT

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 13 of 26)

JULY (1972-1975): 10-METER LEVEL

WIND DIRECTION PERSISTENCE - PASQUILL ALL

1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	14	5	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	8	4	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	15	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	7	4	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	21	3	3	2	5	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	45	20	3	5	4	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	52	29	19	14	4	3	3	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
S	42	22	16	8	4	6	4	4	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0
SSW	24	21	12	4	4	5	1	0	2	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0
SW	18	2	4	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	12	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	11	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	8	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	8	1	4	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 14 of 26)

JULY (1972-1975): 10-METER LEVEL

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.98	2.71	3.03	2.23	1.24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	2.43	3.22	2.99	3.69	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.17	4.13	2.61	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	2.39	2.72	3.01	1.96	1.65	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.16	3.57	3.22	4.86	3.56	2.84	0.	3.73	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.96	3.35	2.61	3.55	3.24	3.27	0.	0.	0.	0.	4.44	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	2.92	3.43	3.73	3.84	4.57	3.71	2.71	3.98	0.	4.39	5.39	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	3.24	3.83	3.96	5.06	4.79	3.94	6.60	4.80	4.30	3.94	0.	0.	7.05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	3.76	4.35	3.97	3.19	3.91	3.89	8.63	0.	5.77	0.	0.	0.	4.98	0.	6.30	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.35	2.97	3.22	4.40	5.60	4.62	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	2.51	2.78	3.59	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	1.95	2.28	4.18	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.69	2.47	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	1.57	2.50	1.91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	2.42	2.10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	2.62	2.94	4.30	1.79	0.	0.	3.06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 2976

TOTAL NO. OF INVALID OBSERVATIONS = 12

99.99 INDICATES INVALID DATA POINT

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 15 of 26)

AUGUST (1972-1975): 10-METER LEVEL

WIND DIRECTION PERSISTENCE - PASQUILL ALL

1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	8	1	0	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	13	5	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	15	2	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	29	17	7	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	49	19	14	4	3	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	50	27	18	12	2	2	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
S	48	34	15	11	7	4	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
SSW	36	22	9	3	5	0	1	1	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0
SW	11	13	3	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	4	3	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 16 of 26)

AUGUST (1972-1975): 10-METER LEVEL

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.46	3.01	0.	0.	4.24	0.	6.30	0.	3.71	4.08	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	2.72	3.98	1.68	5.61	2.82	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.32	2.36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	2.16	1.97	3.14	2.65	0.	3.35	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.44	2.77	2.95	2.24	2.70	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.67	2.52	2.36	1.79	2.58	2.33	0.	2.46	3.63	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	2.68	3.17	3.85	3.10	4.32	5.30	0.	3.69	5.19	0.	0.	0.	0.	3.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	3.67	3.67	3.94	4.21	3.97	4.72	0.	4.81	4.80	0.	0.	0.	0.	0.	0.	5.58	0.	0.	0.	0.	0.	0.	0.	0.
SSW	3.68	3.87	4.02	4.58	3.53	0.	5.01	3.98	5.78	4.10	5.43	4.71	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	2.77	3.30	2.83	3.54	0.	0.	0.	3.80	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	1.86	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	1.44	0.	0.	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	1.68	.48	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.58	1.97	2.10	2.39	0.	0.	1.73	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	2.57	3.66	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	3.12	3.32	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 2976

TOTAL NO. OF INVALID OBSERVATIONS = 31 99.99 INDICATES INVALID DATA POINT

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 17 of 26)

SEPTEMBER (1972-1975): 10-METER LEVEL

WIND DIRECTION PERSISTENCE - PASQUILL ALL

1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	25	11	6	2	3	1	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
NE	21	8	2	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	11	5	2	3	2	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	13	6	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	26	5	7	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	26	20	6	4	5	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	30	15	13	8	2	2	1	1	1	1	0	0	0	1	0	0	0	2	0	0	0	0	0	0
S	27	16	4	5	6	5	2	1	1	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0
SSW	9	8	3	4	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	6	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	10	9	6	5	1	0	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
NNW	23	10	3	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N	37	9	10	4	7	1	1	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 18 of 26)

SEPTEMBER (1972-1975): 10-METER LEVEL

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3.24	3.67	4.13	3.24	5.16	2.41	6.97	0.	4.86	0.	0.	0.	0.	0.	0.	0.	5.54	0.	0.	0.	0.	0.	0.	0.
NE	2.80	2.59	3.03	4.54	0.	3.17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.11	2.85	4.42	2.94	5.27	0.	4.14	0.	0.	2.93	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	2.21	2.00	2.25	1.98	2.81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.19	2.49	2.66	3.10	2.12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.25	2.62	2.93	2.36	2.40	3.69	0.	3.99	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	2.95	3.22	3.88	3.88	4.63	3.01	3.10	4.78	3.39	3.90	0.	0.	0.	3.23	0.	0.	0.	5.25	0.	0.	0.	0.	0.	0.
S	3.86	3.97	4.25	3.98	5.31	4.39	5.53	3.60	7.01	4.31	0.	0.	3.91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	3.32	4.86	5.17	5.86	5.40	0.	0.	5.66	5.22	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	4.22	4.07	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	2.23	0.	2.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	1.24	0.	0.	0	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	1.95	1.60	2.75	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.37	3.07	2.40	3.18	1.87	0.	2.40	3.09	0.	0.	0.	3.60	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.18	3.06	6.76	0.	0.	1.98	0.	0.	0.	5.35	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N	3.05	4.27	4.81	3.05	4.20	6.56	3.01	0.	7.01	0.	0.	0.	6.46	7.50	4.66	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 2880

TOTAL NO. OF INVALID OBSERVATIONS = 35

99.99 INDICATES INVALID DATA POINT

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 19 of 26)

OCTOBER (1972-1975): 10-METER LEVEL

WIND DIRECTION PERSISTENCE - PASQUILL ALL

1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	8	6	6	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	12	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	6	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	10	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	22	7	2	4	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	37	24	6	3	4	2	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
SSE	44	15	15	11	5	7	5	2	3	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
S	35	26	11	7	8	2	1	1	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	19	10	10	2	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	8	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	7	3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	5	2	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	25	6	3	3	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	12	12	2	2	2	1	0	0	0	2	0	0	0	0	1	0	1	0	0	0	0	0	0	0
N	10	7	8	1	2	3	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 20 of 26)

OCTOBER (1972-1975): 10-METER LEVEL

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	2.60	3.07	3.29	6.31	3.10	0.	0.	0.	0.	7.16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	2.33	2.41	0.	2.29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	1.49	1.74	1.71	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	1.64	2.34	3.65	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	1.91	2.82	2.07	2.22	0.	3.19	0.	0.	3.77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.16	2.58	2.27	1.93	2.27	3.32	2.68	0.	0.	0.	0.	0.	0.	3.10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	2.51	3.24	3.58	3.39	4.20	4.42	4.47	4.01	4.94	0.	0.	5.20	0.	0.	0.	0.	4.22	0.	0.	0.	0.	0.	0.	0.
S	3.71	3.84	4.91	6.02	5.16	4.47	5.50	2.81	4.93	3.49	4.66	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	4.40	4.06	4.30	4.24	3.64	0.	1.24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	2.79	2.21	4.91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	1.96	2.87	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	2.01	2.38	0.	0.	0.	0.	0.	1.43	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	1.38	1.79	3.34	1.98	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.50	2.49	2.54	2.64	2.45	0.	0.	3.43	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.12	3.94	3.77	3.86	4.13	5.58	0.	0.	0.	4.96	0.	0.	0.	0.	4.16	0.	5.24	0.	0.	0.	0.	0.	0.	0.
N	2.13	5.51	3.47	3.33	3.67	4.63	7.15	0.	0.	2.07	5.70	7.49	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 2976

TOTAL NO. OF INVALID OBSERVATIONS = 67

99.99 INDICATES INVALID DATA POINT

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 21 of 26)

NOVEMBER (1972-1975): 10-METER LEVEL

WIND DIRECTION PERSISTENCE - PASQUILL ALL

1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	10	10	2	0	4	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	10	5	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	12	1	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	5	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	6	3	5	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	27	12	12	5	6	2	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	39	9	16	3	6	4	2	3	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
S	25	13	11	5	2	2	1	2	2	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0
SSW	7	15	5	4	1	1	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	6	6	2	2	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
WSW	5	6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	11	2	3	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	16	6	7	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	20	17	5	3	7	3	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
NNW	20	10	1	9	2	2	1	2	1	0	0	0	1	0	0	0	1	0	1	0	0	0	0	1
N	12	6	5	3	4	1	1	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 22 of 26)

NOVEMBER (1972-1975): 10-METER LEVEL

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3.02	2.11	1.16	0.	3.24	5.41	0.	4.39	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	2.37	2.57	1.26	2.63	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.27	3.31	1.93	.62	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	1.89	1.77	0.	2.06	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	1.51	1.76	2.38	2.49	0.	2.31	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.67	2.42	2.99	3.09	3.49	4.40	4.03	4.36	0.	5.45	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	3.65	4.45	3.33	3.33	5.44	3.90	2.39	4.67	2.93	0.	3.36	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	3.68	4.61	4.07	6.58	4.76	5.88	3.63	7.33	4.98	0.	4.54	0.	4.32	9.74	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	3.91	4.13	5.74	3.91	7.06	6.06	6.85	7.04	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	3.91	3.65	6.70	4.77	5.78	7.14	4.58	0.	0.	0.	0.	6.79	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	4.29	3.33	0.	1.84	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	2.06	1.94	3.36	0.	0.	2.05	6.05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.41	2.40	4.33	3.13	0.	4.81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	3.51	3.81	6.11	4.50	2.82	6.35	4.43	9.21	0.	0.	0.	0.	0.	0.	0.	9.14	0.	0.	0.	0.	0.	0.	0.	0.
NNW	5.55	3.79	3.30	4.68	4.68	6.53	4.96	4.58	5.91	0.	0.	0.	4.90	0.	0.	0.	6.41	0.	7.74	0.	0.	0.	0.	7.00
N	3.97	3.84	3.43	3.58	3.96	4.72	4.44	5.84	4.98	3.60	0.	0.	8.52	6.87	0.	0.	0.	0.	0.	0.	0.99	0.	0.	0.

TOTAL NO. OF OBSERVATIONS = 2880

TOTAL NO. OF INVALID OBSERVATIONS = 21

99.99 INDICATES INVALID DATA POINT

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 23 of 26)

DECEMBER (1972-1975): 10-METER LEVEL

WIND DIRECTION PERSISTENCE - PASQUILL ALL

1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	9	5	1	5	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E	4	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	13	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	30	14	3	4	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	27	15	9	2	3	3	1	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0
S	26	22	7	3	5	4	2	3	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
SSW	17	8	4	5	2	5	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
SW	13	8	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	11	6	3	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	10	4	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	15	5	6	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	38	18	7	5	7	4	2	1	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0
NNW	25	18	11	7	1	2	2	0	1	0	0	1	1	1	0	0	1	0	0	0	0	0	0	1
N	18	3	7	2	2	2	2	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 24 of 26)

DECEMBER (1972-1975): 10-METER LEVEL

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3.40	4.16	3.36	3.76	2.75	0.	0.	3.47	0.	2.34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NE	2.27	2.90	99.99	4.72	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.10	1.13	1.11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	1.13	.58	0.	2.25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.17	0.	0.	1.97	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.17	2.72	2.07	1.87	1.32	2.24	1.32	2.24	1.32	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSE	2.96	3.46	2.79	5.39	4.80	4.45	5.11	0.	0.	3.64	0.	0.	0.	0.	5.90	0.	0.	0.	0.	0.	0.	0.	0.	0.
S	4.75	4.60	5.27	4.06	4.49	5.44	4.97	6.32	5.12	0.	0.	0.	7.61	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
SSW	4.89	4.74	6.23	6.47	5.39	5.81	0.	0.	0.	0.	0.	0.	0.	0.	6.82	0.	0.	0.	0.	0.	0.	0.	0.	0.
SW	4.00	4.82	3.51	5.85	5.82	8.11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	3.34	4.06	3.25	0.	6.12	0.	4.00	4.43	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	2.10	2.85	3.25	2.23	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	2.97	3.30	2.50	5.42	0.	6.05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	2.95	3.79	5.15	3.26	4.96	4.59	3.82	6.09	0.	3.25	4.08	7.01	0.	0.	6.15.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NNW	3.99	4.63	4.25	5.13	5.77	3.86	4.29	0.	8.28	0.	0.	7.06	7.38	7.37	0.	0.	7.05	0.	0.	0.	0.	0.	0.	8.80
N	4.31	3.11	4.74	6.55	5.75	6.62	7.30	0.	0.	0.	0.	0.	0.	5.67	0.	0.	0.	0.	0.	0.	5.79	0.	0.	0.

TOTAL NO. OFOBSERVATIONS = 2976

TOTAL NO. OF INVALID OBSERVATIONS = 74

99.99 INDICATES INVALID DATA POINT

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 25 of 26)

ANNUAL (5/72-5/76): 10-METER LEVEL

WIND DIRECTION PERSISTENCE - PASQUILL ALL

1 SECTOR PERSISTENCE

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	131	68	32	20	16	9	6	3	5	3	0	0	1	0	0	0	1	0	0	0	0	0	0	0
NE	108	56	23	17	3	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	106	34	16	6	5	0	3	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
E	118	44	18	11	6	4	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	230	81	49	21	12	10	3	3	2	3	0	1	0	0	1	0	0	0	0	0	0	0	0	0
SE	379	191	81	51	40	16	11	8	3	4	2	0	0	1	0	0	0	0	0	0	0	1	0	0
SSE	427	212	149	87	35	34	24	19	12	6	6	2	0	4	1	0	4	3	0	0	0	0	0	1
S	390	225	112	84	60	41	24	22	16	13	6	6	8	2	2	4	2	1	0	0	1	0	0	0
SSW	224	144	79	42	36	26	11	7	4	3	2	2	3	0	2	0	1	0	0	0	0	0	0	0
SW	128	80	26	21	9	6	2	4	3	1	1	2	0	0	0	0	0	0	0	0	0	0	0	0
WSW	110	30	17	5	4	4	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
W	85	34	20	9	3	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	112	35	27	12	2	3	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	204	114	53	35	30	15	10	6	0	4	3	3	0	0	2	2	0	1	0	0	0	0	0	0
NNW	194	104	43	29	14	16	16	6	5	9	4	4	5	2	1	2	3	1	2	0	0	0	0	5
N	162	64	63	22	22	12	12	4	4	6	4	2	3	4	3	0	0	0	0	0	1	0	0	2

TABLE 2.3-14
WIND DIRECTION PERSISTENCE AT CPNPP

(Sheet 26 of 26)

ANNUAL (5/72-5/76): 10-METER LEVEL

AVERAGE WIND SPEED (M/SEC)

CONSECUTIVE HOURS

SECTOR	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	>24
NNE	3.09	3.30	3.72	3.64	3.77	4.71	5.62	3.21	3.82	4.53	0.	0.	99.99	0.	0.	0.	5.54	0.	0.	0.	0.	0.	0.	0.
NE	2.75	3.11	3.04	3.87	2.24	2.60	0.	3.66	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ENE	2.22	2.44	3.07	3.08	4.47	0.	4.04	0.	0.	3.86	4.58	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
E	2.67	2.74	3.20	2.09	3.07	3.59	4.89	4.03	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
ESE	2.60	2.99	3.41	2.91	3.83	3.35	4.97	4.67	6.04	8.64	0.	8.18	0.	0.	5.97	0.	0.	0.	0.	0.	0.	0.	0.	0.
SE	2.76	3.13	2.81	3.01	3.65	4.35	3.41	3.72	4.21	4.79	5.44	0.	0.	3.10	0.	0.	0.	0.	0.	0.	0.	3.15	0.	0.
SSE	3.22	3.77	3.67	4.14	5.09	4.90	4.54	5.07	4.52	4.64	7.30	5.29	0.	4.96	5.90	0.	5.19	4.59	0.	0.	0.	0.	0.	7.63
S	3.94	4.45	4.72	5.14	4.74	4.97	6.37	5.52	5.69	4.96	5.85	7.21	5.84	7.54	5.54	6.79	7.08	6.72	0.	0.	8.76	0.	0.	0.
SSW	4.41	4.55	5.01	5.17	5.75	5.37	6.30	6.69	5.63	5.79	5.43	5.55	5.45	0.	6.56	0.	2.96	0.	0.	0.	0.	0.	0.	0.
SW	3.53	3.96	4.20	5.21	5.95	5.43	4.66	5.71	6.47	5.40	5.23	6.02	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WSW	3.36	3.84	3.95	3.98	6.72	5.66	4.00	4.43	5.18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
W	2.63	3.89	4.42	5.85	3.67	2.05	6.05	1.43	0.	0.	4.91	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WNW	3.09	2.75	4.22	4.03	5.27	4.70	5.86	0.	6.64	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NW	3.15	3.61	4.29	4.02	4.11	5.13	4.42	5.16	0.	4.51	4.33	5.28	0.	0.	7.48	6.92	0.	7.15	0.	0.	0.	0.	0.	0.
NNW	3.99	4.00	4.54	5.58	4.89	5.05	5.91	5.70	6.80	5.72	5.36	5.91	6.10	8.31	4.16	6.31	6.23	8.13	7.19	0.	0.	0.	0.	8.14
N	3.62	4.66	4.64	3.89	4.97	5.57	5.69	5.60	7.01	4.20	5.19	6.82	7.12	6.43	6.70	0.	0.	0.	0.	0.	5.79	0.	0.	7.78

TOTAL NO. OF OBSERVATIONS = 35043

TOTAL NO. OF INVALID OBSERVATIONS = 1267

99.99 INDICATES INVALID DATA POINT

TABLE 2.3-15
VALUES OF MEAN, AVERAGE AND EXTREME DAILY MAXIMUM, AND AVERAGE AND EXTREME DAILY MINIMUM SURFACE TEMPERATURES (°F) AT FORT WORTH (1931 - 1960)

Month	Mean	Average Daily Maximum	Extreme Maximum[(a)]	Average Daily Minimum	Extreme Minimum[(a)]
January	46	56	88(1969)	35	4(1964)
February	49	60	87(1969)	39	12(1971)
March	56	67	91(1971)	44	19(1965)
April	65	76	95(1972)	54	30(1973)
May	73	83	96(1967)	63	42(1971)
June	82	92	105(1972)	71	51(1964)
July	85	96	105(1964)[(b)]	75	59(1972)[(b)]
August	85	96	108(1964)	75	56(1967)
September	78	89	102(1963)	68	46(1971)[(b)]
October	68	79	96(1963)	56	37(1966)[(b)]
November	55	66	88(1965)[(b)]	44	24(1970)
December	48	58	84(1966)	37	10(1963)
Annual	66	77	108(1964)	55	4(1964)

a) Period of record is July 1963 through 1973; year of occurrence given in parenthesis.

b) Record also occurred in earlier year(s).

TABLE 2.3-16
STATISTICS AND DIURNAL VARIATION OF METEROLOGICAL PARAMETERS

(Sheet 1 of 13)

JANUARY (1973 - 1976)

DATA SOURCE: ON-SITE
TABLE GENERATED: 10/04/76. 09.29.33.

COMANCHE PEAK STEAM ELECTRIC STATION
GLEN ROSE, TEXAS
TEXAS UTILITIES GENERATING CO.
DAMES AND MOORE JOB NO: 4486-025-12

METEROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR.	WIND SPEED	WIND DIR.	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.00	10.00	60.00	60.00	10.00 60.00	10.00 60.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	5.1	-.9	63.9	3.3	262	5.6	244	1.6	F
2	4.9	-.8	64.3	3.4	263	5.7	246	1.6	F
3	4.5	-.9	65.3	3.2	269	5.5	246	1.6	F
4	4.2	-1.0	66.4	3.2	281	5.6	255	1.6	F
5	4.0	-1.0	67.3	3.4	283	5.6	256	1.5	F
6	3.7	-1.2	67.5	3.4	296	5.8	266	1.6	F
7	3.5	-1.2	67.7	3.4	304	5.7	273	1.6	F
8	3.6	-.9	67.8	3.3	308	5.5	274	1.3	F
9	5.1	-.5	64.2	3.8	298	5.5	270	.5	E
10	6.9	-.2	59.3	4.6	282	5.9	268	-.0	E
11	8.5	-.3	54.8	4.9	263	6.1	258	-.2	E
12	10.0	-.5	49.9	5.0	257	6.3	253	-.3	D
13	11.1	-.9	45.2	5.2	253	6.5	248	-.4	D
14	11.8	-.8	43.7	5.2	256	6.4	251	-.3	D
15	12.1	-.9	43.1	5.0	257	6.3	251	-.3	D
16	12.2	-.8	43.1	4.8	246	6.1	238	-.2	E
17	11.4	-.7	45.4	4.2	232	5.8	221	.2	E
18	10.1	-.6	50.0	3.5	206	5.7	191	.8	F
19	8.9	-.3	54.5	3.3	200	5.9	176	1.2	F
20	8.0	-.3	56.7	3.3	221	5.8	193	1.3	F
21	7.3	-.5	58.3	3.3	233	5.9	208	1.4	F
22	6.8	-.6	60.0	3.3	246	5.7	225	1.4	F
23	6.2	-.8	60.4	3.3	256	5.7	234	1.5	F
24	6.0	-.4	63.3	3.4	258	5.6	237	1.4	F
ABSOLUTE MAX	28.5	20.7	99.9	14.2		17.4			
AVG DAILY MAX	12.8	3.1	76.9	6.7		9.0			
MEAN	7.4	-.7	57.3	3.9	263	5.8	244	.8	F
CLIMATIC MEAN	7.4	-.6	58.3	4.1		5.8			
AVG DAILY MIN	2.0	-4.4	39.6	1.5		2.5			
ABSOLUTE MIN	-14.3	-20.8	12.5	0.0		0.0			
STANDARD DEV	7.5	7.3	20.9	2.4		2.9			
VALID OBS	2677	2638	2520	2718	2642	2449	2447	2651	2651
INVALID OBS	299	338	456	258	334	527	529	325	325
TOTAL OBS	2976	2976	2976	2976	2976	2976	2976	2976	2976
DATA RECOVERY	90.0	88.6	84.7	91.3	88.8	82.3	82.2	89.1	89.1

TABLE 2.3-16
STATISTICS AND DIURNAL VARIATION OF METEROLOGICAL PARAMETERS

(Sheet 2 of 13)

FEBRUARY (1973 - 1976)

DATA SOURCE: ON-SITE
TABLE GENERATED: 10/04/76. 09.29.33.

COMANCHE PEAK STEAM ELECTRIC STATION
GLEN ROSE, TEXAS
TEXAS UTILITIES GENERATING CO.
DAMES AND MOORE JOB NO: 4486-025-12

METEROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR.	WIND SPEED	WIND DIR.	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.00	10.00	60.00	60.00	10.00 60.00	10.00 60.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	8.3	1.4	61.9	4.0	245	6.3	224	1.3	F
2	7.9	1.5	63.6	3.9	240	6.1	227	1.3	F
3	7.4	1.5	65.3	3.8	245	5.9	233	1.2	F
4	7.1	1.5	66.5	3.7	251	5.7	241	1.2	F
5	6.7	1.4	67.7	3.6	265	5.5	250	1.3	F
6	6.5	1.4	69.8	3.7	275	5.8	261	1.4	F
7	6.1	1.0	70.5	3.7	279	5.7	268	1.3	F
8	6.7	1.2	68.0	3.7	281	5.3	271	.7	E
9	8.3	1.5	64.0	4.5	270	5.5	263	.1	E
10	10.2	1.9	58.4	5.3	261	5.9	252	-.2	E
11	11.6	2.1	53.1	5.6	252	6.2	246	-.3	D
12	12.7	1.5	48.5	5.9	258	6.8	263	-.4	D
13	14.0	1.1	45.0	5.9	257	6.8	258	-.4	D
14	14.6	1.3	42.0	6.0	255	6.7	254	-.5	D
15	15.2	1.2	40.4	6.0	250	7.0	252	-.4	D
16	15.3	1.1	40.1	5.9	239	6.7	245	-.3	D
17	14.8	1.3	41.8	5.1	224	6.3	222	-.1	E
18	13.6	1.3	44.8	4.3	191	5.9	194	.3	E
19	12.2	1.4	49.0	4.0	182	6.1	180	.8	F
20	11.2	1.4	52.3	4.0	186	6.2	168	1.0	F
21	10.6	1.4	54.7	4.1	219	6.3	182	1.1	F
22	9.8	1.3	57.0	4.1	218	6.3	197	1.1	F
23	9.3	1.3	58.2	4.0	222	6.2	207	1.1	F
24	8.8	1.3	59.3	3.9	247	6.2	223	1.3	F
ABSOLUTE MAX	29.5	19.2	100.0	16.1		16.4			
AVG DAILY MAX	15.9	4.8	73.6	7.5		9.3			
MEAN	10.4	1.4	55.6	4.5	250	6.2	239	.6	E
CLIMATIC MEAN	10.7	1.3	56.2	4.6		6.3			
AVG DAILY MIN	5.4	-2.1	38.7	1.8		3.4			
ABSOLUTE MIN	-6.2	-14.6	9.7	0.0		.4			
STANDARD DEV	7.2	7.0	21.3	2.7		2.8			
VALID OBS	2156	2124	2054	2619	2489	2125	2124	2362	2362
INVALID OBS	556	588	658	93	223	587	588	350	350
TOTAL OBS	2712	2712	2712	2712	2712	2712	2712	2712	2712
DATA RECOVERY	79.5	78.3	75.7	96.6	91.8	78.4	78.4	87.1	87.1

TABLE 2.3-16
STATISTICS AND DIURNAL VARIATION OF METEROLOGICAL PARAMETERS

(Sheet 3 of 13)

MARCH (1973 - 1976)

DATA SOURCE: ON-SITE
TABLE GENERATED: 10/04/76. 09.29.33.

COMANCHE PEAK STEAM ELECTRIC STATION
GLEN ROSE, TEXAS
TEXAS UTILITIES GENERATING CO.
DAMES AND MOORE JOB NO: 4486-025-12

METEROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR.	WIND SPEED	WIND DIR.	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.00	10.00	60.00	60.00	10.00 60.00	10.00 60.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	11.8	5.2	64.4	4.6	179	6.6	172	1.1	F
2	11.2	5.0	67.2	4.5	188	6.3	181	1.1	F
3	10.8	4.9	68.0	4.3	197	6.2	186	1.1	F
4	10.4	4.8	68.7	4.2	198	6.0	188	1.1	F
5	10.1	4.8	70.1	4.1	195	5.9	192	1.1	F
6	9.8	4.8	71.6	4.0	184	5.7	182	1.1	F
7	9.8	4.7	71.7	4.2	186	5.8	194	1.0	F
8	10.5	5.0	69.2	4.7	188	5.8	198	.4	E
9	11.8	5.3	64.5	5.4	186	6.3	199	.1	E
10	13.2	5.2	59.3	5.7	189	6.6	202	-.1	E
11	14.5	4.9	55.8	6.0	195	6.9	211	-.2	E
12	15.5	4.9	52.3	6.1	200	6.8	212	-.2	E
13	16.8	4.8	48.2	6.2	204	7.1	212	-.3	D
14	17.7	4.6	44.9	6.2	205	7.0	208	-.3	D
15	18.1	4.6	43.7	6.4	192	7.1	200	-.3	D
16	18.4	4.3	43.2	6.2	188	7.2	196	-.2	E
17	18.2	4.4	43.8	6.1	185	7.3	196	-.1	E
18	17.4	4.4	45.3	5.6	167	7.0	177	.1	E
19	16.1	4.8	49.9	5.0	156	6.8	150	.5	E
20	15.0	5.0	53.5	4.8	156	7.0	144	.8	F
21	14.1	5.3	57.5	4.8	163	7.2	157	1.0	F
22	13.3	5.2	59.8	4.6	166	6.8	157	1.1	F
23	12.6	5.2	61.4	4.6	181	6.7	174	1.2	F
24	11.9	4.7	63.3	5.0	181	6.8	175	1.2	F
ABSOLUTE MAX	36.4	22.4	100.0	18.3		17.9			
AVG DAILY MAX	19.4	9.4	78.7	8.3		10.0			
MEAN	13.8	4.9	57.9	5.1	186	6.6	186	.5	E
CLIMATIC MEAN	14.0	4.9	59.0	5.2		6.8			
AVG DAILY MIN	8.5	.4	39.2	2.0		3.5			
ABSOLUTE MIN	-2.4	-12.1	11.0	0.0		0.0			
STANDARD DEV	6.6	6.9	22.6	2.8		2.8			
VALID OBS	2380	2380	2302	2806	2769	2338	2309	2569	2569
INVALID OBS	596	596	674	170	207	638	667	407	407
TOTAL OBS	2976	2976	2976	2976	2976	2976	2976	2976	2976
DATA RECOVERY	80.0	80.0	77.4	94.3	93.0	78.6	77.6	86.3	86.3

TABLE 2.3-16
STATISTICS AND DIURNAL VARIATION OF METEROLOGICAL PARAMETERS

(Sheet 4 of 13)

APRIL (1973 - 1976)

DATA SOURCE: ON-SITE
TABLE GENERATED: 10/04/76. 09.29.33.

COMANCHE PEAK STEAM ELECTRIC STATION
GLEN ROSE, TEXAS
TEXAS UTILITIES GENERATING CO.
DAMES AND MOORE JOB NO: 4486-025-12

METEROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR.	WIND SPEED	WIND DIR.	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.00	10.00	60.00	60.00	10.00 60.00	10.00 60.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	15.5	11.0	74.7	4.2	151	6.5	139	.9	F
2	15.3	11.1	75.0	4.1	155	6.3	145	.9	F
3	15.0	11.4	76.8	3.9	161	6.0	152	.9	F
4	14.6	11.0	77.6	3.7	162	5.9	153	.9	F
5	14.1	10.6	77.9	3.6	168	5.6	151	.9	F
6	13.7	10.2	77.7	3.7	159	5.7	143	1.0	F
7	13.8	10.2	77.5	3.8	153	5.6	142	.7	E
8	14.8	10.6	75.2	4.1	143	5.4	144	.2	E
9	16.1	11.0	71.2	4.9	145	6.0	144	-.0	E
10	17.4	11.0	65.8	5.2	148	6.3	143	-.2	E
11	18.5	10.6	61.8	5.6	152	6.8	150	-.2	E
12	19.3	10.5	58.8	5.6	149	6.7	145	-.3	D
13	20.0	10.2	56.9	5.7	144	6.8	140	-.4	D
14	20.7	10.1	54.4	6.1	141	7.1	141	-.4	D
15	21.2	10.3	52.8	6.0	142	7.2	140	-.4	D
16	21.4	10.7	52.8	6.0	142	7.2	136	-.3	D
17	21.4	10.9	53.3	5.9	135	7.2	131	-.2	E
18	20.9	10.8	55.3	5.7	129	7.2	125	-.1	E
19	19.9	10.9	58.6	4.9	127	6.6	121	.2	E
20	19.0	11.0	61.8	4.4	124	6.5	116	.5	E
21	18.1	11.0	64.6	4.4	132	6.7	119	.6	E
22	17.3	10.8	66.2	4.4	134	6.7	122	.8	F
23	16.6	10.9	69.9	4.4	142	6.7	132	.8	F
24	15.5	11.2	74.9	4.8	144	6.3	125	.9	F
ABSOLUTE MAX	32.1	24.8	100.0	15.2		18.1			
AVG DAILY MAX	21.9	13.9	85.4	7.8		9.6			
MEAN	17.6	10.7	65.6	4.8	143	6.5	136	.3	E
CLIMATIC MEAN	17.2	10.4	67.2	4.9		6.6			
AVG DAILY MIN	12.4	6.8	48.9	2.1		3.6			
ABSOLUTE MIN	.7	-7.4	11.2	0.0		.5			
STANDARD DEV	5.3	7.4	22.7	2.6		2.9			
VALID OBS	2235	2181	2007	2619	2563	2124	2123	2611	2611
INVALID OBS	645	699	873	261	317	756	757	269	269
TOTAL OBS	2880	2880	2880	2880	2880	2880	2880	2880	2880
DATA RECOVERY	77.6	75.7	69.7	90.9	89.0	73.7	73.7	90.7	90.7

TABLE 2.3-16
STATISTICS AND DIURNAL VARIATION OF METEROLOGICAL PARAMETERS

(Sheet 5 of 13)

MAY (1972 - 1976)

DATA SOURCE: ON-SITE
TABLE GENERATED: 10/04/76. 09.29.33.

COMANCHE PEAK STEAM ELECTRIC STATION
GLEN ROSE, TEXAS
TEXAS UTILITIES GENERATING CO.
DAMES AND MOORE JOB NO: 4486-025-12

METEROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR.	WIND SPEED	WIND DIR.	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.00	10.00	60.00	60.00	10.00 60.00	10.00 60.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	19.2	17.0	83.9	3.0	173	5.2	167	1.2	F
2	18.8	16.7	85.0	2.9	183	5.2	173	1.3	F
3	18.5	16.3	85.8	3.1	190	5.3	180	1.3	F
4	18.0	16.3	86.7	2.8	190	4.9	184	1.2	F
5	17.6	16.2	86.5	2.8	185	4.9	179	1.3	F
6	17.4	16.0	86.0	2.7	196	4.7	181	1.3	F
7	17.4	16.1	85.3	2.8	206	4.6	188	1.1	F
8	18.5	17.0	84.4	3.1	208	4.6	206	.3	E
9	19.9	17.1	80.5	3.8	187	5.0	197	-.1	E
10	21.1	17.2	77.2	4.2	177	5.5	183	-.4	D
11	22.4	17.2	71.9	4.2	176	5.4	181	-.5	D
12	23.7	16.3	66.3	4.1	171	5.3	180	-.5	D
13	24.3	15.6	61.3	4.1	163	5.3	172	-.6	D
14	25.0	16.6	60.1	4.2	158	5.6	171	-.6	D
15	25.6	16.5	58.6	4.3	150	5.7	158	-.6	D
16	25.8	16.5	56.1	4.4	153	6.0	159	-.5	D
17	25.7	16.7	57.4	4.3	146	5.8	156	-.4	D
18	25.3	16.9	60.0	4.2	141	5.8	147	-.2	E
19	24.3	17.1	63.9	3.7	132	5.5	140	-.0	E
20	23.0	17.2	69.7	3.1	140	5.3	144	.5	E
21	21.9	17.4	75.3	3.1	137	5.5	144	.8	F
22	21.1	17.6	79.3	3.0	142	5.5	142	1.0	F
23	20.4	17.5	82.3	3.0	156	5.3	153	1.2	F
24	17.9	14.8	79.4	3.2	163	5.2	123	1.1	F
ABSOLUTE MAX	33.8	25.2	100.0	12.0		15.4			
AVG DAILY MAX	25.8	19.2	93.0	5.9		8.2			
MEAN	21.4	16.7	73.1	3.5	163	5.3	166	.4	E
CLIMATIC MEAN	21.4	16.4	73.4	3.6		5.6			
AVG DAILY MIN	17.0	13.6	53.9	1.4		3.0			
ABSOLUTE MIN	9.6	-3.0	.7	0.0		.4			
STANDARD DEV	4.8	5.6	18.5	1.9		2.3			
VALID OBS	1476	1431	1261	2510	2399	2143	1533	2691	2691
INVALID OBS	1476	1521	1691	442	553	809	1419	261	261
TOTAL OBS	2952	2952	2952	2952	2952	2952	2952	2952	2952
DATA RECOVERY	50.0	48.5	42.7	85.0	81.3	72.6	51.9	91.2	91.2

TABLE 2.3-16
STATISTICS AND DIURNAL VARIATION OF METEROLOGICAL PARAMETERS

(Sheet 6 of 13)

JUNE (1972 - 1975)

DATA SOURCE: ON-SITE
TABLE GENERATED: 10/04/76. 09.29.33.

COMANCHE PEAK STEAM ELECTRIC STATION
GLEN ROSE, TEXAS
TEXAS UTILITIES GENERATING CO.
DAMES AND MOORE JOB NO: 4486-025-12

METEROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR.	WIND SPEED	WIND DIR.	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.00	10.00	60.00	60.00	10.00 60.00	10.00 60.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	23.6	21.0	84.9	3.2	172	5.9	160	.9	F
2	23.1	21.1	86.1	3.1	174	5.4	154	.9	F
3	22.6	21.0	88.6	3.1	178	5.2	163	1.0	F
4	22.3	21.1	90.1	3.0	178	4.7	160	1.0	F
5	22.0	21.0	91.3	2.8	180	4.5	151	1.1	F
6	21.8	20.9	92.3	2.6	168	4.3	144	1.1	F
7	22.0	21.2	92.2	2.6	169	4.1	144	1.0	F
8	23.1	21.6	88.0	3.1	179	4.4	157	.2	E
9	24.4	21.7	84.7	3.8	182	5.3	167	-.2	E
10	25.8	21.5	77.3	4.1	183	5.8	166	-.5	D
11	27.1	21.2	69.7	4.2	179	5.8	165	-.6	D
12	28.1	21.1	64.7	4.4	172	6.1	162	-.5	D
13	28.9	20.8	60.3	4.5	167	6.1	162	-.5	D
14	29.7	20.6	58.4	4.7	166	6.1	160	-.7	D
15	29.9	20.4	57.2	4.7	165	6.3	162	-.6	D
16	30.2	19.5	54.7	4.7	165	6.1	155	-.6	D
17	30.4	20.8	56.8	4.7	159	6.0	152	-.5	D
18	30.2	20.9	58.0	4.6	160	6.3	153	-.3	D
19	29.0	20.9	61.2	4.4	157	6.1	146	-.1	E
20	27.8	21.3	68.6	3.8	157	5.7	143	.6	E
21	26.6	21.5	73.2	3.5	159	5.8	141	.7	E
22	25.7	21.7	77.7	3.5	161	6.1	143	.8	F
23	25.0	21.9	81.9	3.4	164	6.1	146	.9	F
24	23.9	21.0	83.7	3.4	169	6.2	155	.9	F
ABSOLUTE MAX	34.2	26.9	99.8	12.6		14.5			
AVG DAILY MAX	30.4	22.7	94.8	5.9		7.9			
MEAN	25.9	21.1	74.0	3.7	168	5.6	154	.2	E
CLIMATIC MEAN	25.9	20.3	73.4	3.7		5.9			
AVG DAILY MIN	21.4	17.9	51.9	1.5		3.9			
ABSOLUTE MIN	14.2	-2.2	10.2	0.0		.3			
STANDARD DEV	4.0	3.5	16.4	2.2		2.6			
VALID OBS	714	698	638	2768	2649	904	697	2755	2755
INVALID OBS	2166	2182	2242	112	231	1976	2183	125	125
TOTAL OBS	2880	2880	2880	2880	2880	2880	2880	2880	2880
DATA RECOVERY	24.8	24.2	22.2	96.1	92.0	31.4	24.2	95.7	95.7

TABLE 2.3-16
STATISTICS AND DIURNAL VARIATION OF METEROLOGICAL PARAMETERS

(Sheet 7 of 13)

JULY (1972 - 1975)

DATA SOURCE: ON-SITE
TABLE GENERATED: 10/04/76. 09.29.33.

COMANCHE PEAK STEAM ELECTRIC STATION
GLEN ROSE, TEXAS
TEXAS UTILITIES GENERATING CO.
DAMES AND MOORE JOB NO: 4486-025-12

METEROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR.	WIND SPEED	WIND DIR.	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.00	10.00	60.00	60.00	10.00 60.00	10.00 60.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	25.0	20.8	75.3	2.8	174	4.8	176	.8	F
2	24.7	20.9	78.5	2.7	179	4.7	182	.8	F
3	24.1	21.1	81.0	2.6	181	4.4	183	.8	F
4	23.7	21.2	82.7	2.5	188	4.3	189	.8	F
5	23.5	21.0	82.8	2.3	189	4.2	197	.8	F
6	23.2	20.9	83.6	2.0	184	3.9	198	.9	F
7	23.3	21.1	84.3	2.1	184	3.5	199	.6	E
8	24.5	21.8	82.4	2.8	191	3.4	201	-.1	E
9	26.3	21.9	76.5	3.5	199	4.1	206	-.4	D
10	27.9	21.7	69.5	3.7	197	4.2	201	-.5	D
11	29.0	21.4	63.8	3.7	190	4.4	196	-.6	D
12	30.0	20.9	57.6	3.7	184	4.3	185	-.7	D
13	30.7	20.4	53.5	3.8	172	4.5	171	-.7	D
14	31.4	20.0	50.05	4.5	164	4.8	162	-.7	D
15	31.7	19.6	49.0	4.5	155	4.8	154	-.7	D
16	31.7	19.7	48.5	4.5	151	5.0	149	-.6	D
17	31.6	19.5	48.9	4.2	149	5.0	145	-.5	D
18	30.9	19.7	50.0	4.2	149	5.2	148	-.3	D
19	30.0	20.2	53.6	4.0	151	5.1	149	-.1	E
20	28.8	20.5	59.3	3.5	150	5.2	147	.4	E
21	27.6	20.5	64.4	3.3	153	5.4	150	.7	E
22	26.6	20.6	68.5	3.1	159	5.3	157	.8	F
23	26.0	20.7	70.9	3.0	165	5.1	166	.8	F
24	25.4	20.8	73.3	3.1	170	4.9	174	.9	F
ABSOLUTE MAX	38.2	26.2	99.8	14.2		14.5			
AVG DAILY MAX	32.4	22.6	88.7	6.1		7.4			
MEAN	27.4	20.7	66.3	3.3	169	4.6	172	.1	E
CLIMATIC MEAN	27.6	20.5	67.4	3.7		4.9			
AVG DAILY MIN	22.9	18.4	46.1	1.3		2.4			
ABSOLUTE MIN	17.9	10.2	19.6	0.0		0.0			
STANDARD DEV	4.0	2.9	19.1	2.2		1.9			
VALID OBS	2040	1966	1837	2950	2908	2114	2042	2916	2916
INVALID OBS	936	1010	1139	26	68	862	934	60	60
TOTAL OBS	2976	2976	2976	2976	2976	2976	2976	2976	2976
DATA RECOVERY	68.5	66.1	61.7	99.1	97.7	71.0	68.6	98.0	98.0

TABLE 2.3-16
STATISTICS AND DIURNAL VARIATION OF METEROLOGICAL PARAMETERS

(Sheet 8 of 13)

AUGUST (1972 - 1975)

DATA SOURCE: ON-SITE
TABLE GENERATED: 10/04/76. 09.29.33.

COMANCHE PEAK STEAM ELECTRIC STATION
GLEN ROSE, TEXAS
TEXAS UTILITIES GENERATING CO.
DAMES AND MOORE JOB NO: 4486-025-12

METEROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR.	WIND SPEED	WIND DIR.	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.00	10.00	60.00	60.00	10.00 60.00	10.00 60.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	24.9	20.5	76.8	2.4	171	4.7	174	.8	F
2	24.4	20.6	78.9	2.3	174	4.5	180	.8	F
3	23.9	20.7	81.0	2.2	176	4.3	184	.8	F
4	23.6	20.8	83.3	2.1	179	4.1	189	.9	F
5	23.2	20.8	84.2	2.0	179	4.0	191	1.0	F
6	22.9	20.8	85.5	1.8	172	3.7	188	1.0	F
7	22.7	21.0	86.5	1.8	164	3.6	186	.9	F
8	23.9	21.7	84.8	2.2	169	3.3	181	.0	E
9	25.8	21.9	78.8	3.0	189	3.8	196	-.4	D
10	27.8	21.5	68.9	3.6	190	4.4	193	-.5	D
11	29.1	21.1	61.4	3.7	183	4.5	186	-.7	D
12	30.4	20.5	55.5	3.7	176	4.5	177	-.7	D
13	31.1	20.0	51.8	3.8	167	4.6	164	-.8	C
14	31.6	19.6	48.9	3.9	156	4.8	154	-.7	D
15	31.9	19.4	48.3	4.0	158	5.1	160	-.6	D
16	32.1	19.1	45.9	3.8	152	4.8	156	-.6	D
17	32.1	19.1	46.4	4.0	152	5.1	155	-.4	D
18	31.3	19.4	49.6	4.1	151	5.5	151	-.2	E
19	30.3	19.5	52.9	3.8	152	5.5	150	.2	E
20	28.7	19.7	58.7	3.2	152	5.5	152	.6	E
21	27.6	19.9	62.9	3.1	156	5.5	154	.8	F
22	26.6	20.1	68.2	2.8	160	5.3	159	.8	F
23	26.1	20.2	70.4	2.5	165	4.9	162	.8	F
24	25.5	20.5	74.3	2.5	164	5.0	168	.8	F
ABSOLUTE MAX	38.7	26.1	99.9	12.3		12.2			
AVG DAILY MAX	32.7	22.4	89.8	5.4		7.3			
MEAN	27.4	20.4	66.3	3.0	166	4.6	170	.2	E
CLIMATIC MEAN	27.6	20.2	66.9	3.2		4.8			
AVG DAILY MIN	22.5	18.1	43.9	1.1		2.3			
ABSOLUTE MIN	16.6	8.2	18.6	0.0		0.0			
STANDARD DEV	4.1	2.5	19.2	1.6		1.9			
VALID OBS	2370	2290	2183	2812	2794	2628	2423	2901	2901
INVALID OBS	606	686	793	164	182	348	553	75	75
TOTAL OBS	2976	2976	2976	2976	2976	2976	2976	2976	2976
DATA RECOVERY	79.6	76.9	73.4	94.5	93.9	88.3	81.4	97.5	97.5

TABLE 2.3-16
STATISTICS AND DIURNAL VARIATION OF METEROLOGICAL PARAMETERS

(Sheet 9 of 13)

SEPTEMBER (1972 - 1975)

DATA SOURCE: ON-SITE
TABLE GENERATED: 10/04/76. 09.29.33.

COMANCHE PEAK STEAM ELECTRIC STATION
GLEN ROSE, TEXAS
TEXAS UTILITIES GENERATING CO.
DAMES AND MOORE JOB NO: 4486-025-12

METEROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR.	WIND SPEED	WIND DIR.	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.00	10.00	60.00	60.00	10.00 60.00	10.00 60.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	22.3	18.5	77.5	2.7	136	4.9	154	.8	F
2	21.8	18.5	80.4	2.7	142	4.8	162	.8	F
3	21.4	18.5	82.2	2.7	141	4.8	161	.8	F
4	20.9	18.5	83.8	2.5	138	4.5	167	.9	F
5	20.5	18.5	85.7	2.4	112	4.3	165	.9	F
6	20.2	18.6	86.4	2.3	56	4.1	160	.9	F
7	20.1	18.5	87.0	2.3	48	4.0	157	.9	F
8	20.6	19.1	86.9	2.4	98	3.9	164	.3	E
9	22.2	19.5	83.3	3.2	153	4.1	182	-.2	E
10	23.9	19.4	74.7	3.8	165	4.9	187	-.4	D
11	25.3	19.1	68.2	3.9	156	5.1	184	-.5	D
12	26.6	18.5	61.7	4.0	154	5.2	180	-.6	D
13	27.5	18.2	57.4	4.1	137	5.2	171	-.6	D
14	28.3	18.0	53.5	4.3	115	5.3	150	-.6	D
15	28.8	17.7	51.4	4.2	81	5.4	131	-.5	D
16	29.0	17.2	50.2	4.3	81	5.5	122	-.5	D
17	28.8	16.9	49.8	4.2	83	5.5	122	-.4	D
18	28.1	17.2	51.8	4.1	83	5.7	118	-.2	E
19	26.8	17.3	55.9	3.4	94	5.5	121	.2	E
20	25.5	17.5	61.1	3.1	100	5.8	123	.6	E
21	24.4	17.5	65.1	3.0	97	5.7	122	.7	E
22	23.6	17.6	69.3	3.0	105	5.5	128	.8	F
23	22.7	17.6	71.7	2.9	118	5.3	138	.8	F
24	21.7	17.7	76.0	2.8	133	5.1	141	.7	E
ABSOLUTE MAX	37.0	26.3	100.0	11.4		14.7			
AVG DAILY MAX	29.6	20.7	92.2	5.5		7.3			
MEAN	24.2	18.2	68.6	3.3	110	5.0	147	.2	E
CLIMATIC MEAN	24.5	18.2	70.4	3.3		5.0			
AVG DAILY MIN	19.5	15.6	48.7	1.2		2.7			
ABSOLUTE MIN	8.3	-2.0	19.8	0.0		0.0			
STANDARD DEV	5.5	4.8	18.8	1.9		2.2			
VALID OBS	1894	1846	1715	2812	2748	1929	1892	2836	2836
INVALID OBS	986	1034	1165	68	132	951	988	44	44
TOTAL OBS	2880	2880	2880	2880	2880	2880	2880	2880	2880
DATA RECOVERY	65.8	64.1	59.5	97.6	95.4	67.0	65.7	98.5	98.5

TABLE 2.3-16
STATISTICS AND DIURNAL VARIATION OF METEROLOGICAL PARAMETERS

(Sheet 10 of 13)

OCTOBER (1972 - 1975)

DATA SOURCE: ON-SITE
TABLE GENERATED: 10/04/76. 09.29.33.

COMANCHE PEAK STEAM ELECTRIC STATION
GLEN ROSE, TEXAS
TEXAS UTILITIES GENERATING CO.
DAMES AND MOORE JOB NO: 4486-025-12

METEROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR.	WIND SPEED	WIND DIR.	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.00	10.00	60.00	60.00	10.00 60.00	10.00 60.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	16.7	12.0	72.5	2.5	170	5.2	165	1.5	F
2	16.2	12.1	73.7	2.5	178	5.0	171	1.4	F
3	15.9	12.1	75.1	2.4	175	4.8	177	1.4	F
4	15.4	12.1	77.8	2.4	182	4.8	185	1.5	F
5	15.1	11.8	79.2	2.3	168	4.5	184	1.6	F
6	14.8	11.8	81.5	2.3	151	4.3	179	1.6	F
7	14.5	11.9	82.9	2.2	163	4.1	177	1.6	F
8	14.9	12.5	83.2	2.2	166	4.0	177	1.2	F
9	16.6	13.3	79.8	2.8	165	4.1	179	.2	E
10	18.6	13.7	72.2	3.4	184	4.7	188	-.2	E
11	20.3	13.6	66.5	3.8	189	5.2	190	-.3	D
12	21.7	13.6	61.3	4.1	186	5.5	188	-.5	D
13	22.7	13.3	56.3	4.1	178	5.5	181	-.5	D
14	23.5	12.9	52.7	4.3	170	5.6	173	-.5	D
15	24.1	12.8	50.4	4.4	167	5.8	167	-.5	D
16	24.2	12.7	49.9	4.3	161	5.6	160	-.4	D
17	23.9	12.6	51.2	4.1	153	5.6	154	-.2	E
18	22.9	12.6	52.6	3.6	144	5.4	145	.2	E
19	21.3	12.6	58.1	3.0	135	5.6	136	.8	F
20	20.1	12.6	63.2	2.9	140	5.9	140	1.2	F
21	19.1	12.5	66.3	2.9	147	6.0	143	1.2	F
22	18.2	12.3	68.4	2.8	150	5.9	149	1.2	F
23	17.4	12.1	70.0	2.8	161	5.7	154	1.3	F
24	17.0	12.0	70.7	2.5	162	5.4	160	1.4	F
ABSOLUTE MAX	33.1	24.8	100.0	11.0		13.4			
AVG DAILY MAX	24.5	15.3	87.7	5.4		7.6			
MEAN	19.0	12.6	66.6	3.1	164	5.2	165	.7	E
CLIMATIC MEAN	19.2	12.5	68.6	3.2		5.1			
AVG DAILY MIN	13.8	9.8	49.6	1.0		2.6			
ABSOLUTE MIN	6.1	-.6	21.2	0.0		0.0			
STANDARD DEV	6.0	6.0	20.4	2.0		2.3			
VALID OBS	1935	1909	1753	2897	2787	1947	1935	2884	2884
INVALID OBS	1041	1067	1223	79	189	1029	1041	92	92
TOTAL OBS	2976	2976	2976	2976	2976	2976	2976	2976	2976
DATA RECOVERY	65.0	64.1	58.9	97.3	93.6	65.4	65.0	96.9	96.9

TABLE 2.3-16
STATISTICS AND DIURNAL VARIATION OF METEROLOGICAL PARAMETERS

(Sheet 11 of 13)

NOVEMBER (1972 - 1975)

DATA SOURCE: ON-SITE
TABLE GENERATED: 10/04/76. 09.29.33.

COMANCHE PEAK STEAM ELECTRIC STATION
GLEN ROSE, TEXAS
TEXAS UTILITIES GENERATING CO.
DAMES AND MOORE JOB NO: 4486-025-12

METEROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR.	WIND SPEED	WIND DIR.	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.00	10.00	60.00	60.00	10.00 60.00	10.00 60.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	10.2	5.0	69.9	3.4	244	5.7	207	1.2	F
2	9.7	4.7	71.0	3.3	245	5.5	202	1.3	F
3	9.5	4.7	71.7	3.3	257	5.6	206	1.2	F
4	9.2	4.5	71.9	3.2	272	5.4	230	1.3	F
5	9.1	4.7	72.9	3.3	257	5.7	225	1.3	F
6	9.0	4.6	74.4	3.2	271	5.4	218	1.3	F
7	8.9	4.8	75.0	3.1	267	5.4	231	1.1	F
8	9.9	5.1	72.4	3.5	272	5.3	241	.5	E
9	11.7	5.5	66.3	4.4	260	5.9	249	-.0	E
10	13.3	5.3	58.6	4.8	234	6.4	229	-.2	E
11	14.9	5.4	53.9	5.0	229	6.6	216	-.3	D
12	16.1	5.0	51.1	5.0	231	6.6	213	-.4	D
13	16.9	5.3	49.6	5.0	222	6.9	208	-.3	D
14	17.2	4.7	46.8	5.1	225	6.6	213	-.3	D
15	17.0	4.4	46.7	5.0	222	6.4	213	-.2	E
16	16.7	4.7	48.3	4.4	215	6.0	192	-.0	E
17	15.6	4.8	50.8	3.6	182	5.5	163	.4	E
18	14.4	5.0	54.8	3.3	177	5.7	148	.8	F
19	13.3	5.1	58.6	3.3	179	6.0	146	1.1	F
20	12.6	5.1	60.9	3.3	185	5.9	156	1.2	F
21	12.0	4.9	61.7	3.5	227	5.9	164	1.2	F
22	11.6	5.0	63.7	3.5	215	6.1	170	1.3	F
23	10.9	4.8	65.3	3.4	229	5.9	179	1.3	F
24	9.9	4.2	67.5	3.4	237	5.6	198	1.3	F
ABSOLUTE MAX	30.7	23.2	100.0	13.8		17.8			
AVG DAILY MAX	17.7	8.6	80.9	6.5		9.0			
MEAN	12.5	4.9	61.4	3.9	231	5.9	202	.7	E
CLIMATIC MEAN	12.9	5.2	62.9	4.0		6.0			
AVG DAILY MIN	8.1	1.9	44.8	1.4		3.0			
ABSOLUTE MIN	-4.2	-16.0	14.3	0.0		0.0			
STANDARD DEV	7.1	8.9	22.5	2.3		2.8			
VALID OBS	1902	1883	1798	2864	2784	1903	1903	2785	2785
INVALID OBS	978	997	1082	16	96	977	977	95	95
TOTAL OBS	2880	2880	2880	2880	2880	2880	2880	2880	2880
DATA RECOVERY	66.0	65.4	62.4	99.4	96.7	66.1	66.1	96.7	96.7

TABLE 2.3-16
STATISTICS AND DIURNAL VARIATION OF METEROLOGICAL PARAMETERS

(Sheet 12 of 13)

DECEMBER (1972 - 1975)

DATA SOURCE: ON-SITE
TABLE GENERATED: 10/04/76. 09.29.33.

COMANCHE PEAK STEAM ELECTRIC STATION
GLEN ROSE, TEXAS
TEXAS UTILITIES GENERATING CO.
DAMES AND MOORE JOB NO: 4486-025-12

METEROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR.	WIND SPEED	WIND DIR.	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.00	10.00	60.00	60.00	10.00 60.00	10.00 60.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	5.5	-1.0	62.8	3.4	265	6.2	249	1.5	F
2	5.0	-1.1	64.6	3.3	269	6.0	242	1.6	F
3	4.6	-1.1	66.1	3.2	269	6.0	248	1.7	F
4	4.3	-1.1	67.4	3.2	260	6.0	243	1.7	F
5	3.9	-1.1	69.2	3.2	274	5.7	242	1.7	F
6	3.8	-1.1	69.0	3.2	282	5.7	255	1.7	F
7	3.6	-1.1	69.6	3.2	283	5.6	254	1.7	F
8	4.3	-.8	68.5	3.4	284	5.6	252	1.2	F
9	6.1	-.5	62.4	3.9	287	5.4	256	.3	E
10	7.9	-.3	57.3	4.5	259	5.9	238	.0	E
11	10.0	-.2	51.1	4.9	253	6.3	234	-.1	E
12	11.6	-.5	44.4	5.0	251	6.5	237	-.2	E
13	12.6	-.7	41.1	5.1	254	6.6	236	-.2	E
14	13.1	-1.0	39.6	5.1	256	6.6	243	-.2	E
15	13.5	-1.0	39.1	5.0	252	6.5	231	-.1	E
16	13.1	-1.0	40.0	4.6	236	6.3	218	.0	E
17	11.8	-1.0	43.4	3.8	218	6.0	195	.4	E
18	10.2	-.8	47.7	3.5	222	6.3	174	1.0	F
19	9.1	-.8	51.2	3.3	239	6.4	183	1.1	F
20	8.2	-.8	53.8	3.4	276	6.5	194	1.3	F
21	7.5	-.8	56.3	3.5	267	6.4	191	1.4	F
22	7.1	-.7	58.1	3.6	259	6.5	210	1.4	F
23	6.7	-.7	59.4	3.6	261	6.4	219	1.4	F
24	6.4	-.8	60.1	3.3	272	6.4	230	1.5	F
ABSOLUTE MAX	28.5	17.5	99.9	12.7		17.7			
AVG DAILY MAX	13.8	2.5	74.7	6.5		9.3			
MEAN	7.9	-.8	55.8	3.8	262	6.2	233	.9	F
CLIMATIC MEAN	8.1	-.9	55.9	4.0		6.2			
AVG DAILY MIN	2.5	-4.2	37.1	1.4		3.1			
ABSOLUTE MIN	-8.1	-16.0	11.3	0.0		0.0			
STANDARD DEV	7.1	6.8	20.0	2.3		2.9			
VALID OBS	2137	2141	2129	2801	2791	2093	2063	2890	2890
INVALID OBS	839	835	847	175	185	883	913	86	86
TOTAL OBS	2976	2976	2976	2976	2976	2976	2976	2976	2976
DATA RECOVERY	71.8	71.9	71.5	94.1	93.8	70.3	69.3	97.1	97.1

TABLE 2.3-16
STATISTICS AND DIURNAL VARIATION OF METEROLOGICAL PARAMETERS

(Sheet 13 of 13)

MAY 15, 1972 TO MAY 14, 1976

DATA SOURCE: ON-SITE
TABLE GENERATED: 10/04/76. 09.29.33.

COMANCHE PEAK STEAM ELECTRIC STATION
GLEN ROSE, TEXAS
TEXAS UTILITIES GENERATING CO.
DAMES AND MOORE JOB NO: 4486-025-12

METEROLOGICAL PARAMETERS (HEIGHTS IN METERS)

	DRY BULB	DEW POINT	REL HUMID	WIND SPEED	WIND DIR.	WIND SPEED	WIND DIR.	DELTA TEMP	STAB CLASS
	10.00	10.00	10.00	10.00	10.00	60.00	60.00	10.00 60.00	10.00 60.00
HOUR	DEG C	DEG C	PCT	M/SEC	DEG	M/SEC	DEG	DEG C	
1	14.9	9.8	70.9	3.3	182	5.6	178	1.1	F
2	14.5	9.8	72.5	3.2	188	5.5	184	1.1	F
3	14.1	9.7	73.9	3.1	193	5.3	189	1.1	F
4	13.7	9.6	75.1	3.0	199	5.2	196	1.2	F
5	13.4	9.6	75.9	3.0	203	5.1	200	1.2	F
6	13.1	9.5	76.6	2.9	203	4.9	201	1.2	F
7	13.0	9.5	77.0	2.9	206	4.8	203	1.1	F
8	13.8	10.1	75.8	3.2	204	4.7	205	.5	E
9	15.5	10.5	71.8	3.9	203	5.1	207	-.0	E
10	17.1	10.5	65.4	4.4	201	5.5	203	-.3	D
11	18.5	10.3	59.9	4.6	199	5.8	201	-.4	D
12	19.7	10.0	55.0	4.7	198	5.8	201	-.5	D
13	20.6	9.6	51.2	4.8	192	6.0	195	-.5	D
14	21.2	9.3	48.5	4.9	184	6.0	187	-.5	D
15	21.5	9.2	47.3	4.9	176	6.1	179	-.4	D
16	21.6	9.1	46.8	4.8	166	6.1	169	-.3	D
17	21.1	9.2	48.2	4.5	155	5.9	157	-.2	E
18	20.2	9.3	50.9	4.2	148	6.0	149	.2	E
19	19.2	9.5	54.9	3.8	146	5.9	144	.5	E
20	18.1	9.7	58.9	3.6	149	6.0	146	.8	F
21	17.1	9.7	62.1	3.5	155	6.0	151	1.0	F
22	16.5	9.7	65.0	3.5	161	6.0	157	1.0	F
23	15.7	9.5	66.8	3.4	171	5.8	165	1.1	F
24	15.1	9.5	68.8	3.5	176	5.7	174	1.1	F
ABSOLUTE MAX	38.7	26.9	100.0	18.3		18.1			
AVG DAILY MAX	22.4	12.9	83.7	6.5		8.5			
MEAN	17.1	9.7	62.8	3.8	178	5.6	178	.5	E
CLIMATIC MEAN	17.3	9.7	64.0	4.0		5.7			
AVG DAILY MIN	12.2	6.6	44.2	1.5		2.9			
ABSOLUTE MIN	-14.3	-20.8	.7	0.0		0.0			
STANDARD DEV	9.4	10.3	21.4	2.4		2.6			
VALID OBS	23916	23487	22197	33176	32323	24697	23491	32851	32851
INVALID OBS	11124	11553	12843	1864	2717	10343	11549	2189	2189
TOTAL OBS	35040	35040	35040	35040	35040	35040	35040	35040	35040
DATA RECOVERY	68.3	67.0	63.3	94.7	92.2	70.5	67.0	93.8	93.8

TABLE 2.3-17
MONTHLY AVERAGE RELATIVE HUMIDITY (PERCENT) AT FORT WORTH
(1964-1973)

	Hour (CST)			
Month	00	06	12	18
January	75	81	60	59
February	72	79	57	53
March	71	80	57	51
April	75	85	60	55
May	80	88	61	58
June	74	86	57	52
July	68	81	51	46
August	70	83	53	48
September	80	89	61	59
October	78	86	56	59
November	76	83	56	60
December	77	81	60	61
Annual	75	84	57	55

TABLE 2.3-18
MONTHLY AND ANNUAL MEAN, AND EXTREME MAXIMUM AND MINIMUM
DEWPOINT TEMPERATURES (°F) AT FORT WORTH (1970-1975)

Month	Mean	Extreme Maximum	Extreme Minimum
January	34	67	01
February	36	63	08
March	44	70	12
April	52	75	08
May	61	76	36
June	67	79	44
July	68	78	50
August	68	78	51
September	66	77	40
October	57	75	30
November	43	72	02
December	37	68	05
Annual	53	79	01

TABLE 2.3-19
MONTHLY AND ANNUAL AVERAGE VALUES IN THE SITE AREA

Month	Precipitation (Inches)[(a)]	Number of Days With Precipitation .01 In.[(b)]	.10 In.[(c)]	.50 In.[(d)]	Snowfall (Inches)[(b)]	Number of Days With Heavy Fog[(b)]
Jan	2.00	7	3	1	1.6	2
Feb	2.19	7	4	1	0.7	2
Mar	2.01	7	3	1	0.4	1
Apr	3.57	9	6	3	0.0	1
May	4.78	8	6	3	0.0	<1/2
June	2.84	6	4	2	0.0	<1/2
July	2.06	5	3	1	0.0	0
Aug	1.82	5	2	1	0.0	<1/2
Sept	2.80	7	4	1	0.0	<1/2
Oct	2.82	6	5	2	0.0	1
Nov	2.21	6	3	2	T	1
Dec	2.19	7	4	1	0.2	3
Annual	31.30	79	47	19	2.9	11

a) Based on 30 years of record (1931-1960) at Cleburne, Dublin, Fort Worth, Rainbow, and Stephenville (Period of record at Rainbow and Stephenville varies from 25-31 years).

b) Based on 20 years of record (1954-1973) at Fort Worth.

c) Based on 7 years of record (1954-1960) at Cleburne, Dublin, Fort Worth, Rainbow, and Stephenville.

d) Based on 10 years of record (1951-1960) at Cleburne, Dublin, Fort Worth, Rainbow, and Stephenville.

TABLE 2.3-20
MONTHLY PRECIPITATION EXTREMES (Inches) AT SELECTED STATIONS

	Fort Worth (1954-1973)		Cleburne (1956-1960)		Dublin (1951-1960)	
Month	Maximum[a]	Minimum[a]	Maximum[a]	Minimum[a]	Maximum[a]	Minimum[a]
January	3.60(1968)	0.19(1971)	2.65(1960)	0.11(1959)	3.34(1960)	0.04(1953)
February	6.20(1965)	0.15(1963)	3.34(1959)	0.78(1954)	2.16(1958)	0.52(1953)
March	6.39(1968)	0.10(1972)	4.50(1957)	0.15(1956)	2.63(1953)	0.12(1956)
April	12.19(1957)	0.92(1959)	12.19(1957)	1.38(1951)	8.42(1957)	1.62(1951)
May	12.64(1957)	1.06(1961)	8.60(1957)	2.50(1954)	10.89(1956)	2.18(1959)
June	6.94(1962)	0.40(1964)	7.55(1951)	0.03(1952)	7.08(1959)	0.10(1952)
July	11.13(1973)	0.09(1965)	3.22(1960)	0.29(1956)	7.88(1959)	0.22(1956)
August	6.85(1970)	0.01(1973)	7.85(1953)	0.02(1957)	2.54(1953)	0.02(1957)
September	9.25(1964)	0.23(1956)	6.71(1958)	0.15(1956)	3.71(1957)	0.07(1956)
October	9.22(1959)	0.20(1955)	9.60(1959)	0.05(1952)	9.42(1959)	0.00(1952)
November	6.23(1964)	0.20(1970)	8.73(1952)	0.12(1955)	6.27(1957)	T (1955)
December	6.99(1971)	0.21(1955)	5.85(1960)	0.00(1951)	4.11(1960)	0.12(1951)

a) Year of occurrence is given in parentheses.

TABLE 2.3-21
PRECIPITATION WIND ROSE FORT WORTH, TEXAS

(Sheet 1 of 13)

JANUARY (1973 - 1976)

	SPEED GROUPS IN MPH											AVG
DIR	0-3	4-7	8-12	13-15	16-18	19-24	25-31	32-38	39 & GR	TOTAL	PERCENT	SPEED
N		1	12	6	2					21	26.9	11.8
NNE		1	5			1				7	9.0	10.9
NE			3	1						4	5.1	11.0
ENE												
E		1	2	2						5	6.4	10.0
ESE	1	1								2	2.5	4.5
SE		1	2							3	3.8	8.7
SSE		1								1	1.3	5.0
S		2	3	1		1				7	9.0	10.9
SSW		1	1			1				3	3.8	11.7
SW												
WSW		2	1		1					4	5.1	9.8
W		1	1							2	2.6	7.5
WNW			2	1						3	3.8	10.3
NW		2		2						4	5.1	10.3
NNW		2	2	3		2				9	11.5	13.2
CALM	3									3	3.8	
TOTAL	4	16	34	16	3	5				78	100.0	10.4
PERCENT	5.1	20.5	43.6	20.5	3.8	6.4					100.0	

TABLE 2.3-21
PRECIPITATION WIND ROSE FORT WORTH, TEXAS

(Sheet 2 of 13)

FEBRUARY (1973 - 1976)

	SPEED GROUPS IN MPH											AVG
DIR	0-3	4-7	8-12	13-15	16-18	19-24	25-31	32-38	39 & GR	TOTAL	PERCENT	SPEED
N		1	5	4	2	2				14	31.1	13.4
NNE		2	1							3	6.7	7.3
NE		2				1				3	6.7	11.0
ENE												
E	1									1	2.2	3.0
ESE												
SE		1								1	2.2	6.0
SSE		2	1							3	6.7	7.0
S	1	1	1		1					4	8.9	8.5
SSW												
SW			1							1	2.2	8.0
WSW												
W		2								2	4.4	5.5
WNW			1							1	2.2	9.0
NW				1		2				3	6.7	20.3
NNW	1			1	1	2	1			6	13.3	16.7
CALM	3									3	6.7	
TOTAL	6	11	10	6	4	7	1			45	100.0	11.0
PERCENT	13.3	24.4	22.2	13.3	8.9	15.6	2.2				100.0	

TABLE 2.3-21
PRECIPITATION WIND ROSE FORT WORTH, TEXAS

(Sheet 3 of 13)

MARCH (1973 - 1976)

	SPEED GROUPS IN MPH											AVG
DIR	0-3	4-7	8-12	13-15	16-18	19-24	25-31	32-38	39 & GR	TOTAL	PERCENT	SPEED
N		1	1	2	2	1				7	11.1	14.1
NNE			1	1						2	3.2	12.0
NE	1	1	2							4	6.3	6.5
ENE			5	2						7	11.1	11.4
E		2	1		1					4	6.3	9.5
ESE			1							1	1.6	9.0
SE	1	2	2	1	1	1				8	12.7	11.0
SSE		1	2	2	1	2				8	12.7	15.1
S		1	3	1	2	2				9	14.3	13.9
SSW				1						1	1.6	13.0
SW												
WSW												
W						1				1	1.6	20.0
WNW												
NW		1	1		1					3	4.8	10.3
NNW		1			1	2				4	6.3	16.5
CALM	4									4	6.3	
TOTAL	6	10	19	10	9	9				63	100.0	11.7
PERCENT	9.5	15.9	30.2	15.9	14.3	14.3					100.0	

TABLE 2.3-21
PRECIPITATION WIND ROSE FORT WORTH, TEXAS

(Sheet 4 of 13)

APRIL (1973 - 1976)

	SPEED GROUPS IN MPH											AVG
DIR	0-3	4-7	8-12	13-15	16-18	19-24	25-31	32-38	39 & GR	TOTAL	PERCENT	SPEED
N		1	2	1						4	4.9	9.3
NNE		1	2	1						4	4.9	9.8
NE		2	2							4	4.9	7.5
ENE	1		1	1						3	3.7	9.3
E		2	2	2						6	7.3	9.7
ESE		2	2	1						5	6.1	9.4
SE			2			2				4	4.9	14.5
SSE	1	1	5	3	5	2				17	20.7	13.2
S		4	7	3	6	2				22	26.8	12.7
SSW		1								1	1.2	6.0
SW			1							1	1.2	12.0
WSW		1								1	1.2	5.0
W												
WNW				3						3	3.7	14.7
NW				1	1					2	2.4	15.5
NNW												
CALM	5									5	6.1	
TOTAL	7	15	26	16	12	6				82	100.0	11.0
PERCENT	8.5	18.3	31.7	19.5	14.6	7.3					100.0	

TABLE 2.3-21
PRECIPITATION WIND ROSE FORT WORTH, TEXAS

(Sheet 5 of 13)

MAY (1972 - 1975)

	SPEED GROUPS IN MPH											AVG
DIR	0-3	4-7	8-12	13-15	16-18	19-24	25-31	32-38	39 & GR	TOTAL	PERCENT	SPEED
N			3	1						4	9.3	11.8
NNE		1		1	1					3	7.0	12.7
NE		1		1						2	4.7	10.5
ENE			1		1					2	4.7	12.0
E	1									1	2.3	3.0
ESE		1	1							2	4.7	7.5
SE			1							1	2.3	10.0
SSE		1	1	2						4	9.3	11.3
S			4	1	3					8	18.6	12.6
SSW		1		3	1					5	11.6	13.0
SW												
WSW												
W		1	2							3	7.0	9.0
WNW												
NW			1			1				2	4.7	16.0
NNW		1	2	1						4	9.3	9.8
CALM	2									2	4.7	
TOTAL	3	7	16	10	6	1				43	100.0	10.9
PERCENT	7.0	16.3	37.2	23.3	14.0	2.3					100.0	

TABLE 2.3-21
PRECIPITATION WIND ROSE FORT WORTH, TEXAS

(Sheet 6 of 13)

JUNE (1972 - 1975)

	SPEED GROUPS IN MPH										AVG
DIR	0-3	4-7	8-12	13-15	16-18	19-24	25-31	32-38	39 & GR	TOTAL	PERCENT	SPEED
N		1								1	3.1	5.0
NNE												
NE		1								1	3.1	7.0
ENE		1								1	3.1	6.0
E		1	2			1				4	12.5	11.8
ESE		1	2	1		1				5	15.6	12.6
SE		1	4			2				7	21.9	12.0
SSE			1	1		1				3	9.4	14.3
S			1		1					2	6.3	12.5
SSW		1								1	3.1	7.0
SW							1			1	3.1	29.0
WSW		1								1	3.1	5.0
W		1	1	1						3	9.4	9.7
WNW												
NW												
NNW		1								1	3.1	7.0
CALM	1									1	3.1	
TOTAL	1	10	11	3	1	5	1			32	100.0	11.2
PERCENT	3.1	31.3	34.4	9.4	3.1	15.6	3.1				100.0	

TABLE 2.3-21
PRECIPITATION WIND ROSE FORT WORTH, TEXAS

(Sheet 7 of 13)

JULY (1972 - 1975)

	SPEED GROUPS IN MPH										AVG
DIR	0-3	4-7	8-12	13-15	16-18	19-24	25-31	32-38	39 & GR	TOTAL	PERCENT	SPEED
N		1	1							2	6.7	8.5
NNE	1	1	1	1	1					5	16.7	9.8
NE												
ENE												
E		1								1	3.3	5.0
ESE			1							1	3.3	8.0
SE	1									1	3.3	3.0
SSE	1		2	1		1				5	16.7	11.6
S		2	2							4	13.3	7.8
SSW		1								1	3.3	5.0
SW		1	1							2	6.7	7.5
WSW			1			1				2	6.7	14.0
W						1				1	3.3	21.0
WNW					1	1				2	6.7	18.5
NW			1							1	3.3	8.0
NNW												
CALM	2									2	6.7	
TOTAL	5	7	10	2	2	4				30	100.0	9.5
PERCENT	16.7	23.3	33.3	6.7	6.7	13.3					100.0	

TABLE 2.3-21
PRECIPITATION WIND ROSE FORT WORTH, TEXAS

(Sheet 8 of 13)

AUGUST (1972 - 1975)

	SPEED GROUPS IN MPH										AVG
DIR	0-3	4-7	8-12	13-15	16-18	19-24	25-31	32-38	39 & GR	TOTAL	PERCENT	SPEED
N		2			1					3	9.7	10.3
NNE			2	1						3	9.7	11.3
NE			1							1	3.2	12.0
ENE			1							1	3.2	9.0
E		1	1	1						3	9.7	9.3
ESE	1									1	3.2	3.0
SE		3	2							5	16.1	7.2
SSE		1	2	1						4	12.9	10.3
S			2	1						3	9.7	12.7
SSW			1							1	3.2	8.0
SW												
WSW	1									1	3.2	3.0
W		1	1	1						3	9.7	11.0
WNW												
NW												
NNW		1				1				2	6.5	13.5
CALM												
TOTAL	2	9	13	5	1	1				31	100.0	9.8
PERCENT	6.5	29.0	41.9	16.1	3.2	3.2					100.0	

TABLE 2.3-21
PRECIPITATION WIND ROSE FORT WORTH, TEXAS

(Sheet 9 of 13)

SEPTEMBER (1972 - 1975)

	SPEED GROUPS IN MPH											AVG
DIR	0-3	4-7	8-12	13-15	16-18	19-24	25-31	32-38	39 & GR	TOTAL	PERCENT	SPEED
N	2	2	8	2	2	4				20	26.3	12.4
NNE			6	1						7	9.2	11.0
NE		3	3	1	2	1				10	13.2	11.2
ENE	1	1		1	1					4	5.3	9.8
E	1	3	2	1						7	9.2	8.1
ESE		2	1							3	3.9	8.3
SE	1	2	1							4	5.3	5.5
SSE		1	1	1						3	3.9	10.3
S			1	2	1					4	5.3	13.3
SSW		2	1							3	3.9	6.7
SW												
WSW			1							1	1.3	9.0
W		1								1	1.3	6.0
WNW		1	1							2	2.6	7.0
NW		2		1						3	3.9	9.3
NNW			3							3	3.9	9.3
CALM	1									1	1.3	
TOTAL	6	20	29	10	6	5				76	100.0	10.1
PERCENT	7.9	26.3	38.2	13.2	7.9	6.6					100.0	

TABLE 2.3-21
PRECIPITATION WIND ROSE FORT WORTH, TEXAS

(Sheet 10 of 13)

OCTOBER (1972 - 1975)

	SPEED GROUPS IN MPH										AVG
DIR	0-3	4-7	8-12	13-15	16-18	19-24	25-31	32-38	39 & GR	TOTAL	PERCENT	SPEED
N			2	1	1					4	6.8	13.3
NNE		1	2							3	5.1	8.3
NE		1	2							3	5.1	8.7
ENE					1					1	1.7	18.0
E		1	2	1						4	6.8	9.8
ESE		3	1							4	6.8	6.3
SE		2	2							4	6.8	8.0
SSE		1	4	2	1	1				9	15.3	11.9
S			5		1					6	10.2	10.8
SSW			1							1	1.7	8.0
SW	1									1	1.7	3.0
WSW			1							1	1.7	10.0
W			1							1	1.7	9.0
WNW	1		1	1	1					4	6.8	11.0
NW					1					1	1.7	16.0
NNW		4	3							7	11.9	7.1
CALM	5									5	8.5	
TOTAL	7	13	27	5	6	1				59	100.0	9.0
PERCENT	11.9	22.0	45.8	8.5	10.2	1.7					100.0	

TABLE 2.3-21
PRECIPITATION WIND ROSE FORT WORTH, TEXAS

(Sheet 11 of 13)

NOVEMBER (1972 - 1975)

	SPEED GROUPS IN MPH										AVG
DIR	0-3	4-7	8-12	13-15	16-18	19-24	25-31	32-38	39 & GR	TOTAL	PERCENT	SPEED
N			1		1					2	3.3	14.0
NNE			1	1						2	3.3	12.0
NE		1								1	1.6	5.0
ENE		1	2	1						4	6.6	9.5
E		2								2	3.3	6.5
ESE	1	4								5	8.2	5.4
SE	1	2	2							5	8.2	7.2
SSE			8	3						11	18.0	10.5
S		3	1	1	3					8	13.1	11.5
SSW												
SW		1								1	1.6	6.0
WSW												
W		1		2						3	4.9	11.0
WNW		1		3						4	6.6	12.3
NW			2	1						3	4.9	12.3
NNW		3		1		1	1			6	9.8	13.3
CALM	4									4	6.6	
TOTAL	6	19	17	13	4	1	1			61	100.0	9.6
PERCENT	9.8	31.1	27.9	21.3	6.6	1.6	1.6				100.0	

TABLE 2.3-21
PRECIPITATION WIND ROSE FORT WORTH, TEXAS

(Sheet 12 of 13)

DECEMBER (1972 - 1975)

	SPEED GROUPS IN MPH										AVG
DIR	0-3	4-7	8-12	13-15	16-18	19-24	25-31	32-38	39 & GR	TOTAL	PERCENT	SPEED
N		1	11	2	1	1				16	21.1	11.1
NNE	1	4	7							12	15.8	7.9
NE		4	3	1						8	10.5	7.9
ENE		2	1		1					4	5.3	10.0
E	1	2	2							5	6.6	6.2
ESE	1									1	1.3	3.0
SE		3	1							4	5.3	6.5
SSE		2	2	2	1					7	9.2	10.4
S				3	1					4	5.3	14.5
SSW												
SW												
WSW		1								1	1.3	5.0
W												
WNW	1		1							2	2.6	5.5
NW			2							2	2.6	10.5
NNW			4	1	2			1		8	10.5	14.9
CALM	2									2	2.6	
TOTAL	6	19	34	9	6	1		1		76	100.0	9.5
PERCENT	7.9	25.0	44.7	11.8	7.9	1.3		1.3			100.0	

TABLE 2.3-21
PRECIPITATION WIND ROSE FORT WORTH, TEXAS

(Sheet 13 of 13)

ANNUAL (5/72 - 4/76)

	SPEED GROUPS IN MPH										AVG
DIR	0-3	4-7	8-12	13-15	16-18	19-24	25-31	32-38	39 & GR	TOTAL	PERCENT	SPEED
N	2	11	46	19	12	8				98	14.5	12.0
NNE	2	11	28	7	2	1				51	7.5	9.9
NE	1	16	16	4	2	2				41	6.1	9.2
ENE	2	5	11	5	4					27	4.0	10.4
E	4	16	14	7	1	1				43	6.4	8.7
ESE	4	14	9	2		1				30	4.4	7.8
SE	4	17	19	1	1	5				47	7.0	9.1
SSE	2	11	29	18	8	7				75	11.1	11.8
S	1	13	30	13	19	5				81	12.0	12.1
SSW		7	4	4	1	1				17	2.5	9.8
SW	1	2	3				1			7	1.0	10.4
WSW	1	5	4		1	1				12	1.8	8.7
W		8	6	4		2				20	3.0	10.2
WNW	2	2	6	8	2	1				21	3.1	11.4
NW		5	7	6	3	3				24	3.6	12.8
NNW	1	13	14	7	4	8	2	1		50	7.4	12.7
CALM	32									32	4.7	
TOTAL	59	156	246	105	60	46	3	1		676	100.0	10.3
PERCENT	8.7	23.1	36.4	15.5	8.9	6.8	.4	.1			100.0	

TABLE 2.3-22
MONTHLY AND ANNUAL STABILITY CLASS PERCENT FREQUENCY DISTRIBUTIONS AT FORT WORTH (1957-1971)

	Stability Class[a]					
Month	A	B	C	D	E	F and G
January	0.0	1.5	5.5	68.3	13.4	11.2
February	0.1	2.4	6.1	66.9	14.2	10.4
March	0.0	2.4	5.6	69.9	13.7	8.4
April	0.5	2.9	8.8	68.4	10.8	8.6
May	0.8	5.4	12.3	59.2	11.9	10.5
June	1.1	6.9	16.1	48.0	16.3	11.5
July	1.6	10.5	19.3	33.0	19.6	16.2
August	1.9	10.8	17.3	32.2	20.7	17.1
September	0.9	7.0	11.1	43.3	19.0	18.6
October	0.1	4.2	10.2	47.6	17.6	20.3
November	0.0	2.9	8.2	56.3	15.8	16.8
December	0.0	1.4	6.8	63.3	15.2	13.3
Annual	0.6	4.9	10.6	54.6	15.7	13.6

a) Definition of Pasquill Stability Classes

Pasquill Stability Class	Identified in Table as	Definition
1	A	Extremely Unstable
2	B	Unstable
3	C	Slightly Unstable
4	D	Neutral
5	E	Slightly Stable
6	F	Stable
7	G	Extremely Stable

TABLE 2.3-23
STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION AT CPNPP (BASED ON 10-60 METER DELTA TEMPERATURE)

(Sheet 1 of 13)

NUMBER OF CONSECUTIVE HOURS	Stability Persistence Summary January (1973 - 1976) NUMBER OF HOURS PASQUILL STABILITY CLASS							TIME OF DAY (LST)[a]	Diurnal Distribution of Stability January (1973 - 1976) NUMBER OF HOURS PASQUILL STABILITY CLASS							
	-A-	-B-	-C-	-D-	-E-	-F-	-G-		-A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
2	6	4	14	456	851	327	436	0	0	0	0	6	41	31	32	110
3	3	0	5	361	681	217	361	1	0	0	0	5	45	29	38	117
4	1	0	1	292	563	146	301	2	0	0	0	6	45	27	40	118
5	0	0	0	247	466	100	246	3	0	0	0	8	41	30	38	117
6	0	0	0	211	393	71	203	4	0	0	0	10	40	29	38	117
7	0	0	0	181	330	47	168	5	0	0	0	10	42	26	39	117
8	0	0	0	160	277	30	136	6	0	0	0	13	42	26	36	117
9	0	0	0	140	230	17	106	7	0	0	0	13	39	25	39	116
10	0	0	0	131	190	8	79	8	0	0	0	16	46	22	32	116
11	0	0	0	125	159	2	58	9	0	0	0	31	58	9	16	114
12	0	0	0	119	134	0	40	10	1	1	2	49	51	8	3	115
13	0	0	0	114	112	0	24	11	2	2	7	59	41	2	2	115
14	0	0	0	109	94	0	11	12	3	7	7	61	33	3	1	115
15	0	0	0	105	79	0	3	13	3	6	10	61	33	2	1	116
16	0	0	0	102	66	0	0	14	2	1	11	66	34	2	1	117
17	0	0	0	100	55	0	0	15	1	0	6	64	44	3	0	118
18	0	0	0	98	47	0	0	16	0	0	1	49	65	4	0	119
19	0	0	0	96	41	0	0	17	0	0	0	17	95	7	0	119
20	0	0	0	94	35	0	0	18	0	0	0	9	55	46	9	119
21	0	0	0	92	30	0	0	19	0	0	0	7	38	50	24	119
22	0	0	0	90	26	0	0	20	0	0	0	7	36	44	32	119
23	0	0	0	88	23	0	0	21	0	0	0	7	38	39	35	119
24	0	0	0	86	21	0	0	22	0	0	0	7	39	32	41	119
>24	0	0	0	84	20	0	0	23	0	0	0	7	43	30	39	119
								ALL	12	17	44	588	1084	526	536	2807

169 INVALID HOUR(S). (Stability Persistence Summary)

169 INVALID HOUR(S). (Diurnal Distribution of Stability)

TABLE 2.3-23
STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION AT CPNPP (BASED ON 10-60 METER DELTA TEMPERATURE)

(Sheet 2 of 13)

NUMBER OF CONSECUTIVE HOURS	Stability Persistence Summary February (1973 - 1976) NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	TIME OF DAY (LST)[a]	Diurnal Distribution of Stability February (1973 - 1976) NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
2	25	5	10	374	871	404	242	0	1	0	0	3	39	40	21	104
3	16	1	4	271	704	284	191	1	1	0	0	2	42	36	29	110
4	11	0	1	196	595	199	151	2	0	0	0	2	46	36	26	110
5	8	0	0	137	508	137	116	3	0	0	0	4	45	38	23	110
6	5	0	0	89	438	96	88	4	0	1	0	3	44	38	24	110
7	2	0	0	52	382	67	65	5	0	0	0	6	43	36	25	110
8	1	0	0	31	330	46	45	6	0	0	0	3	41	40	26	110
9	0	0	0	18	285	31	31	7	0	0	0	5	38	42	25	110
10	0	0	0	13	247	19	20	8	0	0	0	8	61	25	16	110
11	0	0	0	9	210	10	13	9	0	1	0	27	64	10	8	110
12	0	0	0	7	176	5	6	10	2	1	1	42	57	6	1	110
13	0	0	0	6	146	2	3	11	3	2	6	60	33	6	0	110
14	0	0	0	5	123	0	1	12	5	4	10	59	30	0	1	109
15	0	0	0	4	104	0	0	13	7	6	7	61	24	3	0	108
16	0	0	0	3	88	0	0	14	7	4	4	65	26	2	0	108
17	0	0	0	2	75	0	0	15	6	3	4	63	31	1	0	108
18	0	0	0	1	65	0	0	16	2	3	2	53	47	2	0	109
19	0	0	0	0	56	0	0	17	1	1	0	21	85	1	0	109
20	0	0	0	0	48	0	0	18	1	1	0	6	79	20	2	109
21	0	0	0	0	42	0	0	19	1	0	0	1	60	34	13	109
22	0	0	0	0	37	0	0	20	0	0	0	4	45	43	17	109
23	0	0	0	0	32	0	0	21	0	1	0	3	42	46	17	109
24	0	0	0	0	27	0	0	22	0	0	0	2	42	43	22	109
>24	0	0	0	0	23	0	0	23	2	0	0	2	40	43	22	109
	96 INVALID HOUR(S).							ALL	39	28	34	505	1104	591	318	2619
										96 INVALID HOUR(S).						

TABLE 2.3-23
STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION AT CPNPP (BASED ON 10-60 METER DELTA TEMPERATURE)

(Sheet 3 of 13)

Stability Persistence Summary
March (1973 - 1976)

NUMBER OF CONSECUTIVE HOURS	NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	28	4	10	381	1076	301	210
3	18	1	2	272	900	188	163
4	10	0	0	185	773	113	128
5	5	0	0	125	674	68	99
6	2	0	0	77	590	40	76
7	1	0	0	44	518	25	56
8	0	0	0	24	455	17	40
9	0	0	0	11	400	12	26
10	0	0	0	6	351	8	14
11	0	0	0	5	308	6	4
12	0	0	0	4	272	4	0
13	0	0	0	3	242	2	0
14	0	0	0	2	214	1	0
15	0	0	0	1	188	0	0
16	0	0	0	0	162	0	0
17	0	0	0	0	141	0	0
18	0	0	0	0	123	0	0
19	0	0	0	0	109	0	0
20	0	0	0	0	96	0	0
21	0	0	0	0	85	0	0
22	0	0	0	0	76	0	0
23	0	0	0	0	67	0	0
24	0	0	0	0	60	0	0
>24	0	0	0	0	54	0	0

287 INVALID HOUR(S).

Diurnal Distribution of Stability
March (1973 - 1976)

TIME OF DAY (LST)[a]	NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	2	55	29	25	111
1	0	0	0	5	51	26	28	110
2	1	0	0	2	54	28	26	111
3	1	0	0	4	52	28	24	109
4	0	0	0	5	56	27	22	110
5	0	0	0	5	54	31	20	110
6	0	0	0	6	47	38	19	110
7	0	0	0	3	54	34	19	110
8	0	0	1	15	66	19	9	110
9	2	0	0	33	66	6	4	111
10	0	0	4	46	53	7	1	111
11	2	7	5	55	36	5	1	111
12	4	6	3	62	32	2	1	110
13	9	4	8	54	35	2	1	113
14	9	2	5	62	31	1	2	112
15	8	2	5	60	35	2	2	114
16	3	4	3	51	50	3	1	115
17	2	1	2	32	76	2	0	115
18	0	0	0	16	94	6	0	116
19	0	0	0	1	84	26	4	115
20	0	0	0	1	64	43	7	115
21	0	0	0	1	60	37	15	113
22	0	0	0	1	52	42	19	114
23	0	0	0	1	55	32	25	113
ALL	41	26	36	523	1312	476	275	2689

287 INVALID HOUR(S).

TABLE 2.3-23
STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION AT CPNPP (BASED ON 10-60 METER DELTA TEMPERATURE)

(Sheet 4 of 13)

NUMBER OF CONSECUTIVE HOURS	Stability Persistence Summary April (1973 - 1976) NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	TIME OF DAY (LST)[a]	Diurnal Distribution of Stability April (1973 - 1976) NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
2	60	13	11	326	1154	273	103	0	0	0	0	4	60	28	15	107
3	38	4	1	229	1008	186	71	1	0	0	0	4	61	31	13	109
4	22	1	0	169	892	130	51	2	0	0	0	2	57	37	13	109
5	11	0	0	127	791	89	35	3	0	0	0	2	60	33	14	109
6	6	0	0	91	703	58	24	4	0	0	0	2	58	32	17	109
7	2	0	0	62	625	33	15	5	0	0	0	2	55	37	15	109
8	0	0	0	41	562	19	7	6	0	0	0	2	54	37	16	109
9	0	0	0	27	508	12	3	7	0	0	0	4	69	24	11	108
10	0	0	0	16	459	9	1	8	1	0	1	22	67	13	4	108
11	0	0	0	9	413	6	0	9	1	0	3	42	54	7	2	109
12	0	0	0	5	372	3	0	10	4	5	4	43	46	4	2	108
13	0	0	0	3	333	1	0	11	10	1	8	43	40	3	2	107
14	0	0	0	2	296	0	0	12	12	6	8	41	38	3	0	108
15	0	0	0	1	264	0	0	13	15	6	3	46	35	4	0	109
16	0	0	0	0	235	0	0	14	15	10	6	40	34	3	0	108
17	0	0	0	0	211	0	0	15	18	5	3	43	40	0	0	109
18	0	0	0	0	192	0	0	16	8	8	9	37	47	2	0	111
19	0	0	0	0	177	0	0	17	4	2	12	37	54	3	0	112
20	0	0	0	0	165	0	0	18	1	1	1	31	77	1	0	112
21	0	0	0	0	154	0	0	19	2	1	0	10	90	9	0	112
22	0	0	0	0	145	0	0	20	3	1	0	3	76	25	3	111
23	0	0	0	0	138	0	0	21	1	3	0	2	69	34	2	111
24	0	0	0	0	131	0	0	22	0	1	1	2	66	32	9	111
>24	0	0	0	0	124	0	0	23	0	0	0	4	63	30	12	109
								ALL	95	50	59	468	1370	432	150	2624

262 INVALID HOUR(S). (Stability Persistence Summary)

262 INVALID HOUR(S). (Diurnal Distribution of Stability)

TABLE 2.3-23
STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION AT CPNPP (BASED ON 10-60 METER DELTA TEMPERATURE)

(Sheet 5 of 13)

Stability Persistence Summary
May (1973 - 1976)

NUMBER OF CONSECUTIVE HOURS	NUMBER OF HOURS PASQUILL STABILITY CLASS						
	-A-	-B-	-C-	-D-	-E-	-F-	-G-
2	37	21	30	519	832	320	159
3	25	9	8	368	656	212	111
4	16	4	0	263	534	139	77
5	9	2	0	183	435	92	48
6	4	0	0	129	359	65	29
7	1	0	0	85	295	43	16
8	0	0	0	56	245	25	8
9	0	0	0	32	204	16	4
10	0	0	0	12	173	9	1
11	0	0	0	2	143	4	0
12	0	0	0	0	121	1	0
13	0	0	0	0	101	0	0
14	0	0	0	0	84	0	0
15	0	0	0	0	72	0	0
16	0	0	0	0	61	0	0
17	0	0	0	0	52	0	0
18	0	0	0	0	45	0	0
19	0	0	0	0	40	0	0
20	0	0	0	0	36	0	0
21	0	0	0	0	33	0	0
22	0	0	0	0	31	0	0
23	0	0	0	0	29	0	0
24	0	0	0	0	27	0	0
>24	0	0	0	0	25	0	0

248 INVALID HOUR(S).

Diurnal Distribution of Stability
May (1973 - 1976)

TIME OF DAY (LST)[a]	NUMBER OF HOURS PASQUILL STABILITY CLASS							ALL
	-A-	-B-	-C-	-D-	-E-	-F-	-G-	
0	0	0	0	0	38	26	13	77
1	0	0	0	0	52	43	20	115
2	0	0	0	0	50	40	26	116
3	0	0	0	0	48	43	25	116
4	0	1	0	1	49	38	26	115
5	0	0	0	0	48	41	25	114
6	0	0	0	0	52	34	28	114
7	0	0	0	2	52	39	20	113
8	1	0	0	17	74	21	1	114
9	1	0	2	47	59	4	1	114
10	3	5	3	67	36	0	0	114
11	4	7	7	74	22	0	0	114
12	5	10	9	73	15	0	0	112
13	11	10	13	64	14	0	0	112
14	13	7	20	58	14	0	0	112
15	12	11	17	60	14	0	0	114
16	6	7	15	68	18	0	0	114
17	3	5	9	71	28	0	0	116
18	1	0	1	64	49	1	0	116
19	0	0	1	33	77	5	0	116
20	0	0	0	0	87	20	4	111
21	0	0	0	1	67	43	5	116
22	0	0	0	0	55	47	14	116
23	0	0	0	0	56	41	19	116
ALL	60	63	97	700	1074	486	227	2707

248 INVALID HOUR(S).

TABLE 2.3-23
STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION AT CPNPP (BASED ON 10-60 METER DELTA TEMPERATURE)

(Sheet 6 of 13)

Stability Persistence Summary
June (1973 - 1976)

NUMBER OF CONSECUTIVE HOURS	NUMBER OF HOURS PASQUILL STABILITY CLASS						
	-A-	-B-	-C-	-D-	-E-	-F-	-G-
2	91	7	24	615	782	401	84
3	72	0	9	464	612	293	61
4	58	0	3	343	492	223	43
5	47	0	0	253	408	167	30
6	38	0	0	182	345	122	20
7	31	0	0	131	288	83	12
8	24	0	0	87	235	53	7
9	19	0	0	53	187	32	4
10	16	0	0	27	147	15	2
11	13	0	0	8	116	8	0
12	11	0	0	2	90	5	0
13	9	0	0	0	68	3	0
14	7	0	0	0	48	2	0
15	5	0	0	0	35	1	0
16	3	0	0	0	26	0	0
17	1	0	0	0	18	0	0
18	0	0	0	0	12	0	0
19	0	0	0	0	10	0	0
20	0	0	0	0	8	0	0
21	0	0	0	0	6	0	0
22	0	0	0	0	4	0	0
23	0	0	0	0	2	0	0
24	0	0	0	0	1	0	0
>24	0	0	0	0	0	0	0

128 INVALID HOUR(S).

Diurnal Distribution of Stability
June (1973 - 1976)

TIME OF DAY (LST)[a]	NUMBER OF HOURS PASQUILL STABILITY CLASS							
	-A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	1	0	0	1	50	52	9	113
1	0	0	0	3	53	51	8	115
2	0	1	0	1	53	52	9	116
3	0	2	0	0	50	51	13	116
4	2	0	0	1	54	43	15	115
5	2	0	0	0	53	44	16	115
6	1	0	1	1	49	43	20	115
7	2	0	0	3	65	33	11	114
8	2	0	0	29	66	10	3	110
9	2	0	0	63	46	4	0	115
10	7	1	3	82	21	1	0	115
11	8	6	7	77	18	0	0	116
12	12	5	12	75	8	1	1	114
13	12	5	15	71	10	1	1	115
14	14	11	11	70	8	1	0	115
15	16	1	14	71	12	1	0	115
16	12	3	9	70	18	1	0	113
17	9	3	7	69	27	0	0	115
18	7	2	1	64	38	3	0	115
19	5	1	0	43	59	8	0	116
20	3	0	0	4	92	15	1	115
21	1	0	0	2	70	39	3	115
22	1	0	0	1	58	49	7	116
23	0	0	0	2	53	51	10	116
ALL	119	41	80	803	1031	554	127	2755

128 INVALID HOUR(S).

TABLE 2.3-23
STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION AT CPNPP (BASED ON 10-60 METER DELTA TEMPERATURE)

(Sheet 7 of 13)

Stability Persistence Summary
July (1973 - 1976)

NUMBER OF CONSECUTIVE HOURS	NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	195	6	13	585	819	410	30
3	160	3	1	422	634	304	16
4	128	2	0	311	507	221	9
5	98	1	0	231	401	162	7
6	70	0	0	170	323	117	5
7	48	0	0	125	257	81	3
8	28	0	0	89	201	51	2
9	13	0	0	59	155	29	1
10	6	0	0	33	116	15	0
11	3	0	0	10	87	4	0
12	1	0	0	2	63	0	0
13	0	0	0	0	44	0	0
14	0	0	0	0	30	0	0
15	0	0	0	0	19	0	0
16	0	0	0	0	10	0	0
17	0	0	0	0	5	0	0
18	0	0	0	0	3	0	0
19	0	0	0	0	1	0	0
20	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0
>24	0	0	0	0	0	0	0

60 INVALID HOUR(S).

Diurnal Distribution of Stability
July (1973 - 1976)

TIME OF DAY (LST)[a]	NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	1	0	0	1	64	44	7	117
1	1	0	0	2	68	45	5	121
2	1	0	0	2	62	53	3	121
3	1	0	0	3	62	51	4	121
4	1	0	2	2	60	51	5	121
5	1	0	1	3	53	57	6	121
6	0	0	1	2	50	63	4	120
7	2	0	1	1	75	39	3	121
8	2	0	1	54	58	5	1	121
9	4	3	5	83	25	1	0	121
10	17	3	5	83	14	0	0	122
11	25	6	3	75	12	0	0	122
12	30	9	3	63	16	0	0	121
13	31	4	13	59	14	1	0	122
14	34	5	12	58	11	2	1	123
15	32	6	8	60	15	1	1	123
16	26	5	12	63	15	1	1	123
17	21	4	8	68	19	3	0	123
18	9	1	4	74	32	3	0	123
19	1	0	0	51	66	4	1	123
20	1	0	0	2	100	17	2	122
21	1	0	0	1	68	49	3	122
22	1	0	0	0	68	47	5	121
23	1	0	0	0	70	43	7	121
ALL	244	46	79	810	1097	580	60	2916

60 INVALID HOUR(S).

TABLE 2.3-23
STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION AT CPNPP (BASED ON 10-60 METER DELTA TEMPERATURE)

(Sheet 8 of 13)

Stability Persistence Summary
August (1973 - 1976)

NUMBER OF CONSECUTIVE HOURS	NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	188	17	19	464	847	486	47
3	147	3	5	324	691	355	25
4	114	0	1	221	580	258	14
5	87	0	0	165	487	179	7
6	61	0	0	123	408	123	3
7	41	0	0	91	341	81	2
8	23	0	0	64	289	54	1
9	11	0	0	41	243	33	0
10	4	0	0	19	207	19	0
11	2	0	0	4	174	10	0
12	1	0	0	1	145	4	0
13	0	0	0	0	121	0	0
14	0	0	0	0	101	0	0
15	0	0	0	0	87	0	0
16	0	0	0	0	75	0	0
17	0	0	0	0	69	0	0
18	0	0	0	0	65	0	0
19	0	0	0	0	61	0	0
20	0	0	0	0	58	0	0
21	0	0	0	0	55	0	0
22	0	0	0	0	53	0	0
23	0	0	0	0	52	0	0
24	0	0	0	0	51	0	0
>24	0	0	0	0	50	0	0

29 INVALID HOUR(S).

Diurnal Distribution of Stability
August (1973 - 1976)

TIME OF DAY (LST)[a]	NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	2	0	0	1	68	46	4	121
1	1	1	0	3	65	47	7	124
2	1	0	0	4	62	53	4	124
3	0	0	0	5	54	59	6	124
4	0	0	2	2	59	52	9	124
5	0	0	1	3	52	53	15	124
6	1	1	0	2	53	54	13	124
7	2	0	0	2	48	65	7	124
8	2	0	0	38	73	10	1	124
9	12	2	4	68	36	2	0	124
10	18	1	6	78	19	0	0	122
11	27	9	17	53	16	0	0	122
12	27	19	13	48	15	0	0	122
13	39	7	15	48	10	2	0	121
14	34	11	14	42	15	7	0	123
15	27	10	14	48	17	5	1	122
16	23	6	6	62	19	6	0	122
17	17	2	4	70	27	2	1	123
18	6	4	2	65	43	2	2	124
19	2	0	0	22	90	6	3	123
20	1	0	0	1	84	36	1	123
21	0	0	0	2	64	54	4	124
22	0	0	0	1	65	51	6	124
23	1	0	0	2	58	56	4	121
ALL	244	73	98	670	1112	668	88	2953

29 INVALID HOUR(S).

TABLE 2.3-23
STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION AT CPNPP (BASED ON 10-60 METER DELTA TEMPERATURE)

(Sheet 9 of 13)

NUMBER OF CONSECUTIVE HOURS	Stability Persistence Summary September (1973 - 1976) NUMBER OF HOURS PASQUILL STABILITY CLASS							TIME OF DAY (LST)[a]	Diurnal Distribution of Stability September (1973 - 1976) NUMBER OF HOURS PASQUILL STABILITY CLASS							
	-A-	-B-	-C-	-D-	-E-	-F-	-G-		-A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
2	82	12	13	483	1080	280	110	0	0	0	0	0	78	27	12	117
3	56	3	3	351	909	188	78	1	2	0	0	1	76	29	11	119
4	36	1	1	259	782	127	60	2	2	0	0	1	72	32	11	118
5	23	0	0	194	677	83	48	3	1	1	0	0	72	33	11	119
6	13	0	0	142	583	55	38	4	0	0	1	0	74	28	16	119
7	5	0	0	99	500	33	31	5	0	0	0	1	68	34	16	119
8	1	0	0	63	428	20	25	6	0	0	0	3	68	28	20	119
9	0	0	0	35	361	12	19	7	1	0	0	1	73	25	19	119
10	0	0	0	16	304	7	14	8	0	0	1	12	82	17	8	120
11	0	0	0	7	257	4	9	9	0	1	1	62	52	2	2	120
12	0	0	0	3	221	3	4	10	5	2	8	70	33	1	0	119
13	0	0	0	2	188	2	1	11	10	9	7	67	22	1	0	116
14	0	0	0	1	160	1	0	12	12	10	11	68	17	0	0	118
15	0	0	0	0	134	0	0	13	22	7	7	60	19	1	0	116
16	0	0	0	0	114	0	0	14	19	8	12	60	19	0	0	118
17	0	0	0	0	98	0	0	15	18	3	6	70	20	1	0	118
18	0	0	0	0	84	0	0	16	11	2	8	73	23	2	0	119
19	0	0	0	0	73	0	0	17	7	0	6	75	29	1	0	118
20	0	0	0	0	65	0	0	18	5	0	0	45	66	1	1	118
21	0	0	0	0	60	0	0	19	2	1	1	6	95	14	1	120
22	0	0	0	0	56	0	0	20	2	0	1	1	71	42	3	120
23	0	0	0	0	53	0	0	21	2	0	0	1	64	44	8	119
24	0	0	0	0	50	0	0	22	2	0	0	0	69	38	10	119
>24	0	0	0	0	48	0	0	23	1	0	0	1	71	37	10	120
								ALL	124	44	70	678	1333	438	160	2847

36 INVALID HOUR(S). (Stability Persistence Summary)

36 INVALID HOUR(S). (Diurnal Distribution of Stability)

TABLE 2.3-23
STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION AT CPNPP (BASED ON 10-60 METER DELTA TEMPERATURE)

(Sheet 10 of 13)

	Stability Persistence Summary October (1973 - 1976) NUMBER OF HOURS PASQUILL STABILITY CLASS								Diurnal Distribution of Stability October (1973 - 1976) NUMBER OF HOURS PASQUILL STABILITY CLASS							
NUMBER OF CONSECUTIVE HOURS	-A-	-B-	-C-	-D-	-E-	-F-	-G-	TIME OF DAY (LST)[a]	-A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
2	16	8	18	582	717	371	395	0	0	0	0	6	38	40	34	118
3	8	1	7	452	568	237	319	1	0	0	0	6	41	36	37	120
4	2	0	2	347	467	149	257	2	0	0	0	5	41	30	44	120
5	0	0	1	264	387	96	205	3	0	0	0	5	41	33	41	120
6	0	0	0	198	324	59	161	4	0	0	0	7	36	35	43	121
7	0	0	0	143	273	36	126	5	0	0	0	7	40	26	48	121
8	0	0	0	99	231	18	93	6	0	0	0	4	43	28	46	121
9	0	0	0	67	196	10	67	7	0	0	0	5	41	31	44	121
10	0	0	0	56	166	7	44	8	0	0	0	13	50	20	38	121
11	0	0	0	51	139	4	28	9	0	0	0	39	61	19	2	121
12	0	0	0	46	115	2	15	10	0	0	8	66	41	5	1	121
13	0	0	0	41	94	0	6	11	0	8	11	67	32	2	1	121
14	0	0	0	37	74	0	2	12	8	6	8	73	22	2	0	119
15	0	0	0	33	56	0	0	13	9	5	12	76	18	0	0	120
16	0	0	0	29	44	0	0	14	7	9	9	79	17	0	0	121
17	0	0	0	26	34	0	0	15	2	7	9	91	13	0	0	122
18	0	0	0	23	27	0	0	16	2	1	10	84	25	0	0	122
19	0	0	0	20	21	0	0	17	1	0	0	72	47	2	0	122
20	0	0	0	17	18	0	0	18	0	0	0	16	97	9	0	122
21	0	0	0	14	15	0	0	19	0	0	0	4	64	49	5	122
22	0	0	0	12	13	0	0	20	0	0	0	5	40	57	20	122
23	0	0	0	10	11	0	0	21	0	0	0	5	38	52	27	122
24	0	0	0	8	9	0	0	22	1	0	0	7	38	46	29	121
>24	0	0	0	6	7	0	0	23	0	0	0	5	41	44	31	121
	80 INVALID HOUR(S).							ALL	30	36	67	747	965	566	491	2902

80 INVALID HOUR(S).

TABLE 2.3-23
STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION AT CPNPP (BASED ON 10-60 METER DELTA TEMPERATURE)

(Sheet 11 of 13)

Stability Persistence Summary
November (1973 - 1976)

NUMBER OF CONSECUTIVE HOURS	NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	10	7	14	542	806	439	316
3	6	2	6	418	646	328	254
4	4	0	4	319	524	242	200
5	2	0	2	248	435	182	158
6	1	0	1	192	365	141	124
7	0	0	0	146	304	109	97
8	0	0	0	119	249	85	75
9	0	0	0	101	201	65	56
10	0	0	0	87	168	50	41
11	0	0	0	77	139	39	29
12	0	0	0	67	115	34	18
13	0	0	0	58	94	31	9
14	0	0	0	49	76	28	3
15	0	0	0	42	63	25	0
16	0	0	0	37	50	22	0
17	0	0	0	33	40	19	0
18	0	0	0	29	33	18	0
19	0	0	0	25	28	17	0
20	0	0	0	23	23	16	0
21	0	0	0	22	18	15	0
22	0	0	0	21	15	14	0
23	0	0	0	20	12	13	0
24	0	0	0	19	9	12	0
>24	0	0	0	18	7	11	0

48 INVALID HOUR(S).

Diurnal Distribution of Stability
November (1973 - 1976)

TIME OF DAY (LST)[a]	NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	0	0	0	14	32	39	28	113
1	0	0	0	15	38	36	31	120
2	0	0	0	14	38	37	31	120
3	0	0	0	11	42	39	28	120
4	0	0	0	10	41	40	29	120
5	0	0	0	10	43	36	29	118
6	0	0	0	10	41	38	30	119
7	0	0	0	14	44	33	28	119
8	1	0	0	18	64	23	12	118
9	1	0	1	50	54	11	2	119
10	2	5	5	63	37	5	1	118
11	3	4	9	67	29	3	1	116
12	6	3	8	68	25	3	0	113
13	3	4	4	74	24	2	1	112
14	1	1	6	81	22	2	0	113
15	0	1	0	70	42	4	0	117
16	0	1	0	28	86	4	1	120
17	0	0	0	12	81	25	2	120
18	0	0	0	10	52	49	9	120
19	0	0	0	12	40	50	18	120
20	0	0	0	10	41	43	26	120
21	0	0	0	10	43	38	29	120
22	0	0	0	9	46	36	29	120
23	0	0	0	10	45	33	32	120
ALL	17	19	33	690	1050	629	397	2835

48 INVALID HOUR(S).

TABLE 2.3-23
STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION AT CPNPP (BASED ON 10-60 METER DELTA TEMPERATURE)

(Sheet 12 of 13)

NUMBER OF CONSECUTIVE HOURS	Stability Persistence Summary December (1973 - 1976) NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	TIME OF DAY (LST)[a]	Diurnal Distribution of Stability December (1973 - 1976) NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
2	43	0	12	439	788	455	447	0	3	0	0	10	24	26	34	97
3	38	0	4	348	640	310	359	1	3	0	0	9	36	34	40	122
4	34	0	0	275	532	216	294	2	3	0	0	8	37	32	42	122
5	30	0	0	224	456	149	240	3	2	0	0	8	34	32	47	123
6	27	0	0	183	388	101	191	4	2	0	0	7	33	35	45	122
7	26	0	0	155	327	67	148	5	2	0	0	8	29	38	45	122
8	25	0	0	135	270	48	117	6	1	0	0	9	30	39	43	122
9	24	0	0	124	227	34	88	7	1	0	0	9	34	30	48	122
10	23	0	0	116	190	25	65	8	2	0	0	15	38	39	28	122
11	22	0	0	108	165	17	46	9	2	1	1	33	56	17	10	120
12	21	0	0	101	146	9	33	10	2	1	1	55	44	15	3	121
13	20	0	0	94	129	5	22	11	2	2	4	54	50	7	2	121
14	19	0	0	88	112	2	11	12	2	4	13	50	46	6	1	122
15	18	0	0	82	97	1	4	13	2	0	9	58	46	6	1	122
16	17	0	0	77	83	0	0	14	3	0	5	61	47	6	1	123
17	16	0	0	72	70	0	0	15	3	0	0	55	56	7	1	122
18	15	0	0	69	60	0	0	16	2	0	0	28	84	5	1	120
19	14	0	0	66	51	0	0	17	2	0	0	9	81	27	2	121
20	13	0	0	63	44	0	0	18	2	0	0	7	45	54	15	123
21	12	0	0	60	38	0	0	19	1	0	0	10	28	61	22	122
22	11	0	0	57	33	0	0	20	1	0	0	11	28	55	27	122
23	10	0	0	54	28	0	0	21	1	0	0	11	29	47	34	122
24	9	0	0	51	23	0	0	22	2	1	0	9	35	39	36	122
>24	8	0	0	48	20	0	0	23	3	0	0	8	31	35	45	122
	80 INVALID HOUR(S).							ALL	49	9	33	542	1001	692	573	2899

80 INVALID HOUR(S).

TABLE 2.3-23
STABILITY-PERSISTENCE AND DIURNAL DISTRIBUTION AT CPNPP (BASED ON 10-60 METER DELTA TEMPERATURE)

(Sheet 13 of 13)

Stability Persistence Summary
May 15, 1972 - May 14, 1976)

NUMBER OF CONSECUTIVE HOURS	NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-
2	781	104	188	5767	10633	4472	2586
3	587	27	55	4282	8669	3109	2019
4	436	8	13	3182	7270	2171	1598
5	320	3	3	2400	6160	1511	1251
6	227	0	1	1789	5259	1055	974
7	157	0	0	1316	4484	712	751
8	102	0	0	970	3818	473	568
9	67	0	0	710	3242	309	417
10	49	0	0	534	2757	194	291
11	40	0	0	417	2343	116	192
12	34	0	0	359	1997	71	118
13	29	0	0	323	1693	46	65
14	26	0	0	295	1428	34	28
15	23	0	0	270	1210	27	7
16	20	0	0	250	1022	22	0
17	17	0	0	234	873	19	0
18	15	0	0	220	758	18	0
19	14	0	0	207	668	17	0
20	13	0	0	197	596	16	0
21	12	0	0	188	536	15	0
22	11	0	0	180	489	14	0
23	10	0	0	172	447	13	0
24	9	0	0	164	409	12	0
>24	8	0	0	156	378	11	0

1490 INVALID HOUR(S).

Diurnal Distribution of Stability
May 15, 1972 - May 14, 1976)

TIME OF DAY (LST)[a]	NUMBER OF HOURS PASQUILL STABILITY CLASS -A-	-B-	-C-	-D-	-E-	-F-	-G-	ALL
0	8	0	0	48	587	428	234	1305
1	8	1	0	55	628	443	267	1402
2	8	1	0	47	617	457	275	1405
3	5	3	0	50	601	470	275	1404
4	5	2	5	50	604	448	289	1403
5	5	0	2	55	580	459	299	1400
6	3	1	2	55	570	468	301	1400
7	8	0	1	62	632	420	274	1397
8	11	0	4	257	745	224	153	1394
9	25	8	17	578	631	92	47	1398
10	61	25	50	744	452	52	12	1396
11	96	63	91	751	351	29	10	1391
12	126	89	105	741	297	20	5	1383
13	163	64	116	732	282	24	5	1386
14	158	69	115	742	278	26	5	1393
15	143	49	86	755	339	25	5	1402
16	95	40	75	666	497	30	4	1407
17	67	18	48	553	649	73	5	1413
18	32	9	9	407	727	195	38	1417
19	14	3	2	200	791	316	91	1417
20	11	1	1	49	764	440	143	1409
21	6	4	0	46	652	522	182	1412
22	8	2	1	39	633	502	227	1412
23	8	0	0	42	626	475	256	1407
ALL	1074	452	730	7724	*533	6638	3402	33553

1490 INVALID HOUR(S).

a) LOCAL STANDARD TIME

TABLE 2.3-24

MEAN MONTHLY MIXING DEPTHS FORT WORTH[a] (May 1972-April 1976)

	Morning[b] (meters)	Afternoon[c] (meters)
January	409	771
February	449	1023
March	545	1057
April	547	1203
May	519	1323
June	619	1515
July	689	2120
August	662	2042
September	678	1451
October	481	1355
November	578	995
December	414	804

a) Based on surface observations at Fort Worth and upper air observations at Carswell AFB, Fort Worth from 5/72-10/73 and at Stephenville from 11/73-4/76.

b) Determined from intersection of 1200 GMT RAOB temperature profile and the potential temperature based on the surface RAOB pressure at 1200 GMT and the minimum surface temperature between 0200 and 0600 LST plus 5.0°C (P, C, and M cases excluded).

c) Determined as in b) except using surface temperature at 1500 LST.

TABLE 2.3-25
COMPARISON OF 4- AND 15-YEAR WIND AND STABILITY CONDITIONS AT FORT WORTH

Wind Direction	Wind Frequency Distribution (%) 4-Year[(a)]	15-Year[(b)]
N	9.0	8.4
NNE	4.3	6.1
NE	2.6	3.9
ENE	2.1	3.0
E	4.0	4.4
ESE	3.9	6.0
SE	6.8	7.9
SSE	10.9	10.4
S	22.5	19.6
SSW	8.6	9.3
SW	3.1	3.4
WSW	2.0	2.5
W	2.3	2.2
WNW	2.1	1.8
NW	3.8	3.3
NNW	5.8	5.4
Calm	6.4	2.5

Pasquill Stability Class	Stability Class Frequency Distribution and Mean Speed			
	4-Year[(a)]		15-Year[(b)]	
	Frequency(%)	Mean Speed (knots)	Frequency(%)	Mean Speed (knots)
A	1.1	2.4	0.6	3.1
B	5.8	5.2	4.9	5.4
C	10.5	8.3	10.6	8.8
D	49.5	11.5	54.6	12.3
E	14.6	7.1	15.7	7.5
F & G	18.5	3.5	13.6	4.1
All Classes	100.0	8.6	100.0	9.7

a) May 1972 through April 1976, concurrent with onsite meterological record.

b) January 1957 through December 1971.

TABLE 2.3-26
METEOROLOGICAL INSTRUMENTATION COMANCHE PEAK PREOPERATIONAL METEOROLOGICAL PROGRAM

Measurement	Level (meters)	Instrument	Manufacturer	Model Number	Accuracy	Threshold	Instrument Range
Wind Speed	10 & 60	6 cup Anemometer	WeatherMeasure	W103/6L/A	±1% or .15 mph	.45 m/s[a]	1-100 mph
Wind Direction[b]	10 & 60	Wind Vane	WeatherMeasure	W104-2	±1%	.75 m/s[a]	0-540°
Temperature	10, 30 & 60	Thermistor Composite	WeatherMeasure	44018 X	±.1°C	N/A[c]	-20 to 120°F
		Aspirated Shield (Temp., Dewpoint, & ΔT)	WeatherMeasure	IS-6	N/A	N/A	N/A
Dewpoint	10 & 60	Lithium Chloride Dewcell	Foxboro	2711	±.5°C	N/A	-20 to 120°F
Delta Temperature (ΔT)	10-30 and 10-60	Thermistor Composite	WeatherMeasure	44018 X	.1°C	N/A	-20 to 20
Precipitation	Surface	Tipping Bucket Rain Gauge	WeatherMeasure	P 501	.01 in	.01 in	0 - 10 in
Total Solar Radiation	1	Pyranometer	WeatherMeasure	R 411	±2%	.05 ly/min	-.05 to 2.5 ly/min
Net Solar Radiation	1	Net Radiometer	WeatherMeasure	R 421	±1%	.03 ly/min	-.05 to 2.5 ly/min

a) m/s = meters per second

b) Wind direction variability at the 10-meter level uses this sensor

c) N/A - not applicable

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 1 of 52)

January (1973 - 1976): 10-Meter Level

PASQUILL #A# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	0	0	0	0	0	0	0	4	4	20.17
SSW	0	0	0	0	0	0	0	0	0	0	0	4	4	18.10
SW	0	0	0	0	1	0	0	0	0	0	0	1	2	12.65
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	0	0	0	0	0	0	0	0	0	2	2	12.35
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	1	0	0	0	0	0	0	0	11	12	16.92

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #B# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	1	0	0	0	0	0	1	7.00
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	0	0	0	0	0	0	0	0	0	0	1	2	3	15.43
SW	0	0	0	0	0	0	0	0	0	0	1	5	6	15.02
WSW	0	0	0	0	0	0	0	0	0	0	0	1	1	20.40
W	0	0	0	0	0	0	0	0	0	0	0	2	2	19.45
WNW	0	0	0	0	0	0	0	0	0	0	0	0	1	0.
NW	0	0	0	0	0	0	0	0	0	0	0	1	1	13.00
NNW	0	0	0	0	0	0	0	0	0	0	0	1	1	15.40
N	0	0	0	0	0	0	0	0	1	0	0	1	2	9.80
CALM													0	0.
TOTAL	0	0	0	0	0	0	1	0	1	0	2	13	17	14.75

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 2 of 52)

January (1973 - 1976): 10-Meter Level

PASQUILL #C# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	1	0	0	0	0	1	1	1	4	9.45
NE	0	0	0	0	0	0	0	1	0	1	0	0	2	9.00
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	1	0	0	0	0	0	0	0	0	1	3.90
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSE	0	0	0	0	0	0	0	0	1	0	1	0	2	9.75
S	0	0	0	0	0	0	1	0	0	0	0	2	3	13.23
SSW	0	0	0	0	1	1	0	0	0	0	0	2	4	9.97
SW	0	0	0	0	0	1	0	0	0	0	1	2	4	11.30
WSW	0	0	0	2	2	0	0	0	0	0	0	3	7	9.14
W	0	0	0	0	0	0	0	0	0	1	0	2	3	16.57
WNW	0	0	0	0	0	0	0	0	0	0	0	1	1	17.60
NW	0	0	0	0	0	0	0	0	0	0	0	2	2	11.50
NNW	0	0	0	0	0	0	0	2	1	2	1	0	6	8.92
N	0	0	0	0	0	0	0	0	1	2	2	0	5	9.70
CALM													0	0.
TOTAL	0	0	0	3	4	2	1	3	3	7	6	15	44	10.46

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #D# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	2	2	4	5	6	8	6	6	10	49	8.80
NE	0	1	1	1	1	0	0	3	1	2	2	0	12	7.00
ENE	0	0	1	2	1	0	1	2	1	0	0	0	8	5.67
E	0	1	1	1	1	1	1	0	0	0	1	0	7	5.14
ESE	0	0	0	4	3	0	1	1	0	0	0	0	9	4.71
SE	0	0	1	0	2	4	3	2	1	0	1	0	14	6.28
SSE	0	0	0	0	1	3	3	3	6	1	4	10	31	9.90
S	0	0	0	0	1	0	6	2	2	4	1	20	36	11.23
SSW	0	0	1	2	2	1	0	0	2	3	0	34	45	13.20
SW	0	0	3	2	1	3	1	2	3	2	2	20	39	10.92
WSW	0	0	1	1	0	1	0	1	2	0	2	11	19	11.95
W	0	0	2	1	0	0	0	1	0	1	1	12	18	14.81
WNW	0	0	0	0	1	2	1	1	3	0	0	6	14	10.97
NW	0	0	1	4	2	0	1	2	1	5	3	4	23	8.05
NNW	0	1	4	2	6	1	2	5	4	14	18	45	102	11.79
N	0	1	1	4	2	0	3	2	5	6	8	27	59	12.37
CALM													5	0.
TOTAL	0	4	17	26	26	20	28	33	39	44	49	199	490	10.66

NUMBER OF INVALID OBSERVATIONS = 98
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 3 of 52)

January (1973 - 1976): 10-Meter Level

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	1	5	5	4	4	2	9	7	6	7	6	11	67	7.79
NE	0	1	3	8	3	2	0	5	4	1	0	1	28	5.72
ENE	0	1	2	3	3	3	0	0	0	0	0	0	12	4.09
E	1	3	1	2	1	1	0	1	1	0	0	0	11	3.88
ESE	0	0	1	6	6	5	1	1	0	0	0	0	20	4.56
SE	0	1	5	4	15	9	11	2	7	2	2	0	58	5.80
SSE	0	0	2	1	10	9	8	6	11	9	5	24	85	9.02
S	0	0	1	1	1	7	1	5	7	13	9	71	116	12.47
SSW	0	1	1	2	2	6	3	5	6	0	1	49	76	12.74
SW	0	0	1	3	2	1	6	4	3	4	2	37	63	11.87
WSW	0	0	1	0	0	1	5	0	0	3	0	7	17	10.69
W	0	0	2	1	1	3	1	2	2	2	1	13	28	11.61
WNW	0	0	0	3	4	3	3	2	6	0	2	4	27	7.93
NW	0	1	1	6	8	13	8	8	9	5	3	21	83	9.14
NNW	1	0	2	8	7	7	14	12	20	14	10	113	208	12.85
N	0	8	1	5	2	5	7	13	15	11	14	76	157	10.70
CALM													2	.10
TOTAL	3	21	29	57	69	77	77	73	97	71	55	427	1058	10.36

NUMBER OF INVALID OBSERVATIONS = 26
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	2	1	1	3	1	0	1	1	0	0	11	5.03
NE	0	0	1	2	0	1	0	0	0	0	0	0	4	3.97
ENE	0	2	2	0	0	0	0	0	1	0	0	0	5	3.46
E	0	1	2	3	1	0	0	0	0	1	0	0	8	3.99
ESE	0	0	5	6	1	2	1	2	1	1	0	1	20	5.10
SE	0	0	3	12	6	5	7	5	3	3	0	0	44	5.57
SSE	0	1	5	4	7	9	5	11	11	6	3	7	69	7.21
S	0	3	5	7	5	10	3	9	11	7	10	28	98	9.22
SSW	1	1	5	4	0	4	1	5	2	6	11	23	63	9.61
SW	0	1	1	2	0	5	1	3	0	2	1	7	23	8.48
WSW	0	2	5	2	1	4	0	3	2	1	2	4	26	6.72
W	0	2	1	4	3	1	2	0	1	2	1	3	20	6.57
WNW	0	0	0	5	1	4	9	5	3	0	1	0	28	6.31
NW	1	1	4	6	8	8	8	4	9	0	2	1	52	5.94
NNW	0	3	0	7	4	4	0	5	3	3	2	5	36	6.71
N	0	1	2	3	2	1	1	3	1	1	1	3	19	6.88
CALM													0	0.
TOTAL	2	19	43	68	40	61	39	55	49	34	34	82	526	7.29

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 4 of 52)

January (1973 - 1976): 10-Meter Level

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	2	2	1	0	1	0	0	1	0	2	10	5.83
NE	0	2	1	0	0	0	1	0	0	0	0	0	4	2.85
ENE	0	1	2	1	0	0	0	0	0	0	0	0	4	2.45
E	0	4	4	2	1	0	0	0	0	0	0	0	11	2.56
ESE	0	3	4	2	0	1	1	3	0	1	0	0	15	4.37
SE	0	7	11	16	9	2	3	4	2	1	0	0	55	4.09
SSE	1	4	11	17	11	5	8	0	1	0	0	0	58	4.01
S	1	9	5	7	8	9	5	2	2	4	0	0	52	4.68
SSW	0	3	3	0	6	4	4	2	2	2	0	1	27	5.67
SW	0	3	11	5	5	4	4	3	2	2	0	4	43	5.35
WSW	1	4	7	9	9	4	5	6	3	1	1	2	52	5.17
W	0	9	13	10	19	2	1	0	0	0	0	0	54	3.48
WNW	0	7	10	7	7	7	3	2	0	0	1	0	44	4.01
NW	1	4	10	7	8	10	8	12	1	2	3	0	66	5.28
NNW	2	5	5	1	2	4	1	2	2	1	1	1	27	4.65
N	0	2	1	1	2	0	0	0	0	0	0	0	6	2.92
CALM													8	.37
TOTAL	6	68	100	87	88	52	45	36	15	15	6	10	536	4.45

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	1	9	9	9	9	9	16	13	15	16	13	24	143	7.75
NE	0	5	6	12	4	3	2	9	5	4	2	1	53	5.70
ENE	0	4	7	6	4	3	1	2	2	0	0	0	29	4.19
E	1	9	8	9	4	2	1	1	1	1	1	0	38	3.76
ESE	0	3	12	8	10	8	4	8	1	2	0	1	67	4.68
SE	0	8	20	32	32	20	25	13	13	6	3	0	172	5.24
SSE	1	5	18	22	29	26	24	20	30	16	13	42	246	7.46
S	2	12	12	15	15	26	16	18	23	28	20	125	312	10.03
SSW	1	5	10	8	11	16	8	12	12	11	13	115	222	11.17
SW	0	4	17	13	8	14	12	12	8	10	7	76	181	9.73
WSW	1	7	14	15	12	12	10	10	7	5	5	28	126	7.56
W	0	14	19	16	23	6	4	3	3	6	3	32	129	7.80
WNW	0	7	11	15	13	16	16	10	12	0	4	11	115	6.44
NW	2	8	19	24	27	31	25	26	20	12	11	29	234	7.08
NNW	3	10	13	19	20	16	17	26	30	34	32	167	387	11.25
N	0	13	5	13	8	6	11	18	23	20	25	107	249	10.56
CALM													15	.21
TOTAL	12	123	200	246	229	214	192	201	205	171	152	758	2718	8.62

NUMBER OF INVALID OBSERVATIONS = 258
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 5 of 52)

February (1973 - 1976): 10-Meter Level

PASQUILL #A# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	1	0	0	0	0	0	1	3	5	13.40
SSW	0	0	0	0	0	0	1	0	2	1	1	13	18	14.01
SW	0	0	0	1	0	0	0	0	0	0	1	8	10	12.51
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	0	0	0	1	1	15.50
NNW	0	0	0	0	0	0	0	0	0	0	0	3	3	15.37
N	0	0	0	0	0	0	0	0	0	0	0	2	2	16.25
CALM													0	0.
TOTAL	0	0	0	1	1	0	1	0	2	1	3	30	39	13.81

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2712

PASQUILL #B# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	3	0	0	0	3	8.67
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSE	0	0	0	1	0	0	0	0	0	0	0	1	2	9.20
S	0	0	0	0	0	0	1	0	0	1	0	3	5	15.00
SSW	0	0	0	0	0	2	0	0	1	0	0	3	6	12.63
SW	0	0	0	0	0	0	0	0	1	0	0	2	3	13.17
WSW	0	0	0	0	0	0	0	0	0	0	2	0	2	10.35
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	0	0	0	3	3	12.43
NNW	0	0	0	0	0	0	0	0	0	0	1	1	2	12.30
N	0	0	0	0	0	0	0	0	0	0	0	2	2	16.65
CALM													0	0.
TOTAL	0	0	0	1	0	2	1	0	5	1	3	15	28	12.52

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2712

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 6 of 52)

February (1973 - 1976): 10-Meter Level

PASQUILL #C# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	1	0	0	1	10.00
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	0	0	0	0	0	1	1	14.00
SSE	0	0	0	0	0	0	0	0	0	0	0	3	3	14.70
S	0	0	0	1	0	1	0	2	1	1	1	0	7	7.54
SSW	0	0	0	0	0	0	0	0	1	0	0	0	1	8.20
SW	0	0	0	0	0	0	0	0	0	0	1	2	3	14.57
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	0	1	0	3	4	11.35
NNW	0	0	0	0	0	0	0	0	0	0	3	8	11	13.93
N	0	0	0	0	0	0	0	0	0	0	0	3	3	13.57
CALM													0	0.
TOTAL	0	0	0	1	0	1	0	2	2	3	5	20	34	12.12

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2712

PASQUILL #D# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	3	1	6	1	0	3	1	1	1	1	18	6.10
NE	0	0	1	1	2	2	3	1	3	0	1	0	14	6.38
ENE	0	0	1	1	3	1	4	1	2	0	0	0	13	5.88
E	0	1	3	2	4	3	1	0	0	0	0	0	14	4.07
ESE	0	0	1	1	1	3	2	0	0	3	1	1	13	7.85
SE	0	0	0	1	3	2	5	1	1	1	1	4	19	8.38
SSE	0	0	0	3	2	1	2	0	3	3	3	11	28	10.51
S	0	1	0	1	5	2	4	3	7	7	3	31	64	12.14
SSW	0	1	0	1	2	1	3	4	4	6	1	50	73	13.85
SW	0	0	1	0	1	0	3	2	4	2	2	21	36	12.13
WSW	0	0	0	0	2	1	0	0	0	3	2	15	23	13.69
W	0	0	0	0	0	0	0	0	1	0	0	3	4	12.55
WNW	0	0	0	6	0	1	0	0	0	0	0	14	21	12.52
NW	0	0	1	1	3	2	0	0	1	3	3	43	57	14.14
NNW	0	0	1	2	0	2	0	0	1	4	8	33	51	13.08
N	0	0	1	1	1	3	1	2	1	2	8	32	52	13.17
CALM													5	0.
TOTAL	0	3	13	22	35	25	28	17	29	35	34	259	505	11.68

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2712

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 7 of 52)

February (1973 - 1976): 10-Meter Level

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	1	5	5	2	1	4	0	0	1	2	22	5.84
NE	0	0	6	3	6	2	4	2	0	0	1	2	26	5.55
ENE	0	2	10	3	5	1	2	2	0	0	0	1	26	4.13
E	0	2	3	7	4	1	3	1	0	0	0	1	22	5.03
ESE	0	1	2	3	3	1	1	0	2	2	0	1	16	6.33
SE	0	0	4	4	4	11	5	4	6	2	1	2	43	6.67
SSE	0	1	2	5	5	4	4	2	11	10	8	34	86	10.58
S	0	0	0	7	3	8	2	7	5	6	11	92	141	13.93
SSW	0	0	0	2	3	4	4	6	4	6	5	69	103	14.61
SW	0	1	2	1	0	3	2	2	1	0	4	28	44	11.79
WSW	0	0	1	0	0	2	1	1	2	2	0	23	32	14.47
W	0	0	1	1	3	0	1	1	1	2	1	9	20	12.46
WNW	0	1	1	3	0	0	4	3	3	1	1	26	43	12.13
NW	0	0	2	5	7	6	9	8	5	2	7	55	106	12.37
NNW	0	2	1	2	6	11	8	18	19	22	14	107	210	12.43
N	0	1	0	2	5	3	5	7	7	13	9	87	139	13.53
CALM													14	0.
TOTAL	0	12	36	53	59	59	56	68	66	68	63	539	1093	11.72

NUMBER OF INVALID OBSERVATIONS = 11
TOTAL NUMBER OF OBSERVATIONS = 2712

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	1	2	5	3	2	0	2	0	0	1	0	0	16	3.87
NE	0	2	3	2	5	0	0	0	0	0	0	0	12	3.48
ENE	0	1	2	0	1	2	0	0	0	0	0	1	7	6.59
E	0	0	1	2	1	0	0	0	0	0	0	2	6	7.12
ESE	0	3	4	2	3	1	0	3	0	0	0	2	18	5.44
SE	0	1	3	5	12	9	4	5	2	1	1	4	47	6.33
SSE	0	3	5	10	14	9	6	8	6	3	3	5	72	6.16
S	0	1	2	0	8	2	4	8	12	11	4	33	85	10.05
SSW	0	2	3	2	1	8	3	6	3	2	7	33	70	10.09
SW	1	1	2	2	0	0	0	4	3	2	1	16	32	9.84
WSW	0	1	0	3	1	1	1	2	1	0	2	5	17	8.28
W	0	0	0	1	0	3	0	3	1	3	1	1	13	8.45
WNW	0	1	1	2	2	2	3	9	2	4	2	7	35	8.39
NW	0	0	4	4	9	12	6	2	7	6	2	8	60	7.73
NNW	0	3	6	4	5	6	4	5	3	1	0	7	44	7.17
N	0	5	0	8	0	4	4	0	0	2	1	9	33	7.52
CALM													9	.22
TOTAL	2	26	41	50	64	59	37	55	40	36	24	133	576	7.78

NUMBER OF INVALID OBSERVATIONS = 15
TOTAL NUMBER OF OBSERVATIONS = 2712

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 8 of 52)

February (1973 - 1976): 10-Meter Level

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	1	1	2	0	1	0	0	0	0	0	6	3.92
NE	1	0	0	0	0	0	0	0	0	0	0	0	1	1.00
ENE	0	1	1	1	0	0	0	0	0	0	0	0	3	2.53
E	1	1	2	0	0	0	0	0	0	0	0	0	4	1.95
ESE	1	2	3	2	2	0	0	0	0	0	0	1	11	4.11
SE	1	2	5	14	5	1	1	1	0	0	0	0	30	3.72
SSE	0	1	9	9	9	2	2	1	0	1	2	4	40	5.60
S	1	2	6	7	10	5	5	3	0	1	2	0	42	4.93
SSW	2	2	2	5	8	3	4	3	3	0	2	1	35	5.40
SW	2	4	4	6	2	1	0	0	0	1	1	2	23	4.34
WSW	0	0	5	1	1	1	3	2	1	2	0	1	17	5.91
W	0	5	4	6	2	4	2	0	0	0	1	0	24	4.10
WNW	0	4	5	4	2	4	2	0	1	0	0	1	23	4.50
NW	0	3	4	7	7	7	3	2	0	0	0	8	41	7.15
NNW	0	0	0	1	2	0	1	1	0	0	0	2	7	8.89
N	0	0	0	1	2	4	0	0	0	0	0	0	7	4.91
CALM													1	.20
TOTAL	9	28	51	65	54	32	24	13	5	5	8	20	315	5.11

NUMBER OF INVALID OBSERVATIONS = 3
TOTAL NUMBER OF OBSERVATIONS = 2712

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	1	4	10	10	15	3	4	7	4	3	2	3	66	5.45
NE	1	2	10	6	13	4	7	3	3	0	2	2	53	5.21
ENE	0	4	14	5	9	4	6	3	2	0	0	2	49	4.85
E	1	4	9	11	9	4	4	1	0	0	0	3	46	4.74
ESE	1	6	10	8	9	5	3	3	2	5	1	5	58	5.97
SE	1	3	12	24	24	23	15	11	9	4	3	11	140	6.21
SSE	0	5	16	28	30	16	14	11	20	17	16	58	231	8.37
S	1	4	8	16	27	18	16	23	25	27	22	162	349	11.45
SSW	2	5	5	10	14	18	15	19	18	15	16	169	306	12.25
SW	3	6	9	10	3	4	5	8	9	5	10	79	151	10.45
WSW	0	1	6	4	4	5	5	5	4	7	6	44	91	11.43
W	0	5	5	8	5	7	3	4	3	5	3	13	61	8.32
WNW	0	6	7	15	4	7	9	12	6	5	3	48	122	9.68
NW	0	3	11	17	26	27	18	12	13	12	12	121	272	10.93
NNW	0	5	8	9	13	19	13	24	23	27	26	161	328	11.83
N	0	6	1	12	8	14	10	9	8	17	18	135	238	12.41
CALM													29	.08
TOTAL	11	69	141	193	213	178	147	155	149	149	140	1016	2590	10.08

NUMBER OF INVALID OBSERVATIONS = 122
TOTAL NUMBER OF OBSERVATIONS = 2712

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 9 of 52)

March (1973 - 1976): 10-Meter Level

PASQUILL #A# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	1	1	1	0	3	9.47
NE	0	0	0	0	0	0	0	1	0	0	0	0	1	7.40
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	0	0	0	1	0	0	1	10.00
SSE	0	0	0	0	1	0	0	0	1	0	1	1	4	8.70
S	0	0	0	0	0	0	0	0	0	0	0	11	11	17.46
SSW	0	0	0	0	0	0	0	0	0	0	0	8	8	22.56
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	1	0	0	0	0	1	1	0	1	8	12	14.62
N	0	0	0	0	0	0	1	0	0	0	0	0	1	6.10
CALM													0	0.
TOTAL	0	0	1	0	1	0	1	2	3	2	3	28	41	15.48

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #B# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	1	0	0	1	9.10
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	0	0	1	0	0	2	3	10.80
SSE	0	0	0	0	0	0	0	0	1	0	0	1	2	10.70
S	0	0	0	0	0	0	0	0	0	0	0	2	2	15.45
SSW	0	0	0	0	0	0	0	0	0	0	0	6	6	16.90
SW	0	0	0	0	0	0	0	0	0	0	1	0	1	10.40
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	0	0	0	1	1	11.50
NNW	0	0	0	0	1	0	0	0	0	0	1	8	10	14.79
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	0	1	0	0	0	2	1	2	20	26	14.04

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 10 of 52)

March (1973 - 1976): 10-Meter Level

PASQUILL #C# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	1	0	0	0	0	1	7.90
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.10
E	0	0	0	0	0	0	0	0	1	0	0	0	1	8.70
ESE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.90
SE	0	0	0	0	0	0	0	0	0	0	2	0	2	10.20
SSE	0	0	0	0	1	0	0	0	1	0	1	2	3	11.13
S	0	0	0	0	0	0	0	0	0	0	0	5	5	17.80
SSW	0	0	0	0	0	0	0	0	0	0	1	3	4	13.17
SW	0	0	0	0	0	0	0	0	0	0	0	4	4	14.52
WSW	0	0	0	0	0	0	1	1	0	0	0	0	2	7.05
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	1	0	0	0	0	0	2	1	4	9.62
NNW	0	0	0	0	0	0	0	0	0	0	2	6	8	14.01
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	0	1	2	1	2	1	0	8	21	36	12.39

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #D# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	1	1	0	0	1	2	2	12	19	11.85
NE	0	0	1	1	0	1	1	1	0	2	5	1	13	8.67
ENE	0	0	2	4	4	0	0	1	2	1	0	1	15	5.69
E	0	1	0	1	3	1	0	0	0	0	3	0	9	6.20
ESE	0	0	2	1	3	4	3	1	1	5	3	6	29	8.52
SE	0	0	0	5	5	2	6	3	4	10	8	25	68	10.66
SSE	0	0	1	0	1	0	4	0	7	8	3	16	40	10.83
S	0	0	0	1	1	0	3	0	1	4	7	53	70	15.40
SSW	0	0	0	0	0	0	0	2	1	2	3	36	44	16.20
SW	0	0	0	2	1	3	1	2	2	4	2	25	42	12.89
WSW	0	0	0	0	0	0	1	1	0	1	6	14	23	14.16
W	0	0	0	0	0	0	1	0	0	0	1	18	20	14.69
WNW	0	1	0	0	1	0	1	0	0	1	0	9	13	12.24
NW	0	0	1	1	1	1	1	0	1	2	1	25	34	13.56
NNW	0	0	0	1	0	4	4	2	1	2	0	27	41	13.69
N	0	0	0	0	1	0	2	0	1	2	1	29	36	15.37
CALM													0	0.
TOTAL	0	2	7	17	22	17	28	13	22	46	45	297	516	12.73

NUMBER OF INVALID OBSERVATIONS = 7
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 11 of 52)

March (1973 - 1976): 10-Meter Level

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	3	2	2	2	3	2	1	6	8	29	58	10.87
NE	0	1	4	8	1	2	3	4	7	5	1	4	40	6.80
ENE	0	1	0	4	4	2	1	6	8	8	7	3	44	8.01
E	0	0	0	8	3	7	5	2	4	8	7	6	50	7.97
ESE	0	0	3	7	5	9	6	5	7	8	9	32	91	9.93
SE	0	0	6	5	6	6	5	1	6	7	10	57	109	10.97
SSE	0	0	1	3	4	3	8	4	6	8	6	121	164	14.22
S	0	0	2	2	3	2	3	3	10	6	11	154	196	16.39
SSW	0	0	0	0	1	1	2	0	3	1	5	49	62	17.51
SW	0	0	0	0	0	0	1	1	2	1	0	16	21	14.39
WSW	0	0	0	0	0	0	1	2	2	1	2	21	29	14.65
W	0	1	1	0	2	4	5	0	1	1	0	21	36	12.19
WNW	0	0	0	1	2	3	0	5	3	1	1	36	52	12.51
NW	0	1	2	3	0	6	4	5	2	6	5	61	95	12.92
NNW	0	2	0	2	4	4	7	2	6	5	6	97	135	14.17
N	2	0	0	2	4	2	9	3	4	3	8	74	111	13.78
CALM													1	0.
TOTAL	2	6	22	47	41	53	63	45	72	75	86	781	1294	13.04

NUMBER OF INVALID OBSERVATIONS = 18
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	1	1	3	2	1	1	0	0	2	1	13	6.38
NE	0	1	3	2	3	0	0	0	0	0	2	1	12	5.34
ENE	0	1	1	5	1	2	1	2	0	1	0	0	14	4.91
E	0	1	4	6	1	1	1	2	2	2	0	2	22	5.82
ESE	0	1	5	11	11	3	2	2	1	0	1	0	37	4.64
SE	0	1	3	11	10	10	4	4	3	4	1	4	55	6.29
SSE	0	1	2	8	2	9	5	6	7	9	10	16	75	8.92
S	1	1	2	2	1	1	2	5	2	4	7	45	73	12.60
SSW	0	1	1	0	1	1	0	2	1	0	0	24	31	16.84
SW	0	0	2	1	0	1	2	1	1	1	1	10	20	10.08
WSW	0	0	0	0	2	0	2	5	2	1	0	2	14	8.38
W	0	1	0	1	1	3	4	1	0	0	0	1	12	6.11
WNW	0	1	1	3	3	2	2	4	0	1	1	1	19	6.11
NW	0	0	4	1	3	2	4	0	1	1	2	0	18	5.84
NNW	0	2	2	3	3	6	0	3	2	1	0	2	24	6.31
N	0	3	2	3	5	1	4	0	1	3	2	9	33	8.44
CALM													1	.10
TOTAL	1	16	33	58	50	44	34	38	23	28	29	118	473	8.49

NUMBER OF INVALID OBSERVATIONS = 3
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 12 of 52)

March (1973 - 1976): 10-Meter Level

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	0	0	1	0	0	0	1	1	2	2	8	8.57
NE	0	0	2	2	0	0	0	0	0	1	0	0	5	4.32
ENE	0	1	2	0	1	0	0	0	0	0	0	0	4	3.00
E	0	2	0	2	1	0	0	0	0	0	0	0	5	3.16
ESE	0	0	0	4	1	2	0	0	0	0	0	0	7	4.33
SE	0	2	3	7	5	8	1	2	0	0	0	3	31	5.76
SSE	0	1	6	4	3	1	3	3	2	0	0	6	29	7.77
S	0	1	1	3	2	2	1	4	1	0	2	7	24	9.50
SSW	0	5	0	4	1	0	0	1	1	0	1	9	22	8.83
SW	0	4	3	6	1	1	1	2	2	2	3	10	35	7.41
WSW	0	3	2	2	1	2	3	1	4	1	1	2	22	6.11
W	0	2	3	1	2	3	0	4	1	0	0	3	19	6.24
WNW	0	3	3	2	5	2	2	0	0	0	0	0	17	3.85
NW	0	4	0	2	0	2	4	0	0	2	0	0	14	5.08
NNW	0	2	1	3	1	0	0	2	1	0	0	7	17	10.88
N	0	2	1	0	0	0	0	0	0	3	1	8	15	13.03
CALM													1	.50
TOTAL	0	33	27	42	25	23	15	19	13	10	10	57	275	7.29

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	2	5	3	7	7	4	6	4	11	15	48	112	10.11
NE	0	2	10	13	4	5	5	7	9	14	8	7	84	7.12
ENE	0	3	5	13	11	5	2	10	10	10	7	4	80	6.70
E	0	4	4	18	10	11	9	5	8	11	10	8	98	6.90
ESE	0	2	10	25	21	21	13	10	12	14	14	41	183	8.19
SE	3	6	16	29	28	28	21	14	17	24	24	102	312	9.15
SSE	0	4	12	17	12	15	23	16	24	26	22	178	349	11.62
S	1	2	5	8	7	6	9	12	14	15	27	282	388	15.06
SSW	0	6	1	4	3	2	3	5	6	4	10	135	179	16.01
SW	0	4	5	9	2	5	5	6	7	8	7	65	123	11.16
WSW	0	3	2	2	3	2	8	10	8	5	9	39	91	11.27
W	0	4	4	2	5	10	10	5	2	1	1	43	87	10.63
WNW	0	5	4	6	11	7	5	9	3	3	2	47	102	9.83
NW	0	5	7	7	5	11	13	6	9	13	11	93	180	11.46
NNW	0	6	4	9	9	14	11	10	11	9	11	164	258	13.26
N	2	5	3	5	10	4	16	3	6	12	12	120	198	13.02
CALM													3	.20
TOTAL	6	63	97	170	148	153	157	134	150	180	190	1376	2827	11.48

NUMBER OF INVALID OBSERVATIONS = 149
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 13 of 52)

April (1973 - 1976): 10-Meter Level

PASQUILL #A# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	1	0	1	3	1	1	0	5	12	9.97
NE	0	0	0	0	0	1	1	1	0	0	0	0	3	6.30
ENE	0	0	0	0	1	1	1	0	0	0	0	0	3	5.60
E	0	0	0	0	0	1	0	0	0	1	0	0	2	7.65
ESE	0	0	0	0	0	0	0	0	0	2	0	3	5	13.84
SE	0	0	0	0	0	0	0	0	1	0	1	1	3	10.17
SSE	0	1	0	0	0	0	0	0	0	0	0	16	17	20.76
S	0	0	0	0	0	0	0	0	0	0	0	6	6	20.38
SSW	0	0	0	0	0	0	0	0	0	0	0	4	4	20.77
SW	0	0	0	0	0	0	0	0	0	0	0	3	3	18.33
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	3	3	17.73
WNW	0	0	0	0	0	0	0	0	1	0	0	3	4	14.10
NW	0	0	0	0	0	0	0	0	0	0	1	12	13	13.93
NNW	0	0	0	0	0	0	0	0	0	1	0	9	10	14.22
N	0	0	0	0	0	0	0	0	0	1	1	5	7	14.17
CALM													0	0.
TOTAL	0	1	0	0	2	3	3	4	3	6	3	70	95	14.90

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL #B# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	0	0	0	1	1	0	0	0	1	4	7	12.91
NE	0	0	0	0	0	0	0	0	0	1	0	0	1	9.20
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	1	0	1	10.80
ESE	0	0	0	0	0	0	0	0	0	3	0	0	3	9.60
SE	0	0	0	0	0	0	0	0	1	1	0	7	9	12.86
SSE	0	0	0	0	0	0	0	0	0	0	0	7	7	16.29
S	0	0	0	0	0	0	0	0	0	0	0	7	7	19.34
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	0	0	0	0	0	0	0	0	5	5	18.66
W	0	0	0	0	0	0	0	0	0	0	0	1	1	21.70
WNW	0	0	0	0	0	0	0	1	0	1	0	1	3	9.73
NW	0	0	0	0	0	0	0	0	0	0	0	1	1	17.10
NNW	0	0	0	0	0	0	0	0	0	0	0	2	2	15.75
N	0	0	0	0	0	0	0	0	0	0	0	3	3	16.17
CALM													0	0.
TOTAL	0	0	0	0	0	1	1	1	1	6	2	38	50	14.91

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 14 of 52)

April (1973 - 1976): 10-Meter Level

PASQUILL #C# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	0	1	1	2	14.05
NE	0	0	0	0	0	2	1	0	0	0	0	0	3	6.13
ENE	0	0	0	0	0	1	0	0	0	0	0	1	2	9.10
E	0	0	0	0	0	0	0	1	0	0	0	0	1	7.20
ESE	0	0	0	0	1	0	0	1	1	0	1	0	4	7.80
SE	0	0	0	0	0	0	0	0	1	3	0	5	9	12.68
SSE	0	0	0	0	0	0	0	0	0	0	0	7	7	17.50
S	0	0	0	0	0	0	0	0	0	0	0	5	5	19.72
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SW	0	0	0	0	0	0	0	0	0	0	1	5	6	13.95
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	2	2	25.00
WNW	0	0	0	0	0	1	0	0	0	0	0	2	3	12.30
NW	0	0	0	0	0	0	0	0	0	1	0	2	3	12.87
NNW	0	0	0	0	0	0	0	0	1	0	0	8	9	14.91
N	0	0	0	0	0	0	0	1	0	0	0	2	3	11.13
CALM													0	0.
TOTAL	0	0	0	0	1	4	1	3	3	4	3	40	59	13.82

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL #D# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	1	5	1	2	1	1	1	3	5	20	8.33
NE	0	0	0	1	2	1	1	0	2	2	2	0	11	7.48
ENE	0	0	0	2	2	1	0	2	2	0	1	7	17	9.54
E	0	0	0	3	1	1	1	5	2	0	5	11	29	10.12
ESE	0	0	0	1	0	3	6	6	2	0	4	9	31	10.35
SE	0	0	1	0	0	1	3	3	6	9	11	36	70	11.75
SSE	0	0	0	3	1	0	2	1	3	1	2	50	63	14.73
S	0	0	0	1	3	0	0	1	3	1	2	48	59	16.16
SSW	0	0	0	0	0	1	1	0	1	0	1	15	19	14.39
SW	0	0	0	0	0	1	1	1	0	0	0	15	18	13.29
WSW	0	0	0	0	0	0	0	0	0	0	0	2	2	16.45
W	0	0	0	0	0	1	0	0	0	1	0	8	10	17.13
WNW	0	0	0	0	0	1	2	0	1	3	0	7	14	13.10
NW	0	0	0	3	1	0	2	0	2	1	1	17	27	14.91
NNW	0	0	0	1	0	1	1	2	2	2	5	42	56	14.73
N	0	0	0	0	0	0	1	2	1	2	0	13	19	12.68
CALM													0	0.
TOTAL	0	0	1	16	15	13	23	24	28	23	37	285	465	13.12

NUMBER OF INVALID OBSERVATIONS = 3
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 15 of 52)

April (1973 - 1976): 10-Meter Level

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	4	1	2	8	4	2	4	0	0	2	27	6.61
NE	0	3	0	2	8	7	11	4	6	7	3	1	52	6.76
ENE	0	1	3	5	9	6	0	8	6	2	3	11	54	7.55
E	0	3	0	5	10	6	7	9	5	11	6	25	87	9.53
ESE	0	1	2	1	8	10	12	11	11	12	10	103	181	13.24
SE	0	1	2	2	10	8	16	12	12	17	16	78	174	10.77
SSE	0	0	4	1	5	5	6	5	12	12	16	182	248	14.32
S	0	0	0	6	6	5	7	8	4	8	8	107	159	13.16
SSW	0	0	2	2	3	3	1	5	1	2	2	13	34	10.28
SW	0	1	2	3	3	1	3	0	0	0	2	5	20	7.42
WSW	0	1	1	0	1	2	3	0	1	1	1	5	16	8.86
W	0	0	2	0	1	1	0	2	0	1	1	5	13	9.41
WNW	0	1	5	2	1	5	1	2	2	0	2	4	25	6.85
NW	0	0	3	3	6	6	2	3	6	3	3	43	78	11.67
NNW	1	0	1	7	7	6	5	8	11	5	15	62	128	11.86
N	0	2	0	4	5	5	10	5	7	5	4	7	54	8.03
CALM													2	0.
TOTAL	1	14	31	44	85	84	88	84	88	86	92	653	1352	11.45

NUMBER OF INVALID OBSERVATIONS = 18
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	3	3	1	1	2	1	1	0	0	0	13	4.58
NE	0	2	4	3	0	1	1	0	0	1	0	1	13	4.51
ENE	0	2	5	6	1	3	1	0	3	0	1	1	23	4.86
E	0	1	6	7	4	2	1	2	2	1	4	2	32	5.96
ESE	0	3	7	10	6	6	4	4	1	4	2	7	54	6.22
SE	0	1	8	15	9	10	3	9	3	1	1	4	64	5.65
SSE	0	3	4	6	1	2	3	4	3	1	1	8	36	7.19
S	0	0	0	4	3	1	2	3	3	5	2	3	26	8.30
SSW	0	0	1	2	1	5	1	0	1	2	2	7	22	8.48
SW	0	1	1	1	2	2	0	0	0	0	0	1	8	5.10
WSW	0	0	4	0	0	1	0	1	0	0	0	0	6	4.03
W	0	2	0	2	3	1	1	0	0	0	0	1	10	4.73
WNW	1	1	3	3	3	4	2	1	0	1	0	0	19	4.62
NW	0	0	5	2	1	11	7	9	1	0	0	7	43	7.27
NNW	0	0	4	1	3	7	6	2	0	1	1	1	26	5.90
N	0	0	0	3	4	4	1	4	3	2	2	0	23	6.71
CALM													3	.43
TOTAL	1	17	55	68	42	61	35	40	21	19	16	43	421	6.18

NUMBER OF INVALID OBSERVATIONS = 11
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 16 of 52)

April (1973 - 1976): 10-Meter Level

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	0	0	0	0	0	0	0	0	0	0	1	1.70
NE	0	0	1	0	0	0	0	0	0	0	0	0	1	2.50
ENE	0	0	1	0	1	0	0	0	0	0	0	0	2	3.65
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	1	1	0	3	0	0	1	0	0	1	0	7	5.13
SE	0	2	2	8	2	3	4	0	0	0	0	2	23	4.97
SSE	1	0	1	4	4	2	4	0	0	0	0	0	16	4.67
S	0	2	2	2	5	4	1	0	1	0	0	0	17	4.42
SSW	0	2	0	2	4	1	2	1	1	1	0	0	14	5.41
SW	0	3	0	1	1	0	1	0	0	0	1	0	7	4.31
WSW	0	0	3	2	2	0	0	0	0	0	0	0	7	3.31
W	0	1	3	3	0	0	0	1	0	1	0	0	9	4.09
WNW	0	2	0	2	0	1	1	1	0	0	0	0	7	4.41
NW	1	0	2	2	0	4	4	6	7	1	0	2	29	7.03
NNW	0	0	1	0	0	2	2	1	1	0	0	0	7	6.21
N	0	1	0	0	0	0	1	0	0	0	1	0	3	6.13
CALM													0	0.
TOTAL	2	15	17	26	22	17	20	11	10	3	3	4	150	5.16

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	+	2	7	5	9	13	10	7	7	2	6	17	85	7.84
NE	0	5	5	6	11	12	15	5	8	11	5	2	85	6.42
ENE	0	3	9	13	15	12	2	10	11	2	5	20	102	7.14
E	0	4	6	15	15	10	9	17	9	13	16	38	152	8.86
ESE	0	5	10	12	18	19	22	23	16	21	18	122	286	11.28
SE	0	4	13	25	21	22	26	24	24	34	29	135	357	9.76
SSE	1	4	9	14	11	9	15	10	18	14	19	270	394	13.71
S	0	2	2	13	17	10	10	12	11	14	12	177	280	13.24
SSW	0	2	3	6	8	10	5	6	4	5	5	39	93	10.41
SW	0	5	3	5	6	4	5	1	0	0	4	29	62	9.63
WSW	0	1	8	2	3	3	3	1	1	1	1	12	36	8.76
W	0	3	5	5	4	3	1	3	0	3	1	20	48	10.47
WNW	1	4	8	7	4	12	6	5	4	5	2	17	75	7.95
NW	1	0	10	10	8	21	15	18	16	6	5	84	194	10.65
NNW	1	0	9	9	10	17	14	13	15	9	21	124	242	11.82
N	0	3	0	11	10	9	14	12	11	10	8	30	118	8.93
CALM													5	.26
TOTAL	4	47	107	158	170	186	172	167	155	150	157	1136	2614	10.74

NUMBER OF INVALID OBSERVATIONS = 266
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 17 of 52)

May (1972 - 1976): 10-Meter Level

PASQUILL #A# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	4	1	1	1	2	0	1	10	7.93
NE	0	0	0	0	0	1	3	0	1	0	0	0	5	6.90
ENE	0	0	0	1	0	0	2	0	1	0	0	0	4	6.15
E	0	0	0	0	0	0	0	1	1	0	0	0	2	7.65
ESE	0	0	0	0	0	1	1	1	2	2	1	0	8	8.17
SE	0	0	0	0	0	0	1	1	2	1	0	3	8	9.85
SSE	0	0	0	0	0	0	2	1	2	0	1	0	6	8.23
S	0	0	0	0	0	0	0	2	1	0	0	0	3	8.13
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	1	0	0	0	1	8.70
WNW	0	0	0	0	0	0	2	0	1	0	0	0	3	7.30
NW	0	0	0	0	0	0	0	0	3	0	2	3	8	10.90
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	2	0	0	0	2	8.40
CALM													0	0.
TOTAL	0	0	0	1	0	6	12	7	18	5	4	7	60	8.44

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2955

PASQUILL #B# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	2	0	2	0	0	1	0	0	0	5	5.34
NE	0	0	0	0	0	1	0	0	0	0	0	0	2	6.65
ENE	0	0	0	1	1	0	0	0	0	0	0	0	2	4.05
E	0	0	0	0	0	1	1	0	0	0	0	0	2	6.20
ESE	0	0	1	1	0	2	6	2	1	0	0	0	13	6.22
SE	0	0	0	0	1	0	2	2	1	0	0	0	6	6.92
SSE	0	0	0	0	0	1	0	0	5	1	3	1	11	9.43
S	0	0	0	0	0	1	1	0	2	2	2	1	9	9.04
SSW	0	0	0	0	0	0	0	1	1	2	0	0	4	8.77
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	1	0	0	0	0	1	8.00
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	1	0	0	0	1	1	2	5	10.58
NNW	0	0	0	0	0	0	0	1	0	0	0	0	1	8.00
N	0	0	0	0	0	1	1	0	0	0	0	0	2	6.05
CALM													0	0.
TOTAL	0	0	1	4	2	10	11	8	11	6	6	4	63	7.68

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2955

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 18 of 52)

May (1972 - 1976): 10-Meter Level

PASQUILL #C# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	2	1	3	2	0	0	1	0	0	9	5.72
NE	0	0	0	0	2	0	1	1	0	0	0	1	5	6.72
ENE	0	0	0	1	1	2	0	0	0	0	1	0	5	6.08
E	0	0	0	1	2	1	0	0	0	0	0	0	4	4.35
ESE	0	0	0	1	1	2	3	2	1	1	1	0	12	6.86
SE	0	0	1	0	0	2	2	2	0	0	0	1	10	7.05
SSE	0	0	0	1	1	2	1	3	2	2	1	3	16	8.29
S	0	0	0	0	0	0	1	3	3	3	2	3	15	9.41
SSW	0	0	0	0	2	0	0	1	1	1	2	2	9	9.14
SW	0	0	0	0	0	0	1	0	0	0	0	0	1	7.00
WSW	0	0	0	0	0	0	0	0	0	1	0	0	1	9.20
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	1	0	0	0	0	1	8.00
NW	0	0	0	0	0	0	0	0	0	0	1	1	2	11.50
NNW	0	0	0	0	1	0	0	0	2	0	0	0	3	7.40
N	0	0	0	1	0	1	0	0	0	0	0	0	2	4.90
CALM													0	0.
TOTAL	0	0	1	7	11	13	11	13	11	9	8	11	95	7.59

NUMBER OF INVALID OBSERVATIONS = 2
TOTAL NUMBER OF OBSERVATIONS = 2955

PASQUILL #D# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	0	2	5	5	4	3	6	1	2	1	30	6.93
NE	0	0	1	3	7	3	2	2	1	1	1	6	27	7.43
ENE	0	2	3	3	5	3	5	1	5	1	1	2	31	5.99
E	0	1	1	6	8	5	1	3	3	2	1	2	33	6.07
ESE	0	1	4	7	7	6	8	5	2	4	1	8	53	7.95
SE	0	0	1	1	8	7	8	10	12	7	4	14	72	8.53
SSE	0	0	4	4	7	13	9	5	8	6	8	25	89	9.41
S	0	0	1	2	6	5	6	2	17	13	7	60	119	10.57
SSW	0	0	0	2	2	0	1	2	5	2	10	32	56	11.09
SW	0	1	1	2	2	1	3	4	1	1	2	11	29	9.27
WSW	0	0	1	4	1	0	0	3	1	1	1	2	14	7.05
W	0	0	1	3	0	1	1	0	1	1	1	7	16	9.65
WNW	0	0	1	0	0	1	0	1	0	0	2	4	9	9.87
NW	0	0	1	0	0	1	1	1	3	1	2	11	21	11.19
NNW	0	1	0	3	2	1	1	6	5	5	4	14	42	9.85
N	0	0	0	3	8	3	1	6	6	5	2	10	44	8.42
CALM													1	.60
TOTAL	0	7	20	45	68	55	51	54	76	51	49	209	686	9.00

NUMBER OF INVALID OBSERVATIONS = 14
TOTAL NUMBER OF OBSERVATIONS = 2955

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 19 of 52)

May (1972 - 1976): 10-Meter Level

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	3	3	5	4	4	2	1	4	6	14	46	9.02
NE	0	3	2	7	5	1	5	2	5	1	2	4	37	6.64
ENE	0	1	4	5	4	0	3	3	2	3	0	1	26	5.65
E	2	2	0	5	7	6	1	3	0	2	2	5	35	6.57
ESE	0	5	5	5	9	5	4	3	4	1	1	19	61	8.00
SE	0	2	3	5	9	14	16	11	10	3	6	18	97	7.85
SSE	0	3	3	5	15	22	25	25	22	17	20	48	05	8.84
S	1	1	1	7	11	16	17	24	26	24	21	83	32	9.67
SSW	0	6	0	2	4	3	2	5	4	9	3	28	66	9.53
SW	0	2	2	3	2	1	2	2	0	2	0	5	21	6.99
WSW	0	1	0	2	1	0	0	2	0	0	2	2	10	7.66
W	0	0	2	1	1	1	0	0	1	0	3	4	13	8.33
WNW	0	0	2	1	1	0	0	2	4	1	1	9	21	9.69
NW	1	2	1	5	4	4	6	3	5	8	4	31	74	9.68
NNW	0	0	2	3	10	5	3	4	5	2	5	14	53	8.66
N	0	1	2	1	2	10	9	2	2	1	1	8	39	7.94
CALM													11	.24
TOTAL	4	29	32	60	90	92	97	93	91	78	77	293	1047	8.59

NUMBER OF INVALID OBSERVATIONS = 27
TOTAL NUMBER OF OBSERVATIONS = 2955

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	1	0	2	1	1	0	0	2	0	1	0	0	8	4.82
NE	0	3	2	4	1	1	0	0	0	0	0	0	11	3.23
ENE	0	4	9	3	0	2	0	0	0	0	0	0	18	2.86
E	0	2	5	11	6	1	0	1	1	0	0	1	28	4.08
ESE	0	1	7	11	11	2	2	1	0	1	0	0	36	4.24
SE	0	3	7	16	14	9	1	2	3	1	0	0	56	4.51
SSE	0	5	4	10	12	8	10	3	5	2	1	5	65	5.82
S	0	5	7	7	10	12	8	4	4	6	2	3	68	5.96
SSW	1	1	3	4	1	1	1	5	0	3	1	4	25	7.81
SW	1	1	4	3	4	2	1	1	1	0	1	3	22	5.78
WSW	1	1	5	3	1	0	1	2	1	0	1	1	17	4.95
W	0	1	2	2	1	1	0	0	2	4	5	2	20	7.97
WNW	0	0	3	3	5	4	0	1	1	0	1	1	19	5.37
NW	1	1	3	4	7	7	5	0	0	4	1	7	40	6.77
NNW	0	0	3	3	7	1	3	3	0	0	0	0	20	4.84
N	0	1	2	1	3	3	2	2	2	2	0	1	19	6.22
CALM													5	.20
TOTAL	5	29	68	86	84	54	34	27	20	24	13	28	477	5.42

NUMBER OF INVALID OBSERVATIONS = 9
TOTAL NUMBER OF OBSERVATIONS = 2955

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 20 of 52)

May (1972 - 1976): 10-Meter Level

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	2	1	0	1	0	0	0	0	0	0	0	4	2.47
NE	0	0	2	0	0	0	0	0	0	0	0	1	3	6.00
ENE	0	0	0	3	1	0	1	0	0	1	0	0	6	4.98
E	0	2	2	3	3	0	0	2	0	0	0	0	12	4.02
ESE	0	5	1	3	2	1	0	1	0	0	0	0	13	3.45
SE	0	2	6	11	4	0	2	0	0	0	0	0	25	3.56
SSE	0	4	6	10	6	3	1	0	1	0	0	0	31	3.93
S	0	0	3	3	3	1	3	0	0	0	0	1	14	4.99
SSW	3	2	2	4	5	0	0	0	0	0	0	1	17	3.74
SW	1	2	2	3	1	1	0	0	0	0	0	1	11	3.85
WSW	1	2	3	2	2	1	2	0	1	0	0	0	14	4.03
W	0	3	4	1	0	0	0	0	0	0	0	1	9	3.12
WNW	2	1	3	5	2	0	0	0	0	0	0	0	13	3.19
NW	1	2	9	5	2	7	3	2	2	0	0	0	33	4.43
NNW	0	1	2	1	3	0	1	0	0	0	0	0	8	3.99
N	0	1	1	1	0	0	0	0	0	0	0	3	6	8.22
CALM													5	.24
TOTAL	8	29	47	55	35	14	13	5	4	1	0	8	224	3.98

NUMBER OF INVALID OBSERVATIONS = 3
TOTAL NUMBER OF OBSERVATIONS = 2955

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	1	3	6	10	13	18	11	8	9	9	8	16	112	7.40
NE	0	6	7	14	15	7	11	6	7	2	3	12	90	6.46
ENE	0	7	17	17	12	7	11	4	8	5	2	3	93	5.16
E	2	7	8	26	26	14	3	10	5	4	3	8	116	5.50
ESE	0	12	18	28	30	19	24	15	10	9	4	27	196	6.81
SE	0	7	18	33	36	32	32	28	30	12	10	36	274	6.96
SSE	0	12	17	30	41	49	48	37	45	28	34	82	423	8.12
S	1	6	12	19	30	36	36	35	53	49	34	151	462	9.18
SSW	4	9	5	12	14	4	4	14	11	17	16	67	177	9.19
SW	2	6	9	11	9	5	7	7	2	3	3	20	84	7.05
WSW	2	4	9	11	5	1	3	7	3	2	4	5	56	5.81
W	0	4	9	7	2	3	1	1	5	5	9	14	60	7.78
WNW	2	1	9	9	8	5	2	5	6	1	4	14	66	7.06
NW	3	5	14	14	13	20	15	6	13	14	11	55	183	8.37
NNW	0	2	7	10	23	7	8	14	12	7	9	28	127	8.12
N	0	3	5	7	13	18	13	10	12	8	3	22	114	7.77
CALM													22	.25
TOTAL	17	94	170	258	290	245	229	207	231	175	157	560	2655	7.67

NUMBER OF INVALID OBSERVATIONS = 300
TOTAL NUMBER OF OBSERVATIONS = 2955

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 21 of 52)

June (1972 - 1975): 10-Meter Level

PASQUILL #A# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	2	0	2	0	1	1	2	8	9.15
NE	0	0	0	1	0	1	0	0	1	2	2	3	10	10.03
ENE	0	0	0	0	0	0	1	0	1	0	0	0	2	7.15
E	0	0	0	0	1	1	1	0	0	2	0	0	5	7.42
ESE	0	0	0	0	0	0	0	1	2	0	0	1	4	9.30
SE	0	0	0	0	1	0	0	0	0	0	0	0	1	5.00
SSE	0	0	0	0	1	1	1	0	2	2	2	10	19	11.96
S	0	0	0	0	0	1	1	5	5	6	2	11	31	10.17
SSW	0	0	0	0	1	0	2	3	2	4	5	7	24	10.01
SW	0	0	0	1	2	0	0	1	0	0	0	2	6	8.67
WSW	0	0	0	0	1	3	0	0	1	0	0	0	5	6.40
W	0	0	0	0	1	0	0	0	0	0	0	0	1	5.00
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	1	0	0	0	0	0	1	7.00
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	1	0	0	0	0	0	0	0	1	4.60
CALM													0	0.
TOTAL	0	0	0	2	9	9	7	12	14	17	12	36	118	9.75

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL #B# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.80
NE	0	0	0	0	0	0	2	0	0	1	0	0	3	7.93
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	2	0	2	0	0	0	0	4	6.65
ESE	0	0	0	0	1	0	1	1	1	1	0	1	6	9.13
SE	0	0	0	0	0	1	2	0	0	1	1	0	5	7.92
SSE	0	0	0	0	0	0	0	0	0	0	1	0	1	13.00
S	0	1	0	0	0	0	1	1	1	1	0	3	8	9.04
SSW	0	0	0	0	0	0	1	2	0	0	3	4	10	10.60
SW	0	0	0	0	0	0	0	1	0	1	1	0	3	9.50
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	1	0	0	1	4	7	7	2	5	5	9	41	9.03

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 22 of 52)

June (1972 - 1975): 10-Meter Level

PASQUILL #C# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	2	2	14.10
NE	0	0	0	1	1	0	0	0	4	0	0	2	8	8.85
ENE	0	0	0	0	0	0	1	2	0	3	0	0	6	8.60
E	0	0	0	0	0	0	0	1	1	1	0	0	3	8.83
ESE	0	0	0	0	1	0	1	3	3	1	1	0	10	8.09
SE	0	0	0	0	1	2	1	0	2	1	0	1	8	7.87
SSE	0	0	0	0	0	0	2	1	4	2	0	0	9	8.56
S	0	0	0	0	0	1	5	0	2	0	1	4	13	9.18
SSW	0	0	0	0	0	0	1	1	0	2	2	5	11	10.69
SW	0	0	0	1	0	0	0	0	2	0	1	0	4	8.02
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	1	0	0	0	0	1	1	1	4	9.30
CALM													0	0.
TOTAL	0	0	0	2	4	3	11	8	18	11	6	15	78	9.03

NUMBER OF INVALID OBSERVATIONS = 2
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL #D# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	1	4	0	6	5	2	2	2	1	4	28	7.24
NE	1	0	1	4	4	0	4	5	3	1	0	2	25	6.72
ENE	0	1	1	5	2	2	6	4	2	2	0	0	25	6.26
E	0	2	4	7	5	7	7	3	6	3	3	2	49	6.45
ESE	1	0	8	3	5	8	13	5	9	4	3	3	62	6.77
SE	1	1	5	6	5	7	6	16	5	11	11	10	84	7.95
SSE	0	2	4	3	12	12	16	18	18	14	13	45	157	10.00
S	0	3	2	9	9	10	17	19	13	13	18	71	184	11.05
SSW	0	0	3	1	1	1	3	4	3	6	7	37	66	11.79
SW	0	2	2	4	1	1	4	4	3	7	8	13	49	9.16
WSW	0	1	2	1	1	0	0	1	0	0	0	1	7	5.23
W	0	2	3	2	3	2	0	1	1	0	0	0	14	4.49
WNW	0	0	0	0	1	0	0	0	0	0	0	0	1	5.00
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	1	0	2	0	1	1	0	4	0	0	6	15	8.99
N	0	1	2	4	1	4	1	1	1	1	0	0	16	5.26
CALM													0	0.
TOTAL	3	17	38	55	50	61	83	83	70	64	64	194	782	9.06

NUMBER OF INVALID OBSERVATIONS = 21
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 23 of 52)

June (1972 - 1975): 10-Meter Level

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	0	1	1	3	5	5	0	0	0	2	18	6.92
NE	0	2	2	2	2	1	3	2	2	2	2	2	22	6.89
ENE	2	6	2	2	1	1	2	1	0	3	1	2	23	5.45
E	2	3	5	9	4	6	8	4	1	3	1	2	48	5.56
ESE	2	3	6	8	14	13	8	3	0	1	0	1	59	5.13
SE	1	7	19	21	15	18	16	13	12	9	6	11	148	6.35
SSE	3	8	8	20	17	21	20	12	17	14	16	57	213	9.14
S	1	6	8	5	10	11	14	12	19	24	15	148	273	11.90
SSW	1	2	3	4	2	5	6	8	8	8	10	67	124	11.47
SW	0	1	4	4	3	0	1	1	0	1	0	10	25	8.08
WSW	0	1	0	1	0	0	0	1	0	0	0	3	6	8.12
W	0	1	1	0	2	0	1	0	1	0	0	0	6	5.02
WNW	1	1	1	0	0	0	0	1	0	0	0	1	5	6.00
NW	2	0	4	2	3	1	0	1	1	0	0	1	15	4.65
NNW	0	1	0	3	1	0	0	1	1	1	1	6	15	9.87
N	0	1	2	0	3	3	1	0	1	1	2	4	18	8.05
CALM													1	.40.
TOTAL	15	44	65	82	78	83	85	65	63	67	54	317	1019	9.03

NUMBER OF INVALID OBSERVATIONS = 12
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	2	1	0	1	1	3	1	2	0	1	0	12	6.04
NE	1	2	2	1	1	5	1	1	0	0	1	0	15	4.63
ENE	0	2	1	2	1	0	0	0	1	0	0	0	7	3.80
E	1	0	3	4	4	1	0	0	0	0	0	0	13	3.77
ESE	1	3	4	22	7	10	1	0	0	0	2	2	52	4.62
SE	1	7	14	16	12	10	9	4	4	0	1	3	81	4.95
SSE	2	7	12	11	21	14	7	7	6	6	2	5	100	5.66
S	0	7	7	10	8	14	16	16	12	10	8	34	142	8.41
SSW	1	3	3	3	4	4	4	3	1	3	3	6	38	7.07
SW	4	3	3	2	0	1	1	3	1	3	1	2	24	5.66
WSW	2	2	0	4	3	0	2	1	0	0	0	0	14	4.04
W	1	1	6	1	0	0	0	0	0	0	0	4	13	6.04
WNW	2	0	1	0	1	0	1	1	0	0	0	0	6	3.97
NW	3	0	2	2	4	1	0	0	0	0	0	0	12	3.42
NNW	2	1	2	2	1	0	0	0	0	0	1	1	10	4.41
N	2	0	0	0	2	0	1	0	0	1	0	0	6	4.63
CALM													1	0.
TOTAL	23	40	61	80	70	61	46	37	27	23	20	57	546	6.04

NUMBER OF INVALID OBSERVATIONS = 8
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 24 of 52)

June (1972 - 1975): 10-Meter Level

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	2	0	0	0	0	0	0	0	0	0	0	2	1.70
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	1	1	1	1	0	0	0	0	0	0	0	0	4	2.15
E	1	2	0	0	0	0	0	0	0	0	0	0	3	1.53
ESE	0	1	0	0	0	0	0	0	0	0	0	0	1	1.70
SE	1	3	3	2	0	3	0	0	0	0	0	0	12	3.17
SSE	0	1	3	3	2	0	0	0	0	1	0	0	10	4.01
S	0	3	3	0	0	1	1	1	0	0	1	0	10	4.65
SSW	1	3	6	1	1	1	1	0	0	0	0	1	15	3.91
SW	0	1	1	3	1	0	0	2	0	0	0	0	8	4.69
WSW	0	4	3	1	2	0	0	0	0	0	0	0	10	3.00
W	2	4	6	2	0	0	0	0	0	0	0	0	14	2.34
WNW	0	4	3	0	0	0	0	0	0	0	0	0	7	2.26
NW	0	3	4	2	1	0	0	0	0	0	0	0	10	2.80
NNW	2	4	0	1	0	1	0	0	0	0	0	0	8	2.35
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													3	.53
TOTAL	8	36	33	16	7	6	2	3	0	1	1	1	117	3.13

NUMBER OF INVALID OBSERVATIONS = 10
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	6	2	6	2	13	13	10	4	3	4	10	73	7.20
NE	2	5	5	9	8	7	10	8	10	6	5	9	84	6.97
ENE	3	10	6	10	4	3	10	7	4	8	1	2	68	5.68
E	4	7	12	20	14	17	16	10	8	9	4	4	125	5.81
ESE	4	7	18	33	28	31	24	13	15	7	6	8	194	5.86
SE	4	19	42	45	34	41	34	35	23	22	19	25	343	6.34
SSE	5	19	27	37	55	48	46	38	48	39	33	118	513	8.70
S	1	20	20	24	27	38	55	54	53	55	45	271	663	10.63
SSW	3	8	15	9	9	11	18	21	14	23	30	127	288	10.39
SW	4	7	10	15	7	2	6	12	6	12	11	27	119	7.87
WSW	2	8	5	8	7	5	2	3	1	0	0	6	47	5.34
W	3	8	17	5	6	3	1	1	2	1	0	12	59	5.93
WNW	3	5	5	0	2	0	1	3	1	0	0	4	24	5.61
NW	5	3	10	6	8	2	1	1	1	0	0	1	38	3.83
NNW	4	7	2	8	2	2	1	1	5	1	2	13	48	7.20
N	2	3	4	4	8	7	3	1	2	4	3	5	46	6.54
CALM													5	.40
TOTAL	49	142	200	239	221	230	241	218	197	190	163	642	2737	8.22

NUMBER OF INVALID OBSERVATIONS = 143
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 25 of 52)

July (1972 - 1975): 10-Meter Level

PASQUILL #A# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	2	1	2	3	1	0	1	0	10	7.16
NE	0	0	0	0	2	4	3	0	2	1	0	0	12	6.46
ENE	0	0	0	0	0	0	0	0	1	0	1	0	2	9.60
E	0	0	1	0	2	0	4	0	1	0	0	0	8	5.69
ESE	0	0	2	1	1	1	3	3	2	5	4	6	28	8.57
SE	0	0	0	0	1	0	5	3	4	6	4	3	26	8.86
SSE	0	0	2	1	1	1	5	4	8	4	4	4	34	8.84
S	0	0	0	1	0	1	6	2	9	11	4	29	63	11.68
SSW	0	0	0	0	1	0	0	2	1	7	1	32	44	13.95
SW	0	0	0	0	0	1	0	0	0	0	0	1	2	10.95
WSW	0	0	0	0	0	0	0	1	0	0	0	0	1	8.00
W	0	0	0	0	0	1	0	1	0	0	0	0	2	6.60
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	1	0	0	0	0	0	1	6.20
NNW	0	0	0	0	0	0	1	0	2	0	0	0	3	8.17
N	0	0	0	0	1	0	1	1	1	2	1	1	8	8.32
CALM													0	0.
TOTAL	0	0	5	3	11	10	31	20	32	36	20	76	244	10.14

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #B# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	1	1	0	1	2	0	0	0	0	0	5	5.24
NE	0	0	0	0	0	0	0	0	0	0	1	0	1	10.10
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	1	0	1	10.90
ESE	0	0	0	0	0	0	0	1	1	2	1	1	6	9.65
SE	0	0	0	0	0	0	1	2	0	1	1	2	7	10.13
SSE	0	0	0	0	0	0	0	1	0	2	1	2	6	10.55
S	0	0	0	0	0	0	0	0	0	1	2	4	7	11.49
SSW	0	0	0	0	0	0	0	0	0	0	2	2	4	12.30
SW	0	0	0	0	1	0	0	0	0	0	2	2	5	10.04
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	1	0	0	1	0	0	0	0	2	6.40
WNW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.40
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	1	0	0	0	0	0	1	7.00
CALM													0	0.
TOTAL	0	0	1	2	2	1	4	5	1	6	11	13	46	9.62

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 26 of 52)

July (1972 - 1975): 10-Meter Level

PASQUILL #C# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	1	0	1	1	0	0	0	3	7.30
NE	0	0	0	1	0	0	1	1	0	0	0	0	3	6.13
ENE	0	0	0	0	0	0	1	2	0	1	0	0	4	7.97
E	0	0	0	1	1	0	0	0	0	0	0	0	2	4.10
ESE	0	0	0	0	0	0	1	0	1	4	1	4	11	10.32
SE	0	0	0	1	1	0	0	1	1	1	1	3	9	8.32
SSE	0	0	0	0	0	1	3	1	1	0	1	4	11	9.80
S	0	0	0	0	0	0	0	1	2	1	2	4	10	11.18
SSW	0	0	0	0	1	0	2	0	1	0	4	4	12	10.03
SW	0	0	0	0	0	0	0	1	1	0	1	1	4	9.70
WSW	0	0	0	1	0	1	0	0	0	1	0	0	3	6.33
W	0	0	0	0	1	0	0	0	0	0	1	0	2	7.45
WNW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.30
NW	0	0	0	0	0	0	0	0	0	1	0	0	1	9.20
NNW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.60
N	0	0	0	0	0	1	0	0	0	0	0	0	1	6.00
CALM													0	0.
TOTAL	0	0	0	5	5	4	8	8	8	9	11	20	78	9.09

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #D# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	1	6	6	4	5	6	6	3	1	0	39	6.29
NE	0	1	1	0	2	1	3	2	8	2	4	4	28	8.29
ENE	0	0	3	2	0	0	2	8	3	2	1	2	23	7.43
E	0	0	0	5	0	2	8	6	0	1	1	0	23	6.50
ESE	0	0	3	3	0	7	12	6	9	2	3	5	50	7.49
SE	0	0	2	1	5	5	5	12	8	11	9	14	72	8.91
SSE	0	0	3	4	7	11	13	16	20	16	14	40	144	9.08
S	0	1	2	3	8	6	13	17	21	27	29	40	167	9.89
SSW	0	0	0	1	8	12	14	13	18	10	6	20	102	9.11
SW	0	0	0	3	4	7	7	4	3	4	2	6	40	7.62
WSW	0	0	0	1	5	2	4	4	3	1	3	0	23	7.12
W	0	0	3	7	2	2	4	0	6	2	2	4	32	6.95
WNW	0	0	0	0	0	1	1	4	3	2	1	0	12	8.12
NW	0	0	1	2	1	0	1	3	1	0	2	1	12	7.66
NNW	0	1	0	4	2	3	1	4	0	1	0	2	18	6.39
N	0	1	0	2	4	2	3	4	2	0	1	4	23	7.44
CALM													1	.70
TOTAL	0	5	19	44	54	65	96	109	111	84	79	142	809	8.49

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 27 of 52)

July (1972 - 1975): 10-Meter Level

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	3	1	3	2	1	2	1	0	2	2	2	19	6.28
NE	0	8	5	4	5	6	4	1	1	0	1	0	35	4.27
ENE	0	3	1	5	3	3	5	2	0	0	0	1	23	5.12
E	1	5	6	9	7	6	2	0	1	0	0	0	37	3.90
ESE	0	8	7	1	14	9	3	6	2	0	1	0	51	4.76
SE	0	8	10	19	22	24	19	15	14	10	7	12	160	6.37
SSE	0	4	15	18	23	25	29	24	31	21	20	38	248	7.77
S	1	2	7	9	12	18	17	22	23	31	19	58	219	9.44
SSW	0	3	6	6	8	12	11	9	6	6	10	39	116	8.90
SW	0	4	3	3	6	6	2	5	5	5	4	14	57	8.40
WSW	0	1	3	1	3	2	1	2	1	1	0	2	17	6.56
W	0	1	4	2	1	4	2	0	0	0	0	0	14	4.29
WNW	0	0	3	6	3	2	2	1	0	1	0	1	19	5.11
NW	0	3	1	6	3	1	3	2	0	0	0	1	20	4.81
NNW	0	1	4	4	6	2	1	0	1	1	1	2	23	5.53
N	0	3	5	5	3	2	5	4	1	4	1	3	36	6.11
CALM													3	.27
TOTAL	2	57	81	101	121	123	108	94	86	82	66	173	1097	7.30

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	1	4	5	0	4	0	0	0	0	0	0	0	14	2.78
NE	0	2	3	1	2	0	2	0	1	0	0	0	11	3.97
ENE	2	8	2	2	3	2	0	0	0	0	0	0	19	2.74
E	2	1	2	4	2	1	0	0	0	0	0	0	12	3.02
ESE	0	10	11	7	1	1	2	0	1	0	0	0	33	2.98
SE	0	8	14	8	11	7	7	3	0	0	0	0	58	4.16
SSE	0	9	20	11	20	24	24	13	1	0	0	6	128	5.31
S	0	1	11	10	15	13	17	7	9	1	0	2	86	5.67
SSW	2	3	6	10	7	10	8	8	7	2	9	7	79	6.92
SW	0	6	7	4	5	4	7	0	3	1	2	1	40	5.12
WSW	0	3	9	5	5	2	1	1	1	0	0	0	27	3.74
W	0	3	8	1	0	0	2	0	0	0	0	0	14	2.93
WNW	0	3	6	6	0	0	0	0	0	1	0	0	16	3.17
NW	0	2	6	9	2	1	0	1	0	0	0	1	22	4.20
NNW	0	1	1	2	1	0	0	0	0	0	0	0	5	3.22
N	1	0	3	0	0	2	2	2	0	0	0	0	10	4.84
CALM													6	.37
TOTAL	8	64	114	80	78	67	72	35	23	5	11	17	580	4.80

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 28 of 52)

July (1972 - 1975): 10-Meter Level

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	1	0	0	0	0	0	0	0	0	0	0	1	1.90
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	1	2	1	0	0	0	0	0	0	0	0	4	2.37
SE	0	0	2	1	0	0	0	0	0	0	0	0	3	3.03
SSE	0	4	0	2	2	0	1	0	1	0	0	1	11	4.84
S	1	1	4	3	1	3	2	1	0	0	0	2	18	5.52
SSW	0	0	2	2	1	0	1	0	0	0	0	1	7	5.57
SW	0	1	0	0	0	1	0	0	0	0	0	1	3	7.53
WSW	0	0	1	1	0	0	0	0	0	0	0	1	3	7.53
W	1	1	0	0	0	0	1	0	0	0	0	0	3	3.23
WNW	0	0	0	0	0	0	0	0	0	1	0	0	1	10.00
NW	0	0	0	0	1	1	1	0	0	0	0	0	3	5.70
NNW	0	0	1	0	0	1	0	0	0	0	0	0	2	3.80
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													1	.70
TOTAL	2	9	12	10	5	6	6	1	1	1	0	6	60	5.04

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	1	9	8	10	14	8	11	11	8	5	4	2	91	5.77
NE	0	11	9	6	13	12	14	4	12	3	6	4	94	5.89
ENE	3	13	7	10	6	5	9	12	4	3	2	3	77	5.32
E	3	6	10	19	13	10	15	6	2	1	2	0	87	4.78
ESE	0	19	26	13	17	18	23	19	17	14	10	16	192	6.26
SE	0	16	30	31	42	36	39	37	27	29	22	34	343	6.81
SSE	0	18	41	37	53	62	75	59	62	43	40	95	585	7.60
S	2	6	24	28	36	41	55	50	64	72	56	139	573	9.15
SSW	2	8	14	19	26	34	36	32	33	26	32	106	368	9.13
SW	0	11	11	10	16	19	16	10	12	10	11	27	153	7.44
WSW	0	4	13	9	13	8	6	8	5	3	3	3	75	5.76
W	1	5	15	10	6	7	9	2	6	2	3	4	70	5.42
WNW	0	3	9	13	4	3	3	5	3	5	1	1	70	5.26
NW	0	6	9	17	7	3	6	6	1	1	2	3	61	5.19
NNW	0	4	6	11	9	6	3	4	3	2	1	4	53	5.57
N	1	4	8	7	8	7	12	11	4	6	3	8	79	6.57
CALM													12	.42
TOTAL	13	143	240	250	283	279	332	276	263	225	198	449	2963	7.37

NUMBER OF INVALID OBSERVATIONS = 13
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 29 of 52)

August (1972 - 1975): 10-Meter Level

PASQUILL #A# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	1	0	2	0	2	0	0	0	0	0	6	4.50
NE	0	0	2	1	0	1	1	2	0	1	1	0	9	6.32
ENE	0	0	0	0	0	3	0	1	0	0	0	0	4	6.17
E	0	1	0	2	1	4	1	3	7	2	0	0	21	6.84
ESE	0	1	1	2	7	3	5	9	2	6	0	0	36	6.53
SE	0	0	0	2	4	2	7	11	6	6	1	0	39	7.27
SSE	0	1	0	1	3	2	4	6	6	6	2	1	32	7.64
S	0	0	0	3	1	5	6	4	2	2	2	3	28	7.34
SSW	0	0	1	1	1	4	4	3	4	4	7	4	33	8.81
SW	0	0	0	0	0	1	0	2	0	0	1	1	5	8.60
WSW	0	0	1	3	1	0	0	1	1	0	0	0	7	4.73
W	0	0	0	0	1	2	2	0	0	0	0	0	5	5.76
WNW	0	0	1	1	2	0	0	0	0	0	0	0	4	3.85
NW	0	0	0	0	0	0	0	1	0	0	0	0	1	7.40
NNW	0	1	0	1	2	1	0	0	2	0	0	0	7	5.39
N	0	0	0	0	0	2	2	1	0	1	0	0	6	7.22
CALM													1	.50
TOTAL	0	5	7	17	25	30	34	44	30	28	14	9	244	7.05

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #B# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	1	2	0	0	0	0	0	0	3	5.13
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	1	0	1	0	0	0	0	2	6.65
ESE	0	0	0	0	0	3	2	2	1	0	1	0	9	7.26
SE	0	0	0	0	1	1	2	2	1	1	0	0	8	7.05
SSE	0	0	0	0	1	0	1	2	3	5	2	2	16	9.12
S	0	0	0	0	0	0	1	0	3	4	5	4	17	10.22
SSW	0	0	0	0	0	0	1	0	2	2	1	4	10	10.58
SW	0	0	0	0	0	0	1	0	0	1	2	1	5	10.24
WSW	0	0	0	0	0	0	1	0	0	0	0	0	1	6.40
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
N	0	0	0	0	0	0	0	0	0	0	0	1	1	12.20
CALM													0	0.
TOTAL	0	0	0	0	3	7	9	7	10	13	11	12	72	8.97

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 30 of 52)

August (1972 - 1975): 10-Meter Level

PASQUILL #C# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	1	0	0	0	1	0	1	0	3	6	11.37
NE	0	0	0	1	0	0	0	1	0	0	0	2	4	9.80
ENE	0	0	0	0	0	0	0	0	0	0	0	1	1	12.00
E	0	0	0	0	1	2	1	1	0	1	0	0	6	6.68
ESE	0	0	0	0	0	2	2	2	0	1	0	0	7	7.09
SE	0	0	0	0	1	2	3	3	0	0	1	0	10	6.91
SSE	0	0	0	0	0	1	2	0	1	3	1	3	11	9.20
S	0	0	0	0	1	0	3	0	4	1	4	6	19	9.76
SSW	0	0	0	0	0	3	2	2	3	2	2	7	21	9.82
SW	0	0	0	0	1	1	0	1	0	1	0	1	5	8.18
WSW	0	0	0	0	0	1	0	1	0	0	0	0	2	6.50
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.20
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	0	0	0	0	0	0	0	0	0	1	1	11.80
N	0	0	0	1	1	0	0	0	0	0	0	0	2	4.50
CALM													0	0.
TOTAL	0	0	0	3	6	12	13	12	8	10	8	24	96	8.85

NUMBER OF INVALID OBSERVATIONS = 2
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #D# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	1	1	2	0	4	4	6	7	6	8	39	9.26
NE	0	0	4	0	3	5	7	2	2	5	1	9	38	8.13
ENE	0	0	0	2	4	3	2	3	2	1	2	1	20	6.80
E	0	1	3	3	5	5	0	5	2	0	1	0	25	5.51
ESE	0	0	1	2	4	12	9	11	8	1	0	1	49	6.76
SE	0	3	2	3	9	7	8	8	7	4	4	6	61	7.01
SSE	0	1	1	9	7	14	10	12	6	9	10	15	94	7.79
S	0	1	0	2	9	9	10	14	9	9	9	60	132	10.12
SSW	0	0	0	1	2	7	17	14	14	16	14	41	126	10.08
SW	1	1	0	2	3	5	6	7	4	4	3	6	42	7.58
WSW	0	0	2	3	2	2	1	1	0	0	0	0	11	4.60
W	0	0	0	2	2	0	1	0	0	0	0	0	5	4.66
WNW	0	0	0	0	0	2	0	0	0	0	0	0	2	5.95
NW	0	0	1	1	0	0	0	0	0	0	0	0	2	3.20
NNW	0	0	2	1	0	0	1	0	1	1	0	0	6	5.63
N	0	0	1	0	2	0	1	3	0	0	2	4	15	8.79
CALM													0	0.
TOTAL	1	7	18	32	54	71	77	84	61	59	52	151	667	8.42

NUMBER OF INVALID OBSERVATIONS = 3
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 31 of 52)

August (1972 - 1975): 10-Meter Level

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	4	6	4	1	2	2	2	1	2	0	2	26	5.33
NE	1	2	9	3	5	1	1	1	2	1	0	0	26	4.10
ENE	2	1	6	3	4	1	1	0	1	0	0	0	19	3.60
E	0	5	6	8	10	4	0	1	1	1	0	2	38	4.66
ESE	0	5	12	15	16	12	11	6	4	3	1	2	87	5.15
SE	0	9	8	34	29	16	24	13	11	8	1	5	158	5.61
SSE	0	6	11	18	26	31	32	34	17	24	16	29	244	7.39
S	2	3	7	16	10	20	21	21	34	19	26	62	241	8.90
SSW	1	2	7	9	2	14	12	17	18	14	13	24	133	8.51
SW	0	2	4	4	7	9	5	8	3	4	1	4	51	6.67
WSW	0	3	3	2	3	1	1	0	1	0	0	1	15	4.45
W	0	2	2	1	0	1	0	0	0	1	0	0	7	3.96
WNW	0	3	0	1	2	2	0	0	2	0	0	0	10	4.58
NW	1	1	2	3	2	2	0	1	1	0	1	1	15	5.23
NNW	0	0	0	2	3	2	2	1	2	1	2	3	18	7.50
N	0	0	5	1	2	1	1	1	0	2	0	2	15	5.93
CALM													2	.45
TOTAL	7	48	88	124	122	119	113	106	98	80	61	137	1105	6.96

NUMBER OF INVALID OBSERVATIONS = 7
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	5	3	2	2	0	1	0	0	0	0	0	0	13	2.01
NE	1	2	5	2	0	0	0	0	0	0	0	0	10	2.33
ENE	1	4	2	1	0	0	0	0	0	0	0	0	8	2.01
E	3	4	5	4	3	0	0	1	0	0	0	0	20	3.05
ESE	1	18	10	17	16	2	0	0	2	0	0	0	66	3.28
SE	1	12	29	28	21	12	5	2	0	0	0	1	111	3.81
SSE	0	11	12	18	24	16	13	12	5	0	1	0	112	4.80
S	4	11	8	19	16	17	18	6	7	1	1	1	109	4.96
SSW	1	7	13	8	9	8	7	6	2	4	1	6	72	5.52
SW	0	3	8	3	0	4	3	4	1	0	1	1	28	5.01
WSW	0	3	5	2	2	1	1	2	1	0	0	1	18	4.50
W	0	3	1	0	0	1	0	0	0	0	0	0	5	2.72
WNW	0	2	4	0	2	3	1	0	0	0	0	0	12	3.69
NW	0	3	3	7	2	2	4	0	1	0	0	0	22	4.24
NNW	1	3	4	0	1	0	1	0	0	0	0	0	10	2.67
N	2	4	4	4	0	1	1	0	0	0	0	0	16	2.84
CALM													29	.36
TOTAL	20	93	115	115	96	68	55	33	19	5	4	10	661	4.08

NUMBER OF INVALID OBSERVATIONS = 7
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 32 of 52)

August (1972 - 1975): 10-Meter Level

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	1	0	0	0	0	0	0	0	0	0	0	1	1.20
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	1	1	0	0	0	0	0	0	0	0	0	2	1.90
SE	0	4	5	2	0	2	1	0	0	0	0	0	14	3.15
SSE	0	3	2	0	0	1	2	0	0	0	0	0	8	3.52
S	0	0	1	0	2	3	3	1	0	0	0	0	10	5.75
SSW	0	1	1	0	0	0	1	1	0	0	0	1	5	6.26
SW	0	1	2	1	0	2	1	1	0	0	0	0	8	4.52
WSW	1	1	1	0	1	0	0	0	0	0	0	0	4	2.60
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	4	2	0	0	0	0	0	0	0	0	0	6	1.77
NW	0	2	3	1	3	2	1	0	0	1	0	0	13	4.17
NNW	1	1	1	0	2	0	0	0	0	0	0	0	5	2.64
N	1	0	0	0	0	0	0	0	0	0	0	0	1	1.00
CALM													11	.44
TOTAL	3	19	19	4	8	10	9	3	0	1	0	1	88	3.37

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	5	8	10	8	5	3	8	7	7	10	6	13	90	6.90
NE	2	4	20	7	9	9	9	6	4	7	2	11	90	6.12
ENE	3	6	8	6	8	7	3	4	3	1	2	2	53	4.88
E	3	11	14	17	20	16	2	12	10	4	1	2	112	5.12
ESE	1	25	25	36	43	34	29	30	17	11	2	3	256	5.27
SE	1	28	44	69	65	42	50	39	25	19	7	12	401	5.46
SSE	0	22	26	46	61	65	64	66	40	50	32	50	522	6.97
S	6	15	16	40	39	54	62	46	59	36	48	136	557	8.36
SSW	2	10	22	19	14	36	44	43	44	42	38	87	401	8.58
SW	1	7	14	11	11	23	16	23	8	10	8	14	146	6.71
WSW	1	7	12	10	9	6	4	5	3	0	0	2	59	4.53
W	0	5	3	3	3	4	3	0	0	1	0	0	22	4.25
WNW	0	9	7	2	7	7	1	0	2	0	0	0	35	3.78
NW	1	6	9	12	7	6	5	2	2	1	1	1	53	4.52
NNW	2	5	7	4	8	3	4	1	5	2	2	4	47	5.49
N	3	4	10	6	5	4	5	5	0	5	2	7	56	5.92
CALM													43	.39
TOTAL	31	172	247	296	314	319	309	289	229	199	151	344	2943	6.66

NUMBER OF INVALID OBSERVATIONS = 33
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 33 of 52)

September (1972 - 1975): 10-Meter Level

PASQUILL #A# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	4	4	3	1	1	2	0	3	18	8.12
NE	0	0	0	2	1	0	0	0	0	0	0	0	3	3.97
ENE	0	1	1	2	2	0	0	0	0	1	0	1	8	5.14
E	0	0	0	2	3	0	2	1	1	0	0	0	9	5.43
ESE	0	0	1	3	3	7	7	0	1	2	0	0	24	5.84
SE	0	1	0	0	0	2	0	0	0	1	0	0	4	5.67
SSE	0	0	0	0	1	5	2	1	3	0	3	4	19	8.41
S	0	0	2	1	1	2	3	0	2	2	3	4	20	8.53
SSW	0	0	0	0	0	0	0	0	1	0	0	2	3	11.23
SW	0	0	0	0	1	0	2	0	0	0	0	0	3	6.07
WSW	0	0	0	1	1	0	0	0	0	0	0	0	2	4.35
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	1	0	0	0	0	0	0	0	0	1	3.50
NNW	0	0	1	1	0	0	0	0	0	0	0	0	2	2.90
N	0	0	0	2	2	0	1	0	0	1	0	1	7	6.39
CALM													1	.70
TOTAL	0	2	5	15	19	20	20	3	9	9	6	15	124	6.91

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL #B# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	0	0	0	1	0	1	1	0	1	7	12	11.57
NE	0	0	0	0	0	0	0	0	0	0	1	0	1	10.80
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	1	0	0	0	1	0	1	0	0	3	6.87
SE	0	0	0	1	0	1	0	0	0	0	0	0	2	4.80
SSE	0	0	0	0	0	0	1	0	2	2	2	1	8	9.52
S	0	0	0	0	0	0	1	0	0	1	0	3	5	11.54
SSW	0	0	0	0	0	0	0	0	0	0	0	2	2	13.75
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	0	0	0	0	0	0	1	0	0	0	1	8.40
N	0	0	0	0	0	0	1	2	1	3	3	0	10	9.32
CALM													0	0.
TOTAL	0	1	0	2	0	2	3	4	5	7	7	13	44	10.07

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 34 of 52)

September (1972 - 1975): 10-Meter Level

PASQUILL #C# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	1	0	0	0	0	3	0	3	7	11.73
NE	0	0	0	1	1	0	0	0	0	0	0	0	2	4.20
ENE	0	1	0	0	2	0	0	1	0	0	0	0	4	4.90
E	0	0	0	0	0	0	0	0	1	0	0	0	1	8.70
ESE	0	0	0	1	0	1	1	0	0	2	1	0	6	7.47
SE	0	0	0	0	0	0	0	0	1	0	1	0	2	9.15
SSE	0	0	0	0	1	0	3	2	1	2	0	3	12	8.61
S	0	0	0	1	0	0	0	1	0	0	1	3	6	9.85
SSW	0	1	0	0	0	0	0	0	0	0	1	2	4	9.72
SW	0	0	0	0	0	1	1	0	1	0	0	1	4	8.47
WSW	0	0	0	0	0	2	0	0	1	0	0	0	3	6.50
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	2	0	1	0	3	0	1	7	8.87
NNW	0	0	0	0	0	1	0	1	0	0	0	0	2	6.60
N	0	0	0	0	1	1	0	0	1	0	5	1	9	9.36
CALM													1	.40
TOTAL	0	2	0	3	6	8	5	6	6	10	9	14	70	8.52

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL #D# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	1	1	2	3	2	3	2	5	2	3	3	20	47	9.45
NE	0	2	3	3	6	6	6	6	3	1	0	4	40	6.48
ENE	0	2	0	7	2	3	9	6	5	5	2	8	49	7.74
E	1	0	7	1	4	4	3	2	3	1	0	0	26	5.25
ESE	0	3	6	5	9	5	8	7	11	2	0	0	56	5.94
SE	0	1	2	7	4	9	7	3	3	6	5	3	50	6.76
SSE	0	1	0	4	2	6	5	10	6	12	6	22	74	9.33
S	0	3	1	5	1	3	5	10	10	5	12	55	110	10.83
SSW	0	0	1	0	1	1	6	5	1	8	8	31	62	11.61
SW	0	0	0	1	1	1	2	0	1	2	1	4	13	9.71
WSW	0	0	1	0	2	0	0	1	0	0	1	0	5	6.28
W	0	1	0	0	2	0	0	1	0	1	0	0	5	5.70
WNW	0	0	0	3	0	0	1	1	1	1	0	0	7	6.17
NW	0	0	0	3	3	3	0	2	4	3	2	4	24	8.16
NNW	0	0	1	2	5	0	0	1	5	4	1	20	39	11.23
N	0	4	2	3	3	4	6	3	4	7	2	28	66	10.63
CALM													5	.12
TOTAL	2	18	26	47	47	48	60	63	59	61	43	199	678	8.93

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 35 of 52)

September (1972 - 1975): 10-Meter Level

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	4	8	13	14	4	18	9	16	10	11	28	135	8.18
NE	1	2	8	7	9	10	11	5	9	9	5	13	89	7.53
ENE	1	3	4	5	7	12	6	2	1	2	3	6	52	6.49
E	0	7	7	13	8	7	6	1	0	1	0	0	50	4.28
ESE	3	2	6	16	11	9	6	4	1	2	1	0	61	4.76
SE	1	2	9	12	22	23	18	18	11	5	3	5	129	6.14
SSE	2	3	7	10	14	26	30	20	19	23	13	43	210	8.14
S	2	4	4	8	4	11	6	12	18	16	22	46	153	9.29
SSW	1	1	1	2	0	2	4	2	6	5	6	30	60	10.43
SW	2	0	2	0	1	1	1	0	3	2	3	0	15	6.72
WSW	1	0	3	3	3	4	0	1	0	1	0	0	16	4.47
W	0	0	1	1	0	0	0	0	0	0	0	1	3	5.93
WNW	0	4	2	2	3	2	3	1	2	0	0	0	19	4.83
NW	1	3	5	7	2	9	11	5	3	1	2	3	52	5.98
NNW	1	3	11	7	3	7	5	5	5	7	1	17	72	7.82
N	2	6	7	11	16	13	16	20	16	9	9	75	200	9.65
CALM													14	.38
TOTAL	18	44	85	117	117	140	141	105	110	93	79	267	1330	7.71

NUMBER OF INVALID OBSERVATIONS = 3
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	1	6	0	0	2	1	1	2	0	0	2	0	15	4.53
NE	2	7	2	2	2	5	0	0	0	0	0	1	21	3.84
ENE	0	5	1	4	3	2	0	0	0	0	0	1	16	3.94
E	2	3	3	7	10	2	0	0	0	0	0	0	27	3.61
ESE	3	7	11	8	4	1	0	0	0	0	0	0	34	2.90
SE	0	5	13	13	11	19	6	2	2	0	0	0	71	4.43
SSE	1	4	9	4	6	19	13	6	2	0	1	0	65	5.15
S	0	2	5	6	6	2	4	7	7	6	2	3	50	6.81
SSW	1	2	1	1	0	0	0	2	1	2	1	0	11	5.68
SW	0	2	0	1	0	0	1	0	0	0	0	0	4	3.52
WSW	0	2	2	0	0	0	0	0	0	0	0	0	4	2.12
W	0	3	1	0	0	0	0	2	0	0	0	0	6	3.48
WNW	0	0	3	0	0	0	0	0	0	0	0	0	3	2.70
NW	1	3	7	3	4	2	5	4	1	2	0	0	32	4.82
NNW	1	5	7	6	6	7	2	0	0	1	0	1	36	4.34
N	4	4	4	3	3	3	0	1	0	0	0	0	22	3.28
CALM													20	.33
TOTAL	16	60	69	58	57	63	32	26	13	11	6	6	437	4.35

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 36 of 52)

September (1972 - 1975): 10-Meter Level

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	2	0	0	0	0	0	0	0	0	0	0	2	2.00
NE	0	1	0	0	0	0	0	0	0	0	0	0	1	1.80
ENE	0	0	0	0	2	0	0	0	0	0	0	0	2	5.00
E	0	0	1	0	1	1	0	1	0	0	0	0	4	5.15
ESE	0	0	0	1	1	0	0	0	0	0	0	0	2	4.40
SE	0	1	1	6	4	2	1	0	0	0	0	0	15	4.26
SSE	0	1	5	6	4	1	0	1	0	0	0	0	18	3.73
S	0	1	2	1	2	1	1	0	1	0	0	0	9	4.57
SSW	0	1	2	2	0	0	0	0	0	1	0	0	6	3.78
SW	0	0	0	0	0	0	0	1	0	0	0	0	1	7.70
WSW	0	1	1	0	0	0	0	0	0	0	0	0	2	2.25
W	0	2	4	1	0	0	0	0	0	0	0	0	7	2.56
WNW	3	6	2	0	2	0	0	0	0	0	0	0	13	2.18
NW	2	2	7	4	5	11	8	4	6	2	0	0	51	5.51
NNW	0	4	3	1	1	1	1	1	0	0	0	0	12	3.64
N	0	2	2	0	0	0	0	0	0	0	0	0	4	2.00
CALM													11	.18
TOTAL	5	24	30	22	22	17	11	8	7	3	0	0	160	3.96

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	2	14	10	16	23	13	24	18	20	18	17	61	236	8.42
NE	3	12	13	15	19	21	17	11	12	10	6	18	157	6.64
ENE	1	12	6	18	18	17	15	9	6	8	5	16	131	6.49
E	3	10	18	23	26	14	11	5	5	2	0	0	117	4.50
ESE	6	12	24	36	28	23	22	12	13	9	2	0	187	5.03
SE	1	10	25	39	41	56	32	23	17	12	9	8	273	5.71
SSE	3	9	21	24	28	57	54	40	33	39	25	73	406	7.74
S	2	10	14	22	14	19	20	30	38	30	40	114	353	9.30
SSW	2	5	5	5	1	3	10	9	9	16	16	67	148	10.34
SW	2	2	2	2	3	3	7	1	5	4	4	5	40	7.52
WSW	1	3	7	4	6	6	0	2	1	1	1	0	32	4.51
W	0	6	6	2	2	0	0	3	0	1	0	1	21	4.05
WNW	3	10	7	5	5	2	4	2	3	1	0	0	42	4.08
NW	4	8	19	18	14	27	24	16	14	11	4	8	167	6.03
NNW	2	12	23	17	15	16	8	8	11	12	3	38	165	7.51
N	6	16	15	19	25	21	24	26	22	20	19	105	318	9.23
CALM													52	.30
TOTAL	41	151	215	265	268	298	272	215	209	194	151	514	2845	7.30

NUMBER OF INVALID OBSERVATIONS = 35
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 37 of 52)

October (1972 - 1975): 10-Meter Level

PASQUILL #A# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	1	1	1	0	0	0	3	7.70
SSE	0	0	0	0	0	0	0	1	1	2	6	5	15	10.52
S	0	0	0	0	0	0	0	2	0	1	0	3	6	9.73
SSW	0	0	0	0	1	0	1	0	0	2	1	0	5	8.28
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	0	0	0	0	0	0	0	0	0	1	11	5.70
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	0	1	0	2	4	2	5	7	9	30	9.88

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #B# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	1	0	1	0	0	0	2	7.85
SE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.30
SSE	0	0	0	0	2	2	0	0	0	1	2	5	12	9.41
S	0	0	0	0	0	0	0	1	3	1	1	2	8	9.82
SSW	0	0	0	0	0	1	0	0	0	0	3	2	6	10.35
SW	0	0	0	0	0	0	0	0	0	0	0	1	1	12.60
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	0	0	0	0	0	0	0	1	0	2	3	13.20
N	0	0	0	0	0	0	1	0	1	1	0	0	3	8.23
CALM													0	0.
TOTAL	0	0	0	0	2	4	2	1	5	4	6	12	36	9.76

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 38 of 52)

October (1972 - 1975): 10-Meter Level

PASQUILL #C# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	2	1	1	0	0	0	0	4	6.30
NE	0	0	0	0	0	1	2	0	0	0	0	0	3	6.67
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	2	0	0	0	0	0	0	0	2	4.30
ESE	0	0	0	0	3	0	1	0	1	1	0	0	6	6.33
SE	0	0	0	0	1	0	0	1	0	0	0	0	2	5.90
SSE	0	0	0	0	1	0	1	0	1	1	3	6	13	10.32
S	0	0	0	0	2	1	1	2	2	1	0	0	9	6.92
SSW	0	0	0	1	0	0	2	0	0	0	1	3	7	8.86
SW	0	0	0	1	0	1	0	0	1	0	0	1	4	7.40
WSW	0	0	0	0	0	0	1	0	1	0	0	0	2	7.60
W	0	0	0	0	0	0	0	0	1	0	0	0	1	9.00
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NNW	0	0	0	0	0	0	0	1	0	0	1	7	9	13.04
N	0	0	0	0	0	0	1	0	1	1	2	0	5	8.94
CALM													0	0.
TOTAL	0	0	0	2	9	5	10	5	8	4	7	17	67	8.63

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #D# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	3	4	6	9	2	4	5	1	2	8	44	7.67
NE	0	0	5	4	5	6	1	0	0	0	1	7	29	6.76
ENE	1	0	4	4	5	3	2	2	0	0	0	0	21	4.50
E	0	6	6	4	3	3	1	3	1	1	0	0	28	4.30
ESE	0	2	5	3	9	6	7	4	8	2	0	0	46	5.73
SE	0	3	1	7	11	17	11	4	8	4	1	2	69	6.12
SSE	0	1	4	5	9	5	8	12	10	10	11	19	94	8.89
S	1	1	11	1	13	7	6	8	10	11	8	53	130	10.14
SSW	2	0	0	3	3	5	4	5	7	4	2	29	64	10.34
SW	0	1	3	0	2	1	2	3	1	2	1	5	21	7.62
WSW	0	1	0	2	5	1	1	3	0	0	1	1	15	6.07
W	0	2	1	0	4	2	1	3	0	0	0	0	13	5.19
WNW	0	1	3	0	1	0	0	1	1	1	1	1	10	6.36
NW	0	5	4	4	1	2	2	1	0	3	4	4	30	6.39
NNW	1	2	1	3	3	0	4	5	8	1	11	26	66	10.31
N	0	1	1	0	5	1	4	5	4	2	4	36	63	11.92
CALM													4	.35
TOTAL	5	26	52	44	85	68	56	63	63	43	47	191	747	8.38

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 39 of 52)

October (1972 - 1975): 10-Meter Level

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	1	3	5	2	5	0	9	2	0	0	2	18	47	9.29
NE	0	5	3	6	3	4	2	1	1	0	0	0	25	4.14
ENE	0	0	8	5	2	0	0	0	0	0	0	0	15	3.20
E	0	1	4	7	3	4	1	1	0	0	1	0	22	4.54
ESE	0	3	4	7	10	4	6	7	7	0	1	0	49	5.54
SE	3	5	9	8	14	22	13	15	12	7	3	4	115	6.25
SSE	1	9	1	8	6	12	8	27	18	20	16	61	187	9.54
S	0	3	4	1	8	2	16	19	9	13	6	87	168	11.24
SSW	0	0	1	2	5	6	7	2	7	1	0	20	51	10.01
SW	0	1	2	2	0	2	1	0	0	0	0	2	10	6.00
WSW	0	2	1	3	4	2	1	0	0	0	0	0	13	4.23
W	0	2	2	2	1	1	1	0	2	1	0	0	12	5.01
WNW	0	1	0	2	2	2	1	2	1	1	0	2	14	6.72
NW	1	2	5	7	6	5	1	7	3	4	3	6	50	6.77
NNW	0	2	5	8	8	10	7	10	12	7	5	21	95	8.08
N	0	2	7	4	3	10	9	11	4	3	2	25	80	9.17
CALM													11	.24
TOTAL	6	41	61	74	80	86	83	104	76	57	39	246	964	8.27

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	2	1	3	1	1	0	0	0	0	0	0	8	3.55
NE	1	5	3	0	0	0	0	0	0	0	0	0	9	1.86
ENE	3	7	6	0	0	0	0	0	0	0	0	0	16	1.85
E	1	2	3	4	2	0	0	0	0	0	0	0	12	3.00
ESE	1	7	11	17	9	4	1	1	2	0	1	0	54	4.03
SE	2	4	8	18	19	7	8	3	0	0	1	2	72	4.66
SSE	2	4	11	22	15	17	23	24	13	3	4	14	152	6.35
S	0	3	6	5	4	7	15	12	8	7	2	8	77	7.25
SSW	0	6	0	3	3	7	1	2	2	0	1	3	28	6.01
SW	1	3	4	0	1	3	1	0	0	0	0	0	13	3.46
WSW	0	1	2	0	1	1	0	0	0	0	0	0	5	3.30
W	0	3	1	1	1	0	0	0	0	0	0	0	6	2.60
WNW	1	0	3	0	1	0	0	0	0	0	0	0	5	2.70
NW	0	3	1	6	4	7	6	4	3	2	0	2	38	6.20
NNW	0	1	1	8	3	2	3	4	1	1	0	0	24	5.34
N	1	1	3	4	6	3	2	2	2	3	0	1	28	5.92
CALM													19	.36
TOTAL	13	52	64	91	70	59	60	52	31	16	9	30	566	5.27

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 40 of 52)

October (1972 - 1975): 10-Meter Level

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	3	0	1	0	0	0	0	0	0	0	0	4	2.15
NE	1	2	2	0	0	0	0	0	0	0	0	0	5	1.64
ENE	2	0	0	0	0	0	0	0	0	0	0	0	2	.90
E	1	2	3	0	0	0	0	0	0	0	0	0	6	2.15
ESE	1	9	7	4	1	2	2	0	0	0	0	0	26	2.94
SE	4	12	19	23	10	6	3	1	0	0	0	0	78	3.32
SSE	4	16	15	15	13	6	8	1	0	0	0	1	79	3.61
S	5	4	12	8	9	4	8	7	2	1	1	5	66	5.21
SSW	1	8	4	5	4	6	3	1	1	0	0	0	33	3.93
SW	0	4	0	2	2	1	0	0	1	0	0	0	10	3.75
WSW	1	3	3	2	0	0	0	0	0	0	0	0	9	2.22
W	1	7	10	4	2	0	0	0	0	0	0	0	24	2.50
WNW	5	6	9	2	4	1	3	0	0	0	0	0	30	2.94
NW	3	8	12	4	4	6	7	8	0	1	0	0	53	4.36
NNW	0	8	3	3	1	0	0	0	0	0	0	0	15	2.55
N	2	3	2	1	1	0	1	0	0	0	0	1	11	3.48
CALM													40	.31
TOTAL	31	95	101	74	51	32	35	18	4	2	1	7	491	3.37

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	1	8	9	10	12	12	12	7	5	1	4	26	107	7.81
NE	2	12	13	10	8	11	5	1	1	0	1	7	71	4.85
ENE	6	7	18	9	7	3	2	2	0	0	0	0	54	3.22
E	2	11	16	15	10	7	2	4	1	1	1	0	70	3.97
ESE	2	21	27	31	32	16	18	12	19	3	2	0	183	4.83
SE	9	24	37	57	56	53	36	25	21	11	5	8	342	5.21
SSE	7	30	32	50	47	42	48	66	43	37	42	113	557	7.76
S	6	11	33	15	36	21	46	51	34	35	18	158	464	9.28
SSW	3	14	5	14	16	25	18	10	17	7	8	57	194	8.43
SW	1	9	9	5	5	8	4	3	3	2	1	9	59	5.84
WSW	1	7	6	7	10	4	3	3	1	0	1	1	44	4.49
W	1	14	14	7	8	3	2	3	3	1	0	0	56	3.79
WNW	6	8	15	4	8	3	4	3	2	2	1	3	59	4.40
NW	4	18	22	21	15	20	16	20	6	10	7	12	171	5.83
NNW	1	13	10	22	15	12	14	20	21	11	17	57	213	8.59
N	3	7	13	9	15	14	18	18	12	10	8	63	190	9.25
CALM													74	.32
TOTAL	55	214	279	286	300	254	248	248	189	131	116	514	2908	6.93

NUMBER OF INVALID OBSERVATIONS = 68
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 41 of 52)

November (1972 - 1975): 10-Meter Level

PASQUILL #A# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	1	0	0	0	0	1	7.70
NE	0	0	0	0	1	3	0	0	0	1	0	0	5	6.36
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.70
SE	0	0	0	0	0	0	0	0	0	0	0	1	11	1.90
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	0	0	0	0	1	0	0	0	1	8.40
SSW	0	0	0	0	0	0	0	0	0	1	0	4	51	8.90
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	1	0	0	0	0	0	0	0	1	4.20
NNW	0	0	0	0	0	0	0	0	1	1	0	0	2	9.15
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	0	0	2	4	0	1	2	3	0	5	17	10.74L

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL #B# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.70
NE	0	0	0	0	0	0	0	1	0	0	0	0	1	7.60
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	1	0	0	0	1	8.70
ESE	0	0	0	0	0	0	0	0	0	1	2	0	3	10.13
SE	0	0	0	0	0	0	0	0	0	1	0	2	3	12.10
SSE	0	0	0	0	0	0	0	0	0	0	1	0	1	10.50
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	0	0	0	0	0	0	0	0	0	0	0	1	1	18.00
SW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	0	0	1	0	1	11.00
NNW	0	0	0	0	0	0	0	0	0	1	0	5	6	11.38
N	0	0	0	0	1	0	0	0	0	0	0	0	1	4.50
CALM													0	0.
TOTAL	0	0	0	0	1	1	0	1	1	3	4	8	19	10.58

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 42 of 52)

November (1972 - 1975): 10-Meter Level

PASQUILL #C# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	1	1	0	0	0	0	0	2	6.15
NE	0	0	0	0	0	2	1	1	0	0	0	0	4	6.32
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	2	0	0	0	0	0	0	2	5.55
SE	0	0	0	0	0	0	0	0	0	1	0	2	3	11.10
SSE	0	0	0	0	0	0	0	0	0	0	1	1	2	10.75
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	0	0	0	0	0	0	0	0	0	0	1	0	1	11.00
SW	0	0	0	0	0	0	0	0	1	1	1	1	4	10.00
WSW	0	0	0	0	0	0	0	1	0	1	0	1	3	9.77
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	1	0	0	1	0	0	2	8.00
NNW	0	0	0	0	0	0	0	0	0	1	4	3	8	10.61
N	0	0	0	0	0	0	0	0	0	1	1	0	2	9.95
CALM													0	0.
TOTAL	0	0	0	0	0	5	3	2	1	6	8	8	33	9.23

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL #D# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	3	6	5	6	9	1	5	5	7	13	60	8.03
NE	0	0	4	5	8	6	6	5	0	2	1	0	37	5.48
ENE	0	1	3	0	2	3	4	4	3	1	0	0	21	6.09
E	0	2	1	2	4	2	2	0	0	1	0	0	14	4.81
ESE	1	2	0	2	2	5	5	2	1	1	1	0	22	5.72
SE	0	0	0	1	4	7	6	9	8	9	6	7	57	8.22
SSE	1	0	0	1	6	10	5	7	8	5	1	7	51	7.92
S	0	1	2	0	3	4	3	5	3	3	4	35	63	12.58
SSW	0	2	1	0	1	0	0	0	0	3	2	37	46	14.03
SW	0	0	1	0	1	1	3	0	5	3	4	19	37	11.53
WSW	0	0	1	0	1	1	3	3	1	0	1	7	18	9.54
W	0	2	2	0	0	1	4	2	4	0	2	8	25	9.11
WNW	0	0	1	1	1	6	3	1	1	2	0	3	19	7.87
NW	0	1	0	1	3	3	1	4	2	2	1	16	34	11.76
NNW	0	1	0	2	3	3	5	8	5	7	5	63	102	12.74
N	0	0	1	3	1	8	7	3	5	11	9	34	82	10.58
CALM													2	.60
TOTAL	2	12	20	24	45	66	66	54	51	55	44	249	690	9.94

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 43 of 52)

November (1972 - 1975): 10-Meter Level

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	2	5	4	7	5	4	2	2	2	2	4	39	6.29
NE	0	4	3	4	1	1	1	0	0	0	0	0	14	3.49
ENE	0	4	5	7	2	2	0	0	0	0	0	0	20	3.24
E	0	3	5	4	4	2	1	0	0	0	0	0	19	3.57
ESE	1	2	3	10	11	4	0	0	1	0	0	0	32	4.08
SE	0	5	3	8	12	14	12	13	12	11	2	18	110	7.44
SSE	1	3	0	7	13	14	22	7	7	5	11	56	146	9.62
S	0	1	3	1	1	3	4	6	11	11	17	81	139	12.94
SSW	0	0	2	1	0	4	1	5	3	4	7	41	68	12.57
SW	0	0	2	1	0	3	0	1	0	2	1	17	27	12.41
WSW	0	1	2	1	2	1	1	0	2	3	0	3	16	7.91
W	0	0	2	1	1	2	2	3	0	0	1	5	17	8.49
WNW	0	0	1	0	4	8	5	5	6	2	1	11	43	8.90
NW	0	1	1	4	4	4	5	7	7	10	12	76	131	13.30
NNW	1	0	2	3	2	4	6	7	9	19	13	74	140	12.57
N	0	0	2	5	7	3	2	8	6	8	5	39	85	11.14
CALM													4	.42
TOTAL	3	26	41	61	71	74	66	64	66	77	72	425	1050	10.36

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	5	3	2	3	4	1	0	1	0	0	0	19	3.85
NE	0	3	3	2	1	0	1	0	0	0	0	0	10	3.07
ENE	0	4	2	4	0	0	0	0	0	0	0	0	10	2.69
E	1	2	4	5	0	1	0	0	0	0	0	0	13	2.97
ESE	0	0	3	7	5	2	2	1	0	0	0	0	20	4.30
SE	0	4	6	10	18	7	5	5	7	7	4	5	78	6.36
SSE	2	7	6	6	5	15	16	14	15	11	3	26	126	7.91
S	1	0	2	1	4	11	12	12	9	3	7	12	74	8.28
SSW	0	1	6	2	5	5	4	5	4	5	3	8	48	7.47
SW	0	3	1	1	1	5	0	0	1	0	3	15	30	10.05
WSW	0	2	1	1	1	2	2	1	1	0	0	1	12	5.88
W	0	0	1	1	1	2	1	0	0	1	2	2	11	7.63
WNW	0	2	1	2	5	8	10	6	1	1	0	2	38	6.14
NW	0	1	2	1	3	9	14	14	12	4	3	6	69	7.72
NNW	0	3	0	2	3	6	4	5	2	3	3	7	38	7.72
N	0	2	2	0	6	0	3	3	1	2	0	2	21	6.16
CALM													12	.33
TOTAL	4	39	43	47	61	77	75	66	54	37	28	86	629	6.94

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 44 of 52)

November (1972 - 1975): 10-Meter Level

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	1	0	0	0	0	0	0	0	0	0	0	1	1.50
ENE	1	0	3	0	0	0	0	0	0	0	0	0	4	2.17
E	0	4	1	0	0	0	0	0	0	0	0	0	5	1.74
ESE	0	6	5	2	2	3	0	0	0	0	0	0	18	3.16
SE	2	4	13	10	13	6	1	2	2	1	1	0	55	4.13
SSE	1	2	8	9	12	8	9	4	2	3	0	3	61	5.45
S	0	2	8	10	5	8	5	2	4	1	0	0	45	4.84
SSW	1	4	1	1	4	0	0	3	6	1	0	0	21	5.61
SW	3	3	4	2	0	1	4	0	1	0	0	0	18	3.66
WSW	1	6	3	6	4	3	1	1	0	0	1	0	26	3.83
W	1	9	7	5	5	3	0	2	0	0	0	0	32	3.35
WNW	2	5	4	7	1	2	3	3	0	0	1	0	28	4.15
NW	0	2	8	8	11	6	1	3	3	3	1	0	46	5.03
NNW	1	0	3	1	0	0	2	0	0	0	0	1	8	5.04
N	0	1	0	1	0	0	2	0	0	0	0	0	4	4.80
CALM													22	.21
TOTAL	13	49	68	62	57	40	28	20	18	9	4	4	394	4.20

NUMBER OF INVALID OBSERVATIONS = 3
TOTAL NUMBER OF OBSERVATIONS = 2880

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	7	11	12	15	17	15	4	8	7	9	17	122	6.77
NE	0	8	10	11	11	12	9	7	0	3	1	0	72	4.84
ENE	1	10	13	13	4	5	4	4	3	1	0	0	58	4.11
E	1	11	11	11	8	5	4	0	1	1	0	0	53	3.74
ESE	2	10	11	21	20	17	9	3	2	2	3	0	100	4.60
SE	2	13	22	29	47	34	24	30	29	31	14	35	310	6.84
SSE	5	12	14	23	36	47	52	32	32	24	17	96	390	8.22
S	1	4	15	13	14	26	24	25	28	18	28	128	324	10.61
SSW	1	7	10	5	10	10	5	13	13	14	13	91	192	10.98
SW	3	6	8	4	2	10	7	1	8	6	9	52	116	10.08
WSW	1	9	7	8	8	7	7	6	4	4	2	12	75	6.64
W	1	11	12	7	7	8	7	7	4	1	5	15	85	6.63
WNW	2	7	7	10	11	24	21	15	8	5	2	18	130	7.04
NW	0	5	11	14	22	22	22	29	24	20	18	98	285	10.33
NNW	2	4	5	8	8	15	17	21	17	32	25	153	307	11.67
N	0	3	5	10	17	12	14	15	12	22	15	75	20	10.08
CALM													40	.29
TOTAL	22	127	172	199	240	271	241	212	193	191	161	790	2859	8.62

NUMBER OF INVALID OBSERVATIONS = 21
TOTAL NUMBER OF OBSERVATIONS = 2880

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 45 of 52)

December (1972 - 1975): 10-Meter Level

PASQUILL #A# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSE	0	0	0	0	0	0	0	0	0	0	0	2	2	15.50
S	0	0	1	0	0	2	0	0	0	2	0	2	7	8.89
SSW	0	0	1	0	0	0	0	1	0	0	1	9	12	11.86
SW	0	0	0	0	0	0	1	1	0	0	0	2	4	12.00
WSW	0	0	0	0	0	0	0	1	0	0	0	1	2	9.90
W	0	1	0	3	0	0	0	0	0	0	0	0	4	3.12
WNW	0	1	1	1	1	0	0	1	0	0	0	0	5	4.00
NW	0	0	1	0	2	1	0	1	1	4	1	0	11	7.89
NNW	0	0	0	0	0	1	1	0	0	0	0	0	2	6.50
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	2	4	4	3	4	2	5	1	6	2	16	49	8.89

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #B# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	1	0	0	0	0	0	0	1	0	1	3	8.13
NE	0	0	0	0	0	1	0	0	0	0	0	0	1	5.30
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0.	0.
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0.	0.
SW	0	0	0	0	1	0	0	0	0	0	0	0	1	5.00
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
NW	0	0	0	0	0	0	0	0	2	0	0	0	2	8.95
NNW	0	0	0	0	0	0	0	0	0	0	1	1	2	11.90
N	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
CALM													0	0.
TOTAL	0	0	1	0	1	1	0	0	2	1	1	2	9	8.49

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 46 of 52)

December (1972 - 1975): 10-Meter Level

PASQUILL #C# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	0	0	0	0	0	3	0	0	0	3	8.60
NE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
E	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
S	0	0	0	0	0	0	1	0	0	2	0	0	3	8.47
SSW	0	0	0	0	0	0	0	0	0	0	0	1	1	11.20
SW	0	0	0	0	0	0	0	0	1	0	0	0	1	8.60
WSW	0	0	0	0	0	0	0	1	0	0	0	0	1	7.70
W	0	0	0	0	0	0	0	1	0	0	0	0	1	7.60
WNW	0	0	0	0	0	0	0	2	0	0	0	1	3	9.30
NW	0	0	0	0	0	1	1	0	0	0	2	1	5	9.16
NNW	0	0	0	0	0	0	1	0	0	2	1	2	6	11.57
N	0	0	0	0	0	1	0	0	1	1	0	6	9	13.20
CALM													0	0.
TOTAL	0	0	0	0	0	2	3	4	5	5	3	11	33	10.55

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #D# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	1	4	6	9	3	4	3	6	1	5	42	7.45
NE	0	0	0	2	3	0	1	0	1	1	0	0	8	5.75
ENE	0	0	5	1	2	1	0	0	1	0	0	0	10	4.02
E	0	0	2	0	0	0	0	0	0	0	0	0	2	2.80
ESE	0	0	1	4	3	5	3	0	0	0	0	0	16	4.76
SE	0	0	0	1	1	8	6	2	0	2	0	0	20	6.20
SSE	0	1	2	5	1	4	6	2	3	4	1	10	39	7.78
S	0	0	0	0	4	2	3	1	1	2	3	29	45	11.90
SSW	0	0	0	2	2	0	0	1	1	1	2	35	44	13.72
SW	0	0	0	0	0	1	3	0	0	0	1	18	23	13.57
WSW	0	0	0	0	0	2	0	0	0	1	1	9	13	11.85
W	0	0	0	0	3	3	0	0	2	1	1	3	13	8.51
WNW	0	0	1	1	2	0	0	2	0	0	3	14	23	10.76
NW	0	0	1	1	3	0	4	2	4	2	3	16	36	10.40
NNW	0	0	0	0	2	8	2	3	7	2	4	63	91	14.77
N	0	0	0	1	0	1	2	2	5	4	5	34	54	13.34
CALM													0	0.
TOTAL	0	1	13	22	32	44	33	19	28	26	25	236	479	11.09

NUMBER OF INVALID OBSERVATIONS = 63
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 47 of 52)

December (1972 - 1975): 10-Meter Level

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	0	1	4	8	6	2	1	3	0	0	6	31	7.21
NE	0	0	3	3	2	3	3	1	0	1	0	1	16	5.07
ENE	0	4	4	4	3	1	1	1	0	0	0	0	18	3.52
E	0	2	6	7	0	1	1	0	0	1	0	0	18	3.61
ESE	1	0	5	3	5	4	1	1	1	0	0	1	22	4.75
SE	1	1	3	2	7	9	5	4	1	3	0	1	37	5.71
SSE	0	0	4	4	2	8	11	9	4	11	7	45	105	10.29
S	2	1	0	2	2	4	8	8	9	7	8	95	146	13.15
SSW	0	2	0	1	1	3	3	4	3	6	1	57	81	13.94
SW	0	0	1	1	2	1	4	0	3	6	1	19	38	10.98
WSW	0	0	1	1	3	0	0	2	3	0	2	18	30	10.52
W	0	1	4	2	1	0	4	1	2	2	0	5	22	7.26
WNW	0	0	2	2	1	7	5	3	9	3	2	7	41	8.10
NW	1	2	3	2	5	11	8	8	8	2	10	76	136	11.13
NNW	0	1	3	6	3	10	9	7	10	9	8	99	165	12.20
N	0	1	0	2	3	7	7	4	6	6	6	40	82	11.16
CALM													0	0.
TOTAL	5	15	40	46	48	75	72	54	62	57	45	469	988	10.67

NUMBER OF INVALID OBSERVATIONS = 13
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND DIRECTION	UPPER CLASS INTERVALS OF WIND SPEED (MPH) 1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	MEAN SPEED
NNE	0	1	6	4	0	1	0	0	3	0	1	1	17	5.53
NE	0	4	0	0	1	1	0	2	0	3	0	2	13	6.50
ENE	1	1	3	0	0	1	0	0	0	0	0	1	7	4.34
E	0	5	2	1	3	2	1	0	1	0	0	0	15	3.83
ESE	0	6	7	6	1	3	0	0	0	0	0	0	23	2.95
SE	1	2	6	12	18	20	9	5	0	3	1	0	77	5.05
SSE	0	0	4	5	9	14	11	11	8	13	3	18	96	7.82
S	0	1	3	5	6	9	11	7	10	8	18	28	106	9.49
SSW	1	0	3	3	0	1	3	5	5	1	3	10	35	8.91
SW	0	0	3	1	0	2	3	0	0	3	1	11	24	9.90
WSW	0	3	2	3	0	2	6	3	2	4	2	2	29	7.04
W	0	4	0	4	5	1	1	4	1	0	0	0	20	4.71
WNW	1	2	4	1	10	4	2	1	0	3	1	1	30	5.29
NW	1	1	1	5	8	21	16	15	7	6	3	15	99	7.70
NNW	0	1	0	1	5	9	10	7	9	3	2	11	58	9.02
N	1	1	3	1	0	4	2	5	4	1	1	5	28	8.21
CALM													15	.44
TOTAL	6	32	47	52	66	95	75	65	50	48	36	105	692	7.24

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 48 of 52)

December (1972 - 1975): 10-Meter Level

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	2	0	0	0	3	3	2	0	0	0	10	6.44
NE	0	2	0	1	0	1	1	0	0	0	0	0	5	3.74
ENE	0	4	1	2	0	1	1	0	1	0	0	0	10	3.60
E	2	5	0	0	0	0	0	0	0	0	0	0	7	1.16
ESE	1	3	4	6	7	1	0	0	0	0	0	0	22	3.54
SE	0	5	24	25	21	6	5	0	2	0	0	0	88	3.91
SSE	0	1	17	28	21	9	5	2	1	1	0	0	85	4.21
S	0	3	5	8	7	5	8	4	6	2	0	0	48	5.42
SSW	0	3	5	6	5	4	4	1	1	1	0	2	32	4.98
SW	0	5	4	8	4	2	5	2	1	2	0	0	33	4.61
WSW	0	2	6	8	7	3	3	1	2	0	1	0	33	4.58
W	0	6	7	6	6	3	0	0	2	1	0	0	31	3.91
WNW	1	4	2	5	13	4	4	2	0	0	0	0	35	4.51
NW	0	4	7	8	7	15	11	15	5	4	2	4	82	6.25
NNW	1	5	4	6	1	3	2	1	2	1	2	1	29	4.95
N	1	2	0	2	0	1	1	3	1	0	0	0	11	4.95
CALM													12	.43
TOTAL	6	54	88	119	99	58	53	34	26	12	5	7	573	4.58

NUMBER OF INVALID OBSERVATIONS = 0
TOTAL NUMBER OF OBSERVATIONS = 2976

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	11	12	14	16	8	8	14	7	2	13	106	7.03
NE	0	6	3	6	6	6	5	3	1	5	0	2	43	5.48
ENE	1	10	13	7	5	4	2	1	2	0	0	1	46	3.73
E	2	12	10	8	3	3	2	0	1	1	0	0	42	3.24
ESE	2	9	17	19	16	13	4	1	1	0	0	1	83	3.93
SE	2	8	33	40	47	43	25	11	3	8	1	1	222	4.81
SSE	0	2	27	42	33	35	33	24	16	29	11	76	328	7.73
S	2	5	9	15	19	22	31	20	26	23	29	154	355	10.73
SSW	1	5	9	12	8	8	10	12	10	9	7	114	205	11.50
SW	0	5	8	10	7	6	16	3	5	11	3	50	124	9.52
WSW	0	5	9	12	10	7	9	8	7	5	6	30	108	7.89
W	0	12	11	15	15	7	5	6	7	4	1	8	91	5.56
WNW	2	7	10	10	27	15	11	11	9	6	6	23	137	6.89
NW	2	7	13	16	25	49	40	41	27	18	21	113	372	8.95
NNW	1	7	7	13	11	31	25	18	28	17	18	177	353	11.70
N	2	4	3	6	3	14	12	14	17	12	12	85	184	11.08
CALM													27	.44
TOTAL	17	105	193	243	249	279	238	181	174	155	117	848	2826	8.63

NUMBER OF INVALID OBSERVATIONS = 150
TOTAL NUMBER OF OBSERVATIONS = 2976

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 49 of 52)

May 15, 1972 - May 14, 1976: 10-Meter Level

PASQUILL #A# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	1	0	9	11	9	11	5	7	3	11	68	8.13
NE	0	0	2	4	4	11	8	4	4	5	3	3	48	7.07
ENE	0	1	1	3	3	4	4	1	3	1	1	1	23	6.12
E	0	1	1	4	7	6	8	5	10	5	0	0	47	6.50
ESE	0	1	4	6	11	13	16	14	9	17	5	10	106	7.48
SE	0	1	0	2	6	4	14	16	14	15	6	8	86	8.09
SSE	0	2	2	2	7	9	14	13	23	14	19	43	148	10.53
S	0	0	3	5	3	11	16	15	20	24	12	76	185	11.04
SSW	0	0	2	1	4	4	8	9	10	19	16	87	160	12.78
SW	0	0	0	3	3	2	3	4	0	0	2	18	35	11.10
WSW	0	0	1	4	3	3	0	3	2	0	0	1	17	5.98
W	0	1	0	3	2	3	2	1	1	0	0	3	16	7.59
WNW	0	1	2	2	3	0	2	1	2	0	0	3	16	7.11
NW	0	0	1	1	3	1	2	2	4	4	4	16	38	10.50
NNW	0	1	2	2	2	2	2	1	6	2	1	23	44	11.44
N	0	0	0	2	4	2	5	2	3	5	2	9	34	9.23
CALM													2	.60
TOTAL	0	10	22	44	74	86	113	102	116	118	74	312	1073	9.71

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 35043

PASQUILL #B# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	1	2	3	0	7	3	1	5	2	2	12	38	9.29
NE	0	0	0	0	1	4	3	2	0	2	2	0	14	7.32
ENE	0	0	0	1	1	0	0	0	0	0	0	0	2	4.05
E	0	0	0	0	0	4	1	3	1	0	2	0	11	7.52
ESE	0	0	1	2	1	5	10	7	5	8	4	2	45	7.87
SE	0	0	0	1	2	4	7	6	4	5	2	13	44	9.27
SSE	0	0	0	1	3	3	2	3	11	11	11	21	66	10.29
S	0	1	0	0	0	1	5	2	9	11	10	29	68	11.55
SSW	0	0	0	0	0	3	2	3	4	4	10	26	52	12.06
SW	0	0	0	0	2	0	1	1	1	2	7	11	25	11.50
WSW	0	0	0	0	0	0	1	0	0	0	2	6	9	15.64
W	0	0	0	0	1	0	0	2	0	0	0	3	6	13.57
WNW	0	0	0	1	0	0	0	1	0	1	0	1	4	8.15
NW	0	0	0	0	0	1	0	0	2	1	2	8	14	11.48
NNW	0	0	0	0	1	0	0	1	1	2	3	20	28	13.12
N	0	0	0	0	1	1	4	2	3	4	3	7	25	10.20
CALM													0	0.
TOTAL	0	2	3	9	13	33	39	34	46	53	60	159	451	10.48

NUMBER OF INVALID OBSERVATIONS = 1
TOTAL NUMBER OF OBSERVATIONS = 35043

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 50 of 52)

May 15, 1972 - May 14, 1976: 10-Meter Level

PASQUILL #C# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	0	0	3	3	7	4	4	4	7	2	10	44	9.07
NE	0	0	0	4	4	5	6	5	4	1	0	5	34	7.41
ENE	0	1	0	1	3	4	2	5	0	4	1	2	23	7.34
E	0	0	0	3	6	3	1	3	3	2	0	0	21	6.16
ESE	0	0	0	2	6	8	9	8	7	10	5	4	59	7.75
SE	0	0	1	1	4	6	6	7	7	6	5	13	56	8.82
SSE	0	0	0	1	3	4	12	7	11	10	9	32	89	10.08
S	0	0	0	2	3	3	12	9	14	9	11	32	95	10.37
SSW	0	1	0	1	4	4	7	4	6	5	14	29	75	10.01
SW	0	0	0	2	1	4	2	2	7	2	6	18	44	10.49
WSW	0	0	0	3	2	4	2	4	2	3	0	4	24	7.96
W	0	0	0	0	1	0	0	1	1	1	1	4	9	14.58
WNW	0	0	0	0	2	1	0	3	0	0	0	4	10	9.89
NW	0	0	0	0	1	3	2	1	0	7	5	11	30	10.05
NNW	0	0	0	1	1	1	1	4	4	5	12	36	65	12.88
N	0	0	0	2	3	4	1	1	4	6	11	13	45	10.05
CALM													1	.40
TOTAL	0	2	1	26	47	61	67	68	74	78	82	217	724	9.68

NUMBER OF INVALID OBSERVATIONS = 6
TOTAL NUMBER OF OBSERVATIONS = 35043

PASQUILL #D# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	1	4	15	34	46	49	41	39	46	38	35	87	435	8.11
NE	1	4	22	25	43	31	35	27	24	19	18	33	282	7.03
ENE	1	6	23	33	32	20	35	34	28	13	7	21	253	6.56
E	1	15	28	35	38	34	25	27	17	9	15	15	259	6.08
ESE	2	8	31	36	46	64	77	48	51	24	16	13	436	7.01
SE	1	8	15	33	57	76	74	73	63	74	61	121	656	8.38
SSE	1	6	19	41	56	79	83	86	98	89	76	270	904	9.56
S	1	11	19	25	63	48	76	82	96	98	104	556	1179	11.38
SSW	2	3	6	13	24	29	49	50	57	61	56	397	747	11.81
SW	1	5	11	16	17	25	36	29	27	31	28	163	389	10.31
WSW	0	2	8	12	19	10	10	18	7	7	18	62	173	9.82
W	0	7	12	15	16	12	12	8	15	7	8	63	175	9.60
WNW	0	2	6	11	7	14	9	11	10	10	7	58	145	10.11
NW	0	6	11	21	18	12	13	15	19	22	22	141	300	11.17
NNW	1	7	9	23	23	24	22	36	43	44	56	343	631	12.42
N	0	8	9	21	28	26	32	33	35	44	42	251	529	11.36
CALM													23	.20
TOTAL	13	102	244	394	533	553	629	616	636	590	569	2614	7516	9.88

NUMBER OF INVALID OBSERVATIONS = 208
TOTAL NUMBER OF OBSERVATIONS = 35043

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 51 of 52)

May 15, 1972 - May 14, 1976: 10-Meter Level

PASQUILL #E# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	2	23	42	46	56	39	63	39	34	33	38	120	535	7.98
NE	2	31	48	57	50	40	48	28	37	27	15	27	410	6.06
ENE	5	27	49	51	47	32	21	25	18	18	14	25	332	5.69
E	6	36	43	84	61	51	35	23	13	27	17	41	437	6.05
ESE	7	30	56	82	112	85	59	47	40	29	24	159	730	7.90
SE	6	41	81	124	165	174	160	121	114	84	57	211	1338	7.36
SSE	7	37	58	100	140	180	203	175	175	174	154	738	2141	9.82
S	9	21	37	65	71	107	116	147	175	178	173	1084	2183	11.66
SSW	3	17	23	33	31	63	56	68	69	62	63	486	974	11.54
SW	2	12	25	25	26	28	28	24	20	27	18	157	392	9.69
WSW	1	10	16	14	20	15	14	11	12	12	7	85	217	9.60
W	0	8	24	12	14	17	17	9	10	10	7	63	191	9.13
WNW	1	11	17	23	23	34	24	27	38	10	10	101	319	8.88
NW	7	16	30	53	50	68	57	58	50	41	50	375	855	10.61
NNW	4	12	31	55	60	68	67	75	101	93	81	615	1262	11.64
N	4	25	31	42	55	64	81	78	69	66	61	440	1016	10.64
CALM													65	.22
TOTAL	66	357	611	866	981	1065	1049	955	975	891	789	4727	13397	9.68

NUMBER OF INVALID OBSERVATIONS = 136
TOTAL NUMBER OF OBSERVATIONS = 35043

PASQUILL #F# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	9	28	31	20	19	15	11	7	8	3	6	2	159	4.40
NE	5	33	31	21	16	14	5	3	1	4	3	5	141	4.01
ENE	7	41	36	27	10	14	2	2	5	1	1	4	150	3.60
E	10	22	40	58	37	11	3	6	6	4	4	7	208	4.25
ESE	6	59	85	124	75	37	15	14	8	6	6	12	447	4.22
SE	5	48	114	164	161	125	68	49	27	20	10	23	814	5.04
SSE	7	55	94	115	136	156	136	119	82	54	32	110	1096	6.46
S	6	35	58	76	86	99	112	96	94	68	63	201	994	8.18
SSW	8	27	45	42	32	54	33	49	29	30	42	131	522	8.29
SW	7	24	36	21	13	29	20	16	11	12	12	67	268	7.31
WSW	3	20	35	23	17	14	16	21	11	6	7	16	189	5.71
W	1	23	21	18	15	13	11	10	5	10	9	14	150	5.79
WNW	5	12	30	25	33	31	30	28	7	11	6	12	230	5.69
NW	7	15	42	50	55	83	75	53	42	25	13	47	507	6.65
NNW	4	23	30	39	42	48	33	34	20	14	9	35	331	6.48
N	11	22	25	30	31	26	23	22	14	17	7	30	258	6.39
CALM													120	.34
TOTAL	101	487	453	853	778	769	593	529	370	285	230	716	6584	6.17

NUMBER OF INVALID OBSERVATIONS = 54
TOTAL NUMBER OF OBSERVATIONS = 35043

TABLE 2.3-27
WIND FREQUENCY DISTRIBUTIONS AT CPNPP

(Sheet 52 of 52)

May 15, 1972 - May 14, 1976: 10-Meter Level

PASQUILL #G# (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	0	13	6	4	5	0	5	3	3	2	2	4	47	5.16
NE	2	8	8	3	0	1	2	0	0	1	0	1	26	3.26
ENE	4	10	11	8	5	1	2	0	1	1	0	0	43	3.13
E	5	22	13	7	6	1	0	3	0	0	0	0	57	2.72
ESE	3	32	28	25	19	10	3	5	0	1	1	1	128	3.57
SE	8	44	94	125	73	39	22	10	6	2	1	5	429	3.97
SSE	7	38	83	107	87	38	43	12	8	6	2	15	446	4.58
S	8	28	52	52	54	46	43	25	17	9	6	15	355	5.33
SSW	8	34	28	32	39	19	20	13	15	6	3	17	234	5.27
SW	6	31	31	37	17	14	16	11	7	7	5	18	200	5.10
WSW	5	26	38	34	29	14	17	11	11	4	4	6	199	4.63
W	5	49	61	39	36	15	4	7	3	2	1	4	226	3.62
WNW	13	46	43	34	36	21	18	8	1	1	2	1	224	3.77
NW	8	34	66	50	49	71	51	52	24	16	6	14	441	5.48
NNW	7	30	24	18	13	12	10	8	6	2	3	12	145	5.20
N	4	14	7	7	5	5	5	3	1	3	2	12	68	6.41
CALM													115	.32
TOTAL	93	459	593	582	473	307	261	171	103	63	38	125	3383	4.49

NUMBER OF INVALID OBSERVATIONS = 19
TOTAL NUMBER OF OBSERVATIONS = 35043

PASQUILL ALL (FROM AEC/DELTA-T CRITERIA 10-60 METERS)
WINDS AT 10 METERS LEVEL

WIND FREQUENCY DISTRIBUTION
(FREQUENCY IN NUMBER OF OCCURRENCES)

WIND	UPPER CLASS INTERVALS OF WIND SPEED (MPH)													MEAN
DIRECTION	1	2	3	4	5	6	7	8	9	10	11	>11	TOTAL	SPEED
NNE	12	73	98	111	138	132	136	106	105	92	90	250	1343	7.57
NE	10	78	111	115	121	109	109	70	72	65	41	75	976	6.11
ENE	18	89	123	127	103	75	67	68	55	38	24	53	840	5.47
E	22	96	126	192	158	113	78	71	51	48	38	63	1056	5.56
ESE	18	131	208	280	272	224	195	149	125	97	62	224	1985	6.56
SE	23	146	312	453	473	430	359	290	238	212	146	407	3489	6.66
SSE	22	142	260	370	436	471	496	419	411	362	304	1251	4944	8.58
S	25	97	170	228	281	317	380	376	427	400	380	199	5080	10.41
SSW	21	84	104	123	134	177	176	196	191	189	204	1174	2773	10.50
SW	16	72	105	105	79	103	106	87	73	81	78	453	1358	8.80
WSW	9	59	98	92	90	66	60	68	45	33	38	182	840	7.50
W	6	91	120	87	86	61	46	38	35	31	26	162	789	7.09
WNW	19	72	99	96	104	10	183	80	59	33	25	186	957	7.11
NW	22	74	154	176	177	239	200	183	146	118	103	618	2210	8.72
NNW	16	75	101	139	143	158	135	160	181	163	167	1093	2531	10.81
N	19	71	72	109	130	130	152	142	129	146	128	762	1990	10.05
CALM													327	.30
TOTAL	278	1450	2261	2803	2925	2906	2778	2503	2343	2108	1854	8952	33488	8.50

NUMBER OF INVALID OBSERVATIONS = 1555
TOTAL NUMBER OF OBSERVATIONS = 35043

TABLE 2.3-28
MINIMUM DISTANCE FROM THE REACTOR CONTAINMENT STRUCTURE TO THE EXCLUSION-AREA BOUNDARY

Direction From Plant	Minimum Distance (meters)
N	2148
NNE	2594
NE	2673
ENE	2588
E	2570
ESE	2199
SE	2234
SSE	2211
S	2040
SSW	1717
SW	1547
WSW	1544[a]
W	1631
WNW	2056
NW	2106
NNW	2083

a) Minimum Exclusion Distance

TABLE 2.3-29
THIS TABLE HAS BEEN DELETED.

TABLE 2.3-30
THIS TABLE HAS BEEN DELETED.

TABLE 2.3-31
THIS TABLE HAS BEEN DELETED.

TABLE 2.3-32
THIS TABLE HAS BEEN DELETED.

TABLE 2.3-33
AVERAGE ANNUAL RELATIVE CONCENTRATION AT CPNPP
(SEC./CUBIC METER) PERIOD OF RECORD: 5-15-72 TO 5-14-76

BASE DISTANCE IN MILES/KILOMETERS

AFTD SECT	DESIGN DIST MI	.50 .80	1.00 1.61	1.50 2.41	2.00 3.22	2.50 4.02	3.50 5.63	4.00 6.44	4.50 7.24
NNE	0.	1.3E-05	3.1E-06	1.2E-06	6.5E-07	4.2E-07	2.3E-07	1.8E-07	1.5E-07
NE	0.	9.2E-06	2.2E-06	8.5E-07	4.6E-07	2.9E-07	1.6E-07	1.3E-07	1.1E-07
ENE	0.	7.5E-06	1.8E-06	6.8E-07	3.7E-07	2.3E-07	1.3E-07	1.0E-07	8.4E-08
E	0.	8.9E-06	2.1E-06	8.0E-07	4.3E-07	2.7E-07	1.5E-07	1.2E-07	9.9E-08
ESE	0.	9.7E-06	2.3E-06	8.8E-07	4.7E-07	3.0E-07	1.6E-07	1.3E-07	1.1E-07
SE	0.	1.4E-05	3.4E-06	1.3E-06	7.1E-07	4.5E-07	2.5E-07	2.0E-07	1.6E-07
SSE	0.	1.1E-05	2.7E-06	1.1E-06	5.8E-07	3.7E-07	2.0E-07	1.6E-07	1.3E-07
S	0.	8.6E-06	2.2E-06	8.5E-07	4.7E-07	3.0E-07	1.6E-07	1.3E-07	1.1E-07
SSW	0.	7.1E-06	1.8E-06	6.9E-07	3.8E-07	2.4E-07	1.3E-07	1.0E-07	8.6E-08
SW	0.	6.5E-06	1.6E-06	6.4E-07	3.5E-07	2.3E-07	1.2E-07	9.7E-08	8.0E-08
WSW	0.	7.1E-06	1.8E-06	6.9E-07	3.8E-07	2.5E-07	1.3E-07	1.1E-07	8.7E-08
W	0.	8.6E-06	2.2E-06	8.4E-07	4.6E-07	2.9E-07	1.6E-07	1.3E-07	1.0E-07
WNW	0.	1.4E-05	3.4E-06	1.3E-06	7.3E-07	4.7E-07	2.6E-07	2.0E-07	1.7E-07
NW	0.	2.3E-05	5.7E-06	2.2E-06	1.2E-06	7.7E-07	4.1E-07	3.3E-07	2.7E-07
NNW	0.	2.5E-05	6.1E-06	2.4E-06	1.3E-06	8.4E-07	4.5E-07	3.6E-07	3.0E-07
N	0.	2.0E-05	4.9E-06	1.9E-06	1.1E-06	6.7E-07	3.6E-07	2.9E-07	2.4E-07

BASE DISTANCE IN MILES/KILOMETERS

AFTD SECT	DESIGN DIST MI	6.00 9.65	7.50 12.07	10.00 16.09	15.00 24.13	25.00 40.22	35.00 56.31	45.00 72.40	50.00 80.45
NNE	0.	9.6E-08	7.0E-08	4.6E-08	2.7E-08	1.4E-08	9.5E-09	7.0E-09	6.2E-09
NE	0.	6.8E-08	5.0E-08	3.3E-08	2.0E-08	1.0E-08	6.9E-09	5.1E-09	4.5E-09
ENE	0.	5.5E-08	4.1E-08	2.7E-08	1.6E-08	8.5E-09	5.7E-09	4.2E-09	3.7E-09
E	0.	6.5E-08	4.8E-08	3.1E-08	1.9E-08	1.0E-08	6.8E-09	5.0E-09	4.4E-09
ESE	0.	7.1E-08	5.2E-08	3.5E-08	2.1E-08	1.1E-08	7.4E-09	5.5E-09	4.9E-09
SE	0.	1.1E-07	7.8E-08	5.1E-08	3.1E-08	1.6E-08	1.1E-08	8.0E-09	7.1E-09
SSE	0.	8.4E-08	6.1E-08	4.0E-08	2.3E-08	1.2E-08	8.1E-09	6.0E-09	5.3E-09
S	0.	6.7E-08	4.9E-08	3.2E-08	1.9E-08	9.7E-09	6.4E-09	4.7E-09	4.1E-09
SSW	0.	5.5E-08	4.0E-08	2.6E-08	1.5E-08	7.8E-09	5.1E-09	3.8E-09	3.3E-09
SW	0.	5.1E-08	3.7E-08	2.4E-08	1.4E-08	7.3E-09	4.8E-09	3.5E-09	3.1E-09
WSW	0.	5.6E-08	4.0E-08	2.6E-08	1.5E-08	8.1E-09	5.3E-09	3.9E-09	3.5E-09
W	0.	6.7E-08	4.9E-08	3.2E-08	1.9E-08	9.7E-09	6.4E-09	4.7E-09	4.2E-09
WNW	0.	1.1E-07	7.9E-08	5.1E-08	3.0E-08	1.6E-08	1.1E-08	7.8E-09	6.9E-09
NW	0.	1.8E-07	1.3E-07	8.5E-08	5.0E-08	2.7E-08	1.8E-08	1.3E-08	1.2E-08
NNW	0.	1.9E-07	1.4E-07	9.2E-08	5.4E-08	2.9E-08	1.9E-08	1.4E-08	1.2E-08
N	0.	1.5E-07	1.1E-07	7.3E-08	4.3E-08	2.3E-08	1.5E-08	1.1E-08	9.7E-09

TABLE 2.3-34
METEOROLOGICAL INSTRUMENTATION COMANCHE PEAK OPERATIONAL METEOROLOGICAL PROGRAM

Measurement	Level (Meters)	Instrument Type	Threshold	Instrument Range
Wind Speed	10 & 60	3 Cup Anemometer	0.45 m/s[a]	0 to 100 mph[b]
Wind Direction	10 & 60	Wind Vane	0.45 m/s[a]	0 to 540°
Temperature	10	Platinum Temp. Sensor	N/A	-20° to +120°F
Delta-Temp	10 to 60	Platinum Temp. Sensor	N/A	-5° to +15°F
Precipitation	Surface	Tipping Bucket	0.01 in.	0-1 in.

a) m/s = meters per second

b) Envelops the range 0-67 mph as proposed by Reg. Guide 1.97 Rev. 2

TABLE 2.3-34A
METEOROLOGICAL INSTRUMENTATION COMANCHE PEAK OPERATIONAL METEOROLOGICAL PROGRAM OVERALL SYSTEM ACCURACIES[a]

Parameter	Recording Type	System Accuracy (ANSI/ANS-2.5-1984)[b]	Actual System Accuracy
Wind Speed	Digital	±0.5 mph, WS<5mph ±10%, otherwise	±0.39mph, WS<25mph ±1.10%, otherwise[c]
	Analog[d]	±0.75mph, WS<5mph ±15%, otherwise	±0.58mph, WS<25mph ±1.18%, otherwise[c]
Wind Direction	Digital	±5°	±3.4°[c]
	Analog[d]	±7.5°	±4.5°[c]
Temperature	Digital	±0.9°F	±0.6°F[c]
	Analog[d]	±0.9°F	±0.9°F[c]
Delta Temperature	Digital	±0.27°F	±0.17°F[c]
	Analog[d]	±0.27°F	±0.19°F[c]
Precipitation	Digital	Rain guage with ±0.01 in resolution ±10% measured value for total accumulated catch greater than 0.2 in	Rain guage with ±0.01 resolution ±0.011 in or ±1.1%[c]
	Analog[d]	Rain guage with ±0.01 in resolution +10% measured value for total accumulated catch greater than 0.2 in	Rain guage with ±0.01 resolution ±0.013 in or ±1.3%[c]

a) These values are based upon equipment being properly calibrated.

b) Endorsed by Reg. Guide 1.23 Second Proposed Revision 1, April 1986.

c) Accuracy values show were calculated for original system. Calculations made for subsequent equipment upgrades computed uncertainties equal or less. All uncertainties computed are below acceptance criteria of requirements documents.

d) Paperless digital recorder replaces previous analog recorders. Uncertainties calculated for paperless digital recorder do not exceed acceptance criteria requirements for digital channels.

TABLE 2.3-34B
METEOROLOGICAL INSTRUMENTATION COMANCHE PEAK
OPERATIONAL METEOROLOGICAL PROGRAM DELTA
TEMPERATURE SYSTEM ACCURACY[a]

	Instrument Accuracy	
1.	Sensor Accuracy	
	Signal Conditioner Accuracy	±0.13°F
	Instrument Accuracy	±0.08°F
	Temperature Coefficient	±0.05°F
2.	Square Root of the Sum of the Squared Tolerances	±0.09°F
3.	Transmitter Accuracy	±0.04°F
4.	Receiver Accuracy	±0.04°F
5.	Current Driver Accuracy	±0.04°F
6.	Digital Recorder Accuracy	
	Input Resistor Accuracy	±0.05°F
	Input Accuracy	±0.05°F
7.	Square Root of the Sum of the Squared Tolerances	±0.071°F
8.	Analog Data Reduction Accuracy	±0.05°F
	System Accuracy[b]	
	Digital Recording	
	Square Root of the Sum of the Squared Tolerance of 1, 2, 3, 4, 5 and 6	±0.17°F

a) Measurement of delta temperature is made by comparing two identical sensors after having first calibrated out any difference between them at the reference temperature. The sensor error is then essentially the tracking error between the two sensors. This error includes accuracy and interchangeability and linearity. These errors plus those which are attributed to the signal conditioning electronics and recorders have been included in the analysis.

b) These values are well within the ±0.27°F criteria established by ANSI/ANS-2.5-1984, which is endorsed by Reg. Guide 1.23. Paperless digital recorder replaces previous analog recorders. Uncertainties calculated for paperless digital recorder do not exceed acceptance criteria requirements for digital channels. Calculations made for subsequent equipment upgrades computed uncertainties equal to or less than these uncertainties.

TABLE 2.3-35
COMPARISON OF ANALOG AND DIGITAL DATA

(Sheet 1 of 2)

I. WIND DIRECTION COMPARISON

DIGITAL OCCURRENCES

Wind Sector	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	N	TOTAL
NNE	6																6
NE	1	2															3
ENE		1	2	1													4
E			1	3													4
ESE				2	6	1											9
SE					1	25	2	1									29
SSE						4	32	1									37
S						1	4	47	1								53
SSW						1		4	19								24
SW									1	9							10
WSW										3	7						10
W											5	11	5				21
WNW												2	15	1			18
NW													3	38	1		42
NNW														2	29	1	32
N															2	23	25
Total	7	3	3	6	7	32	38	53	21	12	12	13	23	41	32	24	327

TABLE 2.3-35
COMPARISON OF ANALOG AND DIGITAL DATA

(Sheet 2 of 2)

II. WIND SPEED COMPARISON[(a)]

Wind speed (mph)	DIGITAL OCCURRENCES																	
	Calm	1	2	3	4	5	6	7	8	9	10	11	12	13	14-16	17-19	≥20	Total
Calm	2																	2
1		5	1															6
2	1	3	19															23
3			1	23														24
4				5	24	1												30
5					3	16												19
6						3	19	1										23
7							1	24	1									26
8								3	23	2	1							29
9									5	16								21
10										5	8							13
11											7	12	1					20
12												3	15					18
13													3	13	1			17
14-16														3	20			23
17-19															3	22		25
≥20																1	7	8
Total	3	8	21	28	27	20	20	28	29	23	16	15	19	16	24	23	7	327

a) All wind speed averages were rounded off to the nearest mph.

Note: In a perfect correlation, all occurrences would fall on the single diagonal indicated by the underlined values above.

TABLE 2.3-36
THIS TABLE HAS BEEN DELETED.

TABLE 2.3-37

5-PERCENTILE VALUES[a] OF THE ACCIDENT PERIOD DIFFUSION ESTIMATES AT THE LPZ

Sector Affected	1 Hour	0-8 Hours	8-24 Hours	1-4 Days	4-30 Days
N	42.6	18.7	12.4	5.05	1.40
NNE	41.2	16.8	10.7	4.04	1.00
NE	41.2	15.9	9.9	3.52	0.80
ENE	38.7	14.5	8.8	3.03	0.65
E	51.5	18.9	11.5	3.86	0.81
ESE	51.1	19.0	11.6	3.98	0.85
SE	47.4	19.2	12.2	4.58	1.12
SSE	36.3	14.8	9.5	3.57	0.88
S	25.7	10.7	6.9	2.68	0.69
SSW	23.7	9.6	6.1	2.29	0.56
SW	22.9	9.3	5.9	2.22	0.54
WSW	30.4	12.0	7.5	2.75	0.65
W	29.4	12.0	7.7	2.90	0.72
WNW	42.6	17.6	11.3	4.31	1.08
NW	55.6	23.8	15.6	6.22	1.66
NNW	51.1	22.5	15.0	6.15	1.72

a) 10^{-6} s/m^3

TABLE 2.3-38

50-PERCENTILE VALUES[a] OF THE ACCIDENT PERIOD DIFFUSION ESTIMATES AT THE LPZ

Sector Affected	1 Hour	0-8 Hours	8-24 Hours	1-4 Days	4-30 Days
N	9.50	5.34	4.00	2.14	0.87
NNE	4.31	2.55	1.96	1.11	0.49
NE	1.58	1.05	0.85	0.54	0.29
ENE	0.00	0.00	0.00	0.00	0.00
E	0.00	0.00	0.00	0.00	0.00
ESE	0.00	0.00	0.00	0.00	0.00
SE	7.04	3.91	2.91	1.54	0.61
SSE	3.56	2.13	1.65	0.95	0.43
S	2.93	1.75	1.35	0.77	0.35
SSW	1.46	0.94	0.75	0.46	0.23
SW	0.00	0.00	0.00	0.00	0.00
WSW	0.00	0.00	0.00	0.00	0.00
W	0.10	0.11	0.11	0.11	0.12
WNW	4.72	2.80	2.16	1.22	0.54
NW	12.40	6.81	5.04	2.63	1.03
NNW	12.80	7.09	5.28	2.78	1.11

a) 10^{-6} s/m^3

2.4 HYDROLOGIC ENGINEERING

2.4.1 HYDROLOGIC DESCRIPTION

2.4.1.1 Site and Facilities

The Comanche Peak Nuclear Power Plant (CPNPP) site is located approximately 65 miles southwest of the Dallas-Fort Worth, Texas, area, on a peninsula in Squaw Creek Reservoir (for a description of the Reservoir see Section 2.4.8.2). The Squaw Creek Reservoir (SCR) has a service spillway crest elevation of 775.0 feet. The calculated probable maximum flood level of Squaw Creek Reservoir is 789.7 feet. The station, which takes cooling water from one side of the peninsula and discharges to the other, has a site grade elevation of 810.0 feet.

The Safe Shutdown Impoundment (SSI) is formed by building a seismic Category I dam across an arm of the reservoir. The water level is maintained by an equalization channel between the SSI and SCR. Near the south end of the equalization channel, a non-intrusive, floating raft system has been added which bridges from the east bank to west bank of the channel. Details of the SSI Dam are presented in Section 2.5.6.

The Service Water Intake Structure is located on a bank of the SSI. The structure foundation is at elevation 749'0" with the top of slab at elevation 755'0". The operating deck of the structure is at elevation 796'0" with the pump discharge centerline at elevation 800'0". Access to the Service Water Intake Structure is provided by a personnel door and truck bay entrance at elevation 810'6".

The Containment Building is a completely closed, water-tight structure which cannot be affected by exterior flooding. Safety class equipment outside the Containment Building is located in the Safeguards, Fuel, Auxiliary, and Electrical and Control buildings. All exterior accesses to these buildings are above the 810 ft elevation with the exception of Turbine Building entrances to the Electrical and Control Building. This height is significantly above the maximum probable flood (see section 2.4.2). Protection against flooding of safety-related components and systems is discussed in Section 3.4.

A topographical map of the CPNPP site is shown in Figure 2.4-4, and changes made to the natural drainage features are indicated thereon.

The stability of the Squaw Creek Dam has been evaluated for construction and operating conditions, including conditions of maximum reservoir elevation and minimum tail water elevation, utilizing engineering properties of all embankment materials and all foundation materials, by normally recognized procedures such as that used by the Department of the Army, Corps of Engineers, as more fully described in Engineering Manual EM-1110-2-1902, “Stability of Earth and Rock-Fill Dams.” Squaw Creek Dam is not a seismic Category I structure.

Each building is equipped with a roof drainage system designed to effectively collect, pass and discharge the water volume resulting from a six-inch rainfall in one hour with a maximum intensity two inches in five minutes. The scuppers are in the parapet walls and the scupper invert elevation will not be more than three inches above the roof at the outside wall or not more than five inches above the low point of the roof. The roof drains and drain pipes are designed in accordance with “Roof Drain Design for Nuclear Project Safety Related Buildings” by Southern Services, Inc., dated December 8, 1972. The roofs of all nuclear-safety-related buildings are

designed to support an eight-inch maximum uniform depth of water in addition to the regular live loads considered (see Fig. 2.4-2 and 2.4-3). The parapet walls have relief openings to ensure that the eight-inch level will not be exceeded.

The onsite drainage system for the CPNPP site is a natural drainage system as outlined in Figure 2.4-4. As this figure shows, the safety-related buildings are located at a high point, with the surrounding grounds sloping towards the Squaw Creek Reservoir (SCR) to the north and the south. The ground east and west of the buildings slopes towards the ditches as indicated on Figures 2.4-40 and 2.4-41. Each ditch discharges into the reservoir on both sides of the peninsula. A possible clogging of any ditch will not affect the system's water removal capacity.

In addition, the onsite drainage system is designed to remove the water resulting from a rainfall of six inches in one hour and 7.5 inches in two hours, in such a manner that the runoff is accomplished without ponds forming on the ground.

Further, the drainage system is designed to adequately drain a rainfall of 15 inches in one hour and 22 inches in two hours in such a way that there are no ponds which can back up into the structures and affect safety-related systems.

The design bases given above are consistent with the Probable Maximum Precipitation (PMP) as discussed in Section 2.4.3.1.

2.4.1.2 Hydrosphere

2.4.1.2.1 Regional Description

The Comanche Peak Nuclear Power Plant (CPNPP) site is located in the Squaw Creek catchment. Squaw Creek is a small tributary to the Paluxy River, which is a tributary to the Brazos River. The Brazos River and its tributaries constitute one of the principal river systems in the South-Central United States, extending from New Mexico, through Texas, to the Gulf of Mexico. The Texas portion of the Brazos River basin is illustrated in Figure 2.4-5.

The portion of the Brazos River catchment considered in this study is illustrated in Figure 2.4-6, a regional topographic map showing the site, existing and possible future reservoirs in the vicinity, and locations of the stream and rainfall gaging stations considered in this study. At gaging station 8-0910, east-southeast of the site, the Brazos River has a contributing catchment of 15,590 square miles [1].

For this study the most significant portion of the Brazos River catchment is that between Lakes Granbury and Whitney. In this reach, the Brazos River Channel is located in incised meanders formed by the river. These meanders may be the result of uplift of the area and/or sea level fluctuations after a mature meandering drainage pattern had been attained.

The meanders eroded through, and are flanked by, rock slopes confining the river within a relatively narrow channel. Immediately adjacent to the channel, within the meanders, is a narrow flood plain. Although accretion and erosion occur within the channel, as is typical of a meandering river, the well-defined meanders indicate that the channel location is closely confined. The geometry of the banks is governed closely by their location with respect to the meander pattern. The bank on the outside of a bend generally is steep, whereas the bank on the inside of the bend usually has a gentler slope.

2.4.1.2.2 Squaw Creek

Squaw Creek is a small, intermittent stream which drains parts of Hood and Somervell counties and empties into the Paluxy River, upstream of the confluence of the Brazos and Paluxy rivers. Squaw Creek frequently has no flow during dry periods. Squaw Creek Dam impounds SCR for CPNPP cooling water approximately 4.3 stream miles north of the creek's entrance into the Paluxy River. The principal features of the 64-square mile SCR catchment are illustrated in Figure 2.4-1. The Squaw Creek catchment is hydrologically similar to the Paluxy River basin.

The Squaw Creek watershed is underlain by sedimentary rocks of lower Cretaceous age (poorly cemented sandstone, limestone and shale) which dip gently to the east. The topography is influenced by the underlying geology, generally with steeper slopes in the limestone areas than in the shale and sandstone areas. Landforms are gently to steeply rolling. In the lower reaches of Squaw Creek, a small flood plain has developed.

Topographic maps prepared by the U.S. Geological Survey show a number of small man-made ponds in the catchment, some of which are in creek channels and others which are off-channel. The total volume of the on-channel and off-channel storage in these ponds has been estimated to be about 1150 acre-feet. There are three retaining ponds in the catchment for the purpose of mitigating oil spills. See FSAR Section 2.2.3.2.3. Other than these small ponds, there are no known control structures, weirs, or canals.

Tolar, with a 1970 population of 312 [2], is the only community in the catchment. The remainder of the catchment is largely ranchland with some cultivated areas.

2.4.1.2.3 Paluxy River

The Paluxy River basin is hydrologically similar to that of Squaw Creek and is used as a basis for developing hydrologic parameters for Squaw Creek and its subcatchments since Squaw Creek is ungaged. At gaging station 8-0915, near Glen Rose, the Paluxy River has a catchment of 410 square miles [1].

The Paluxy watershed also is underlain by sedimentary rocks of lower Cretaceous age (poorly cemented sandstone, limestone and shale) which dip gently to the east. The topography, governed somewhat by the geology, is generally stair-stepped in limestone areas and gently rolling in sandstone and shale areas.

There are no known control structures on the Paluxy River.

2.4.1.2.4 River Control Structures

The Brazos River is undergoing continuing development of reservoirs and control structures initiated for water supply, recreation and flow control. Table 2.4-1 lists important on-channel and off-channel reservoirs and dams upstream of Cox Bend. Cox Bend is shown on Figure 2.4-6. On-channel dams and reservoirs downstream of Cox Bend are identified on Table 2.4-2. Reservoir locations are represented on Figure 2.4-5.

Four potential future reservoirs are being considered on the Brazos between Possum Kingdom Reservoir and Lake Whitney [3]. These are described in Table 2.4-3 and their approximate locations are indicated in Figure 2.4-6.

2.4.1.2.5 Surface Water Users

No water rights have been issued on Squaw Creek, but two potential surface water users (irrigation) have filed claims to withdraw water. In due course, these claims will be evaluated by the Texas Water Rights Commission and either upheld or dismissed. The points of potential withdrawal are located within SCR limits, adjacent to the Hood-Somervell county line, and are listed in Table 2.4-4. No surface water users are known on the Paluxy River, downstream of the Squaw Creek confluence [4]. Cattle are watered from Squaw Creek and also probably from the Paluxy River.

There are numerous parties on the Brazos River downstream of the site vicinity who have applied for and/or received water allocations (hereafter called water users for non-irrigational and irrigational use). Non-irrigational users (municipal, industrial, mining and hydroelectric) are identified in Table 2.4-5 and on Figure 2.4-7.

Irrigational users are summarized by county in Table 2.4-6 and on Figure 2.4-7. The nearest irrigational water user below Squaw Creek Dam is approximately three stream miles downstream from the Paluxy and Brazos River confluence. The nearest extraction of water for public supply is at Waco, approximately 109 stream miles downstream of this confluence. There are no other known extractors of water for potable uses between Squaw Creek Dam and Waco.

2.4.1.2.6 Groundwater Environment

Most of the groundwater in the site region occurs in bedrock formations of very low permeability, although some does exist in shallow floodplain alluvium in stream valleys but is not withdrawn for use. The best producing formation is the Twin Mountains Formation which underlies the relatively impermeable Glen Rose Formation on which CPNPP and SCR are being constructed. Groundwater users near the site are described in Section 2.4.13.2 and presented in Tables 2.4-24 and 2.4-25.

2.4.2 FLOODS

2.4.2.1 Flood History

2.4.2.1.1 Brazos River

The maximum known flood on the Brazos River occurred in 1876 [1] well before flow monitoring began, and consequently, there is little quantitative data available on this flood. Flood records for the Brazos River at gaging station 8-0910, just upstream from the Paluxy River confluence, have been obtained since 1923 [1, 5, 6, 7]. Gage location is shown in Figure 2.4-6, and the annual maximum stage and discharge measurements for 1924 to 1975 are shown in Table 2.4-7. These records indicate that the highest water level recorded at gaging station 8-0910 was elevation 601.69 feet (May 27, 1957), corresponding to a discharge of 87,400 cubic feet per second (cfs).

For comparative purposes, Figure 2.4-8 shows the mean annual, the fifty-year, and the historical peak floods on the Brazos River. These correspond to flows of approximately 40,000 cfs, 110,000 cfs and 97,600 cfs, respectively, at gaging station 8-0910. The stage reached at station 8-0910 during the 97,600 cfs flood (May 18, 1935) was less than that of the 87,400 cfs flood due to backwater effects from the Paluxy River discharge.

The flood of record (elevation 601.69 feet) and the 1876 event are significantly lower than the CPNPP site grade (elevation 810 feet). Newly filled (1969) Lake Granbury and any subsequent flow-control facilities erected on the Brazos River watershed will further retard future flood levels.

2.4.2.1.2 Squaw Creek

There was no monitoring on the Squaw Creek watershed prior to 1966. A crest-stage partial-record station was installed in 1966 on Panter Branch, a tributary to Squaw Creek. Its location is shown in Figure 2.4-1, and the annual maximum stage and peak discharge measurements are presented in Table 2.4-8. In 1973, a continuous recording gage was installed on Squaw Creek at the State Highway 144 bridge, 2.1 miles upstream from the mouth of the creek. Annual peak discharges for the Squaw Creek gage during water years 1974 and 1975 are presented in Table 2.4-9.

2.4.2.1.3 Paluxy River

Periodic flow records were obtained in the 1920’s and continuous monitoring began in 1947 at gaging station 8-0915 at Glen Rose [1, 5, 6, 7]. The gage location is shown on Figure 2.4-6, and the annual maximum stage and discharge measurements are provided in Table 2.4-10.

The maximum flood since 1876 is believed to have occurred on April 17, 1908. Information from a local resident has established the basis for an estimated stage at Elevation 637 feet at Glen Rose, corresponding to a discharge of 59,000 cfs for this event.

2.4.2.1.4 Flood Causes

All historical floods in the catchment area pertinent to the CPNPP site have been due to precipitation runoff into streams and rivers. The area is not subject to surges, tsunamis, or ice jams, and there have been no floods due to dam failure.

2.4.2.2 Flood Design Considerations

CPNPP safety-related facilities are designed to safely withstand all floods and flood waves which are remotely possible at the site. The crest of the service spillway, elevation 775 feet, has been utilized as the pre-flood condition. The planned design assures that the safety-related facilities of the CPNPP will not be adversely affected by this event. A summary of the consequences of flooding on all pertinent facilities is contained in Section 2.4.10. The PMF for Squaw Creek has been determined by imposing the 48-hour probable maximum precipitation (PMP) as obtained from Hydrometeorological Report No. 33 (HMR #33) [9] upon the catchment.

Studies show that the maximum sustained wind velocities in one general direction during major windstorms of record in most regions of the United States have averaged approximately 40 to 50 mph for a period of one hour [10]. In accordance with regional precedents set by the Corps of Engineers, wind tide and wave runup have been evaluated by procedures outlined in Engineering Technical Letter No. 1110-2-8 [10] using an overland wind velocity of 40-mph. Detailed analyses are described in Section 2.4.3.6.

Other events considered include the effect of domino-type failure of Morris Sheppard and DeCordova Bend Dams, and the effect of a 30-minute 80-mph wind coincident with the 10-year return period flood and with the maximum operating pool level. The domino-type failure is shown

in Section 2.4.4.3 to have no effect on CPNPP or on Squaw Creek Dam. On SCR wave runup due to an 80-mph wind is shown in Section 2.4.3.6 to be less critical than for a 40-mph wind coincident with the PMF.

Events considered, but not applicable to CPNPP facilities include surge, tsunami, and ice flooding. Landsliding and/or reservoir slope failures are not an expected source of floodwaves. Natural slopes are 3:1 (Horizontal to Vertical), or flatter, except for occasional local portions of slope which are steeper (ranging to 2:1 or 1:1). Slope failures are improbable, but small localized sloughs conceivably might occur from erosion and/or weathering of the exposed edges of claystone seams from beneath overlying, more resistant rock zones. The small waves resulting from such failures will not adversely affect CPNPP facilities.

2.4.3 PROBABLE MAXIMUM FLOOD (PMF) ON STREAMS AND RIVERS

The PMF is defined by the Corps of Engineers as the “hypothetical flood characteristics that are considered to be most severe ‘reasonable possible’ at a particular location, based upon relative comprehensive hydrometeorological analyses of critical runoff producing precipitation and hydrologic factors favorable for maximum flood runoff.” The PMF for the SCR catchment has been derived synthetically, using procedures customarily applied by the U.S. Army Corps of Engineers. Results of the evaluations are summarized in Table 2.4-11 and Figure 2.4-9.

The flood routings for Squaw Creek Reservoir and Safe Shutdown Impoundment include allowance for rainfall on the surface of the reservoirs and the rainfall volumes are tabulated in Tables 2.4-11 and 2.4-15.

The nearby Brazos River has not been evaluated in detail for PMF because postulated upstream dam breaks are shown in Section 2.4.4 to be harmless to CPNPP facilities.

2.4.3.1 Probable Maximum Precipitation (PMP)

The PMP is the theoretically greatest precipitation over the applicable drainage area that would produce flood flows which have virtually no risk of being exceeded. From HMR No. 33 [9], it is found that the PMP is 25.5 inches in six hours on an area of 64 square miles in the CPNPP vicinity. Similarly, the PMP is 31.3 inches in 12 hours, 34.7 inches in 24 hours, and 39.1 inches in 48 hours. Table 2.4-11 lists the three hour rainfall increments, as divided for analyses.

For comparative purposes, a statistical method for estimating the largest rainfall likely to occur at a gaging station was applied to the nearby gaging stations shown on Figure 2.4-6. This procedure, developed by Hershfield [11], employs analyses of rainfall records to develop a statistical envelope defining the maximum precipitation occurrence. The method is applied to rainfall records from a single station, and a 24-hour estimate of maximum precipitation for that station is found. Results of analyses are compared to the 24-hour PMP and the maximum recorded rainfall in Table 2.4-12.

The amount of moisture present in the soil before the advent of the PMP, commonly referred to as the antecedent condition, is of importance in determining the amount of runoff produced by the PMP. The U.S. Bureau of Reclamation recommends “average” antecedent conditions [12]. Average conditions are defined as “the average of the conditions which have preceded the occurrence of the maximum annual flood on numerous watersheds.” The actual conditions

assumed become relatively unimportant when considering 48-hour design storms because the initial 24-hour period of light rainfall saturates the ground prior to periods of intense rainfall.

The catchment area and site vicinity are gently to steeply rolling in character, with somewhat incised stream and river valleys. Relative relief is modest and does not require modification of the PMP value, or distribution, to account for orographic effects. Sub-basins within the SCR catchment are small; thus, catchment response to precipitation is relatively rapid. Therefore, postulation of storm centering is not of major importance, and the storm can be assumed to have uniform distribution and intensity over the entire catchment.

A comprehensive study of floods in Texas [5] indicates that snowmelt does not contribute significantly to river floods anywhere in the state. Similarly, no frozen-ground conditions are anticipated.

2.4.3.2 Precipitation Losses

Precipitation losses are estimated by evaluating the initial losses and the infiltration rates of the soils in a watershed. Evaluation of losses reveals that initial losses can be expected to be in the range of 0.5 inches with average antecedent conditions; and infiltration rates after presaturation will be in the range of 0.05 to 0.15 inches per hour. The PMF selected utilizes an initial loss of 0.5 inches and a conservative infiltration rate of 0.1 inch per hour as shown in Table 2.4-11.

These losses are based upon Corps of Engineers records for the Paluxy catchment shown below [13]:

			Losses (inches)			
Date of Flood	Rainfall (inches)	Duration (hours)	Initial (1st 3 hrs)	Balance	Total	Steady Loss (in/hr)
05/23/52	4.19	15	.85	2.24	3.09	.187
04/06/57	2.94	12	.47	1.36	1.83	.151

These values are indicative of the magnitude of precipitation losses expected on the SCR catchment due to its similarity to the Paluxy watershed in regard to general topography, geology, soil types and land usage. The values require evaluation, however, in light of some differences between the two watersheds, including: 1) the SCR catchment is generally not as steep as the Paluxy watershed; 2) the SCR watershed is much smaller; and 3) much of the relatively level, low-lying portion of the SCR catchment will be inundated by the reservoir.

Although the first difference described above tends to increase the precipitation losses on the SCR catchment in relation to that of the Paluxy River, the other two differences indicate a decrease in losses. Smaller drainage areas, such as the SCR catchment, generally have lower losses than larger areas, and submergence of much of the creek alluvium removes a section of the catchment which should have the most infiltration capacity. Thus, it is prudent to adopt lower estimates of losses on the SCR catchment. This conclusion is further supported by the relatively short duration of the available historical storms studied, in comparison to the 48-hour storm used

in computing the PMF. In view of these factors, an initial loss estimate of 0.5 inches and an infiltration rate of about 0.1 inch per hour is considered appropriate for the catchment.

2.4.3.3 Runoff Model

2.4.3.3.1 Description of Squaw Creek Reservoir Catchment

Figure 2.4-1 illustrates the 64-square mile SCR catchment and the reservoir limits corresponding to a selected flood-stage at Elevation 780 feet.

The pre-flood condition reservoir level is assumed to be Elevation 775 feet.

During the PMF, pool level will rise from Elevation 775 feet (area 3,272 acres) to Elevation 789.7 feet (area 3,863 acres).

2.4.3.3.2 Synthetic Hydrographs

Synthetic methods for developing a runoff model have been undertaken. Three methods of synthetic hydrograph development were considered:

1. Use of Snyder's Unit hydrograph relations presented by the U.S. Army Corps of Engineers (USACE) [14].

2. Use of dimensionless hydrographs presented by the Soil Conservation Service (SCS) [14].

3. Use of triangular hydrograph techniques presented by the U.S. Bureau of Reclamation [12].

The empirical relations developed by Snyder have also been shown to be reliable through widespread usage. To employ this method, two coefficients which depend upon drainage basin characteristics are computed from hydrologic records for a representative portion of the drainage area under study, or for nearby catchment of similar characteristics [15]. Snyder's method was adopted for development of a runoff model for Squaw Creek.

2.4.3.3.3 Hydrograph Development

For purposes of analyses, the SCR catchment has been divided into three areas, as shown on Figure 2.4-1 and described below:

1. The Upper Squaw Creek catchment, which consists of about 38 square miles of land located above the reservoir area.

2. The Lower Squaw Creek catchment which consists of about 20.3 square miles of land located around the fringes of the reservoir. This area is actually comprised of a number of very small catchments, which are considered together for reasons of clarity and convenience.

3. The Squaw Creek Reservoir Area

The Corps of Engineers has developed unit hydrographs from gaging station records for two nearby watersheds, the Paluxy River and the Clear Fork of the Trinity River. The pertinent data from these studies [13] is summarized below:

	Drainage Area (Sq. Mi.)		
Paluxy River	361	.60	420
Clear Fork (upper portion)	210	1.50	480

The lower portion of the SCR catchment (see Figure 2.4-1) is generally similar to the Paluxy River watershed. The upper portion is considered to have characteristics falling between those of the Paluxy River and Clear Fork. These considerations lead to the adaptation of the following coefficients for the SCR catchment:

			Basis
Upper 38.0 Sq. Mi.	1.1	440	Combination of Paluxy & Clear Fork
Lower 20.3 Sq. Mi.	.3	420	Paluxy

All other information needed to apply Snyder’s relationships (such as area, length, and center of gravity of the catchments) has been derived from U.S.G.S. quadrangle maps. These data are summarized in Table 2.4-13.

The unit hydrographs are shown in Figure 2.4-10.

2.4.3.3.4 Non-Linearity

High rainfall rates associated with intense storms may result in above normal concentrations of runoff (non-linearity) because of a more severe rainfall distribution and increased hydraulic efficiencies.

The USACE recommends increasing hydrograph ordinates by 25 to 50 percent during the period of most intense rainfall [14]. In view of this, the hydrograph for the upper SCR catchment was increased by 30 percent during the most intense period of rainfall (See Table 2.4-13). This magnitude of increase is considered applicable for a drainage basin of 38 square miles.

2.4.3.3.5 Translation of Inflows

The size and shape of the reservoir in relation to the catchment area suggest that there will be no significant translation time from inflow points to the dam and CPNPP site locations; accordingly, no delay is introduced into the computations.

2.4.3.4 Probable Maximum Flood Flow

The PMF inflow and outflow hydrographs to SCR resulting from the PMP are presented in Figure 2.4-9. As explained in Section 2.4.3.1, snowmelt was not considered in establishing the PMP.

Except for a few existing small farm ponds, there are no present or planned structures upstream of SCR; therefore, the effect of such structures was not considered in developing the PMF hydrograph.

The PMF was routed through the SCR assuming the reservoir level at the beginning of the PMF was at elevation 775, the service spillway crest elevation. All discharge was assumed to occur over the uncontrolled spillways of Squaw Creek Dam.

The current SCR operating practice (see Section 2.4.8.2.1) of pumping makeup water to cause a small flow over the service spillway may routinely raise the SCR level. This small SCR level increase and the resulting small flow over the service spillway is negligible when combined with the maximum postulated precipitation and flooding analysis results and has insignificant impact on the PMF peak reservoir level.

All streams in the SCR basin empty directly into SCR; therefore no channel routing coefficients were required. The applicability of the stream course response model to handle the PMF is discussed in Section 2.4.3.3.4. The ability of the SCR dam to withstand the PMF and coincident wave action is discussed in Section 2.4.3.6.

2.4.3.5 Water Level Determinations

The mass curve, the capacity-area-depth curves, and the spillway rating curves (Figure 2.4-9) are used in routing the PMF through the reservoir to evaluate water level. The resulting peak reservoir level is Elevation 789.7.

In routing, the reservoir water surface has been assumed to be nearly horizontal, and the volume of water in the reservoir has been assumed to be directly related to the reservoir elevation. These are reasonable assumptions in view of the shape and depth of the SCR. These assumptions allow the principle of continuity expressed as a storage equation ($\hat{I}\Delta t - \Delta s = \bar{\theta}\Delta t$, where $\hat{I}$ and $\bar{\theta}$ are the average rates of inflow and outflow for the time Δt, and Δs is the change in water volume during time Δt) to be applied directly to the routing problem [16].

2.4.3.6 Coincident Wind Wave Activity

The magnitude of the wind tide and wave runup are dependent upon the wind velocity, fetch and reservoir depth. The wind direction must coincide with the fetch direction. An overland wind velocity of 40 miles per hour has been approved by the USACE for use in determining freeboard requirements in the Fort Worth District. This 40 mph wind velocity is the highest that may reasonably be assumed to occur coincidentally with the probable maximum flood [17].

The effective fetch length for wave generation was determined for the center of Squaw Creek Dam (fetch of 1.28 miles) and for the exposed side of the CPNPP plant location (fetch of 1.25

miles). It was also determined for the Safe Shutdown Impoundment Dam and the protected side of the CPNPP plant location, but freeboard requirements were found to be less than two feet for these locations, so discussion is not included here. Computation of effective fetch considered radial lines at angles up to 42 degrees from the central or primary fetch line, as recommended by the USACE [10].

The average depth of the reservoir at PMF, Elevation 789.7 feet, is approximately 55 feet, and the longest theoretical deep-water wave length (for waves reaching the center of Squaw Creek Dam) is 46 feet, so the ratio of water depth to wave length is well over one-half, and the reservoir can be considered to have “deep water” [10].

Computation [10] utilizing data for wind velocity, fetch length, and reservoir depth yield the results shown in Table 2.4-14. The Table illustrates the maximum runup and setup of smooth and riprapped banks on the Squaw Creek Dam and at the exposed side of the CPNPP plant area. As can be seen from the Table, wave runup and wind tide at the dam and plant are about 4 and 5.0 feet and elevations reached are 793.7 feet and 794.7 feet, respectively. Due to the much shorter fetch available around the area, water level elevation reached at the SSI is about 791.3 feet. All plant facilities are above the maximum wave runup and setup elevation of 794.7 feet. The Service Water Intake Structure is the only safety-related structure subject to wave action. The elevation at the operating deck is approximately 796, above the maximum expected wave runup. Section 2.4.10 discusses the effect of wave runup and wind tide on all pertinent safety-related facilities.

2.4.3.7 Flood Evaluations for Safe Shutdown Impoundment

[redacted] Water can pass freely between the SSI and SCR, and the water surface in both water bodies normally will be at the same elevation. Figure 2.4-11 is a graph of the discharge characteristics of the SSI spillway. Table 2.4-15 outlines predicted performance of the SSI during occurrence of simultaneous Probable Maximum Floods on the overall SCR watershed and the SSI watershed. The maximum level reached in the SSI during the PMF is computed to be 790.5 feet, leaving a freeboard in the SSI of 5.5 feet. Further details on the Safe Shutdown Impoundment Dam are given in Section 2.4.8.2.2. Table 2.4-16 gives the unit hydrograph parameters for the SSI watershed, and Figure 2.4-12 shows the unit hydrograph for the SSI watershed. A non-intrusive, floating raft system has been located near the south end of the equalization channel. This floating raft system bridges from the east bank to west bank of the channel. The raft system is retained at its designated position through the use of bollards on the banks of the channel. These bollards function as bumpers for the raft system. Should the equalization channel experience flooding conditions, the floating raft system is designed to freely float on the water surface, even if the floats are punctured. If the water level exceeds an elevation above approximately elevation 781 feet, the raft system will float over the bollards and, due to the direction of flow through the channel, the raft system will be pushed away from the SSI and into the SCR. As a result, this floating raft system will not affect the design function of the equalization channel to freely pass water to the SCR under flooding conditions up to a PMF.

2.4.4 POTENTIAL DAM FAILURES (SEISMICALLY INDUCED)

There are no impoundments other than small farm ponds on the SCR catchment; therefore, a postulated dam failure upstream on Squaw Creek is not appropriate for the CPNPP facilities. The farm ponds on the catchment have a combined volume which is less than one percent of the reservoir volume and are insignificant.

Failure of Squaw Creek Dam itself presents no danger of flooding the CPNPP, as the Station is above the PMF water level. The possibility of damage to Squaw Creek Dam by backwater due to flooding on the Brazos River in the event of a postulated domino-type failure of Morris Sheppard Dam and DeCordova Bend Dam is ruled out in Section 2.4.4.3.

2.4.4.1 Reservoir Description

Present and possible future reservoirs which might be considered to have an influence on the site from a safety or water-supply standpoint are described in Tables 2.4-1 through 2.4-3, and their locations are shown in Figures 2.4-5 and 2.4-6.

2.4.4.2 Dam Failure Permutations

Considering CPNPP safety, the most severe dam failure permutation conceivable is the failure of Morris Sheppard Dam and the subsequent domino-type failure of DeCordova Bend Dam. The 25-year floods of both the Brazos and Paluxy rivers can be added into the effects of the combined dam breaks without significantly intensifying the results. Failure of the Lake Whitney Dam, downstream, would not have an adverse effect on CPNPP.

The detailed analysis of the most severe dam failure permutation is presented in Section 2.4.4.3 and the effect of landslides into the reservoir is discussed in Section 2.4.2.2.

There will be no commercial water traffic on SCR, and no possible blockage of any water course in the site region could affect the plant.

2.4.4.3 Unsteady Flow Analysis of Potential Dam Failures

The possibility of damage to Squaw Creek Dam due to failure of Morris Sheppard Dam and DeCordova Bend Dam was examined by initiating a number of highly conservative simplified evaluations which would establish conservative water levels. The results of these studies clearly indicate that there is no possibility of flood damage to the CPNPP site and Squaw Creek Dam. The toe of Squaw Creek is above Elevation 640 feet, approximately 60 to 90 feet higher than the bankfull elevation of the Brazos River at the Brazos River - Paluxy River confluence (Elevation 560 feet). The maximum wave height that could be generated by complete and instantaneous removal of DeCordova Bend Dam is about 37 feet, according to dam break calculations described in Section 2.4.4.3.3.

Prior failure of Morris Sheppard Dam is not expected to increase this wave height significantly due to the modifying effects of 145 miles of river channel between Morris Sheppard and DeCordova Bend Dams. Although calculations (Sections 2.4.4.3.1) show that a wall of water over 60 feet high would be initiated by the complete and instantaneous removal of Morris Sheppard Dam, routing by the method of coefficients (Section 2.4.4.3.2) shows that the wall would have decayed during translation to DeCordova Bend Dam. Rather, there would be a flood,

the peak of which would arrive some five hours after initial inflow to Lake Granbury reservoir had begun. The break in the DeCordova Bend Dam is postulated to occur when the reservoir level becomes full. Therefore, the reservoir inflow from an upstream dam break would serve to sustain the high rate of outflow through the break in DeCordova Bend Dam rather than to increase the initial outflow (height of water wall) significantly.

Even with the ultra-conservative assumption that the combined wave created by the dam breaks remained undiminished in traveling below DeCordova Bend to the Paluxy River - Brazos River confluence, the flood wave would fall more than 40 feet (elevation) short of reaching the toe of Squaw Creek Dam.

In view of the highly conservative assumptions made in the following flood analyses, the results are regarded as a very conservative upper limit on the river level in the event of the domino-type failure, rather than a refined estimate of the flood to be expected.

2.4.4.3.1 Morris Sheppard Dam Break

[redacted]

Evaluation assumptions:

1. Complete and instantaneous removal of dam.

2. [redacted]

3. Channel is frictionless, rectangular and horizontal.

4. No water downstream of dam.

5. Vertical accelerations are negligible

These highly conservative assumptions allow the following analysis to be made, using the method shown by Henderson [19] and Chow [20].

Crest Velocity

= $(gy)^{1/2}$ *

= $((32.2 \text{ ft/sec}^2) \times (145 \text{ ft}))^{1/2}$

= 46.5 mph

Trough Velocity (velocity of wave downstream)

= $2 (gy)^{1/2}$

= 2 x (46.5 mph)

= 93 mph

Velocity of water through dam site

= $2/3 (gy)^{1/2}$

= 2/3 (46.5 mph)

= 31 mph

Discharge

= $8/27 (g)^{1/2} y^{3/2} W$

= $8/27 (32.2 \text{ ft/sec}^2)^{1/2} (145 \text{ ft})^{3/2} (1600)$

= 4,700,000 cfs

Time of constant discharge (assuming discharge will remain until lake is empty)

= 600,000 ac-ft/(.0826 ac-ft/cfs-hr) (4,700,000 cfs)

= 1.5 hours

where

t = length of time interval, in this case one hour.

X = a constant dependent upon channel characteristics.

g = acceleration of gravity

y = height of water surface exposed upon dam removal

2.4.4.3.2 Routing From Morris Sheppard Dam to DeCordova Bend Dam

Travel times for floods between Morris Sheppard Dam and DeCordova Bend Dam cannot be determined with accuracy because of such factors as incidence of rain and runoff accumulation within the reach. However, there are some data regarding water movement on the river. It has been found that it takes about two days for normal turbine releases from Morris Sheppard Dam to reach DeCordova Bend Dam [3]. This is equivalent to a velocity of under three mph. Flow travel time studies on the Brazos River between Lake Whitney and Richmond show that velocities vary between 1.6 mph and 3.8 mph. Travel time is greatest for low flows and least for small floods, and then increases again as flows become very large [21]. These data are inconclusive but they seem to indicate that the average velocity of flow from a dam break would be in the order of three or four mph.

The length of river channel required to reach a terminal velocity is not known; therefore, in the evaluations the flow from the Morris Sheppard Dam Break has been conservatively assumed to continue unbated at 31 mph, the theoretical velocity of flow through the dam section.

The distance traveled to Lake Granbury is 144.5 miles, and the lake is 33.5 miles long; therefore, travel time is indicated to be on the order of five hours, with one hour of this being flow along the reaches of Lake Granbury.

Routing was by the method of coefficients (Muskingum) [22] through a reach using total flood-wave travel equal to 4xt* and an X* of 0.3 (deemed appropriate for a wide rectangular channel where changes in discharges are small) and through a reach using total flood-wave travel equal to t and an X of zero (for reservoir-type storage routing). This evaluation yields an outflow hydrograph having a base time of over 12 hours and a peak flow of about 1,900,000 cfs, well under half of the theoretical initial discharge of 4,700,000 cfs.

2.4.4.3.3 DeCordova Bend Dam Break

[redacted]

Assumptions made:

1. DeCordova Bend Dam holds until lake level reaches top of dam.

2. Complete and instantaneous removal of dam.

3. [redacted]

4. Channel is frictionless, rectangular and horizontal.

5. No water downstream of dam.

6. Vertical accelerations are negligible.

These highly conservative assumptions allow the following analysis to be made:

Crest Velocity

$= (gy)^{1/2}$

$= (32.2 \text{ ft/sec}^2 (84 \text{ ft}))^{1/2}$

$= 52$ ft/sec

$= 35$ mph

Trough Velocity

$= 2\ (gy)^{1/2}$

$= 2\ (35\ mph)$

$= 70\ mph$

Velocity of water through dam site

$= 2/3\ (gy)^{1/2}$

$= 2/3\ 35$

$= 23\ mph$

Discharge

$= 8/27\ (g)^{1/2} y^{3/2} w$

$= 8/27\ (32.2\ ft/sec^2)^{1/2} (84\ ft)^{3/2} (2200\ ft)$

$= 2{,}800{,}000\ cfs$

Depth of water at dam site

$= 4/9\ Y$

$= 4/9\ (84\ ft)$

$= 37\ ft$

Theoretical time of discharge

$$= \frac{(2)(\text{length of lake})}{(\text{velocity of wave})}$$

$$= \frac{(2)(33.5\ \text{mi})}{35\ \text{mph}}$$

$= 2\ hours$

Assuming no inflow, the 2,800,000 cfs discharge would empty Lake Granbury in less than a half hour. But the inflow from Possum Kingdom Reservoir would provide additional water to maintain the 2,800,000 cfs flow for two hours. After the two hour period, flow would diminish until the remaining 65,000 acre feet are discharged.

2.4.4.3.4 Routing from Decordova Bend

[redacted]

[redacted] Thus, there is no possibility of dam breaks on the Brazos River affecting the safety of the CPNPP.

In the event that other dams are constructed between Morris Sheppard Dam and DeCordova Bend Dam, their presence should in no way endanger the safety of the CPNPP, even in the case of a domino-type failure.

[redacted]

2.4.4.3.5 Consideration of Antecedent Flow

In the preceding description of analyses, river channels have been assumed to be dry. Inclusion of water in the river (antecedent flow) would not have a significant effect on the results of the dam break analyses. For example, the 25-year flood on the Brazos River would contribute only about 90,000 cfs (refer to Figure 2.4-13), which is only 3.2 percent of the theoretical flow from the dam breaks.

2.4.4.4 Water Level at CPNPP

The Station site can in no way be endangered by any dam breaks or series of dam breaks, as it is over 110 feet above postulated maximum water levels.

2.4.5 PROBABLE MAXIMUM SURGE AND SEICHE FLOODING

2.4.5.1 Probable Maximum Winds and Associated Meteorological Parameters

The probable maximum sustained over-land wind selected for evaluation of wave action of the maximum operated reservoir elevation is 81 mph. The wind has an estimated return period of 200 years [23].

2.4.5.2 Surge and Seiche History

There are no existing large bodies of water near the site that would allow development of either surge or seiche; therefore, there is no history of surge and seiches in the site vicinity.

2.4.5.3 Surge and Seiche

The small size, relatively shallow depth and irregular shape of Squaw Creek Reservoir indicates that there is a minimum probability of either surges or seiches occurring in the reservoir. Therefore, surge and seiche should not be considered significant at this site.

2.4.5.4 Wave Action

The effect of the maximum sustained wind on the reservoir surface has been evaluated in Section 2.4.5.1. This wind is considered coincident with a 10 year return period flood elevation in Squaw Creek (778.1 feet). Results of the wind wave activity calculation are presented in Table 2.4-14. With an effective fetch of 1.28 miles, computations indicate that the significant wave height will be approximately five feet with a period of 3.9 seconds. The maximum wave height will be about eight feet with a setup of 0.2 feet and runup of 6.8 feet [10].

This will occur at Squaw Creek dam as illustrated in Table 2.4-14.

The wind penetrated waves on the SSI are less than those on SCR due to the much shorter fetch available around the SSI area (see Figure 2.4-14, Figure 2.4-15 and Table 2.4-14).

2.4.5.5 Resonance

Due to the irregular shape and sloping sides of SCR and SSI, wave resonance will not have any significant effect on the maximum water elevation.

2.4.5.6 Runup

The maximum water elevation reached due to wave runup and setup at the plant site, Squaw Creek dam and SSI dam are 794.7 feet, 793.7 and 791.3 feet, respectively. All plant facilities will be above the maximum wave runup elevation of 794.7 feet.

The Service Water Intake Structure will be the only safety-related structure subject to wave action or wave runup. The operating deck will be approximately elevation 796', well above the maximum expected wave runup.

2.4.6 PROBABLE MAXIMUM TSUNAMI FLOODING

This site is nearly 300 miles from the Gulf of Mexico and the plant will be over 800 feet above sea level. Therefore, tsunami flooding will not occur.

2.4.7 ICE FLOODING

The Texas climate is too warm to allow the development of significant ice on any lake. Certainly there are no records of any major river in Texas freezing over at any time, so the possibility of ice flooding can be discounted.

2.4.8 COOLING WATER CANALS AND RESERVOIRS

2.4.8.1 Canals

No canals are involved.

2.4.8.2 Reservoirs

2.4.8.2.1 Squaw Creek Reservoir (SCR)

SCR is a cooling lake for CPNPP. The location and configuration of the reservoir are shown in Figures 2.4-5 and 2.4-6. Table 2.4-17 gives the area and capacity characteristics of the SCR site, based on planimeter measurements from U.S. Geological Survey quadrangle maps entitled Hill City, Texas, and Nemo, Texas, scale 1:24,000. The volumes and areas indicated are those of the entire reservoir, including the reserve storage within the Safe Shutdown Impoundment (SSI) described in Section 2.4.8.2.2 below. The performance capability of SCR as operational cooling pond was evaluated through mathematical modeling as documented in Reference [40].

[redacted]

During some periods and especially in summer months, the pumping of makeup water may be utilized to raise the level of SCR above the crest of the service spillway to keep a small flow of SCR water going over the crest of the service spillway even in the absence of rain. This practice enhances the cooling capacity of the reservoir.

1. Squaw Creek Dam

   [redacted]

2. Spillways

   [redacted]

[redacted]

Design bases for the service spillway at Squaw Creek Dam are as follows:

a. Spillway width: [redacted]

b. Design Head: [redacted]

c. Crest elevation: [redacted]

d. Depth of approach channel below crest: [redacted]

e. Slope of upstream face of weir: [redacted]

f. Type of spillway crest: [redacted]

g. Manning's "n" of approach channel: [redacted]
(Ref: EM 1110-2-1603)

h. End contraction effects from Engineering Manual Part CXVI

i. Entrance loss assumed to be 0.1 V**2/2g for approach channel

j. Coefficients of Discharge from Figure 251, Design of Small Dams, 1973 Edition

Design for rip-rap lining on the sides of the discharge channel of the service spillway was determined using U.S. Army Corps of Engineers EM 1110-2-1601 (1 July 1970) and supplemental ETL 1110-2-120 (14 May 1971) along with U.S.A.E.W.E.S. Hydraulic Design Chart 712-1 (Revised September 1970). Unit weight used for rip-rap stone was 145 pcf. Average velocities of water flow were determined from backwater analyses starting at the confluence of the discharge channel with Squaw Creek and progressing through the channel to the stilling basin.

Velocities ranged from 16.2 fps in the lower reach of the channel to five fps just below the stilling basin. The termination of the rip-rap at the end of the discharge channel was designed based on the possibility that future stream bed degradation in Squaw Creek could cause critical depth of flow at the end of the rip-rap lining with a corresponding local flow velocity of 18.5 fps. Rip-rap bedding beneath the stone layer was designed as a filter to prevent migration of soil or bedding material through the slope protection layer. The bottom of the channel is sound limestone and did not require rip-rap protection.

The emergency spillway discharges into a tributary of Squaw Creek whose confluence with Squaw Creek is 7,000 feet downstream of the dam. A water surface profile in Squaw Creek showed that the water level at the toe of the dam will reach Elevation 656.0 during a Probable Maximum Flood. The tributary, through which the emergency spillway discharge will flow, is separated from the dam by a large hill composed of a thin overburden overlying limestone. The Squaw Creek Dam embankment will not be endangered by flows through the emergency spillway.

Design bases for the emergency spillway at Squaw Creek Dam are as follows:

a. Spillway width: [redacted]

b. Crest elevation [redacted]

c. Length of level section at elevation 783.0: [redacted]

d. Slope of spillway downstream from level section: [redacted]

e. Manning's "n" of spillway channel: [redacted]
(Ref: Chow: Open-Channel Hydraulics)

f. Side slopes: 1 vertical on 3 horizontal

g. Entrance loss assumed to be 0.1 V**2/2g.

The emergency spillway at Squaw Creek Dam is not lined. A concrete wall at Elevation 783.0 on the emergency spillway crest serves as the spillway's erosion control structure. Its purpose is to maintain a uniform elevation for the entire length of the crest. The wall is anchored in limestone. The maximum velocity along the emergency spillway during a Probable Maximum Flood is 10 fps. Velocities at the downstream edge of the spillway will be higher. These velocities will cause some erosion damage. The erosion will not be severe since the emergency spillway cut is into limestone. In places, surface materials (up to 2 feet thick) overlying the limestone consist of softer materials, graded for drainage. The frequency of operation of the emergency spillway is in excess of 100 years. The erosion damage will not endanger the dam or reduce its storage capacity.

Location of the spillways are indicated on Figure 2.1-2.

3. Flood Levels

Routing of the PMF through the reservoir has been discussed in detail under Section 2.4.3. The maximum high water level during the PMF would be Elevation 789.7, leaving a freeboard allowance of 6.3 feet, which is more than adequate to accommodate wave runup and wind tide on rip-rapped slopes as shown in Section 2.4.3.6.

In order to evaluate the probable frequency of flows through the emergency spillway cut, inflow hydrographs were also computed for floods having 50-year and 100-year probable recurrence intervals, using rainfall data developed for those frequencies by the U.S. Weather Bureau [24]. It was found that the 100-year flood would involve less total runoff than the volume of surcharge storage available between the crest of the service spillway and the crest of the emergency spillway, and that the 100-year storm would, therefore, not cause flow through the emergency spillway.

4. Brazos River Diversion System

Supplemental water from Lake Granbury on the Brazos River will be conveyed by pipeline to SCR when required. The pipeline is 48 inches in diameter, with a design delivery capability of 65.1 million gallons per day (MGD). To allow for one pumping unit

being temporarily out of service, the station includes four pumps with 21.7 MGD of rated capacity each, for a total installed name-plate capacity of 86.8 MGD.

5. Service Outlet

Service outlet facilities are located at the right (south) abutment of the dam and consist of an intake tower and outlet conduit. The tower has ports at various levels in the reservoir to allow selective taking of water. Backup closure facilities are provided to protect against loss of storage due to inability to close a valve or a gate.

2.4.8.2.2 Safe Shutdown Impoundment (SSI)

A portion of the arm of the reservoir that is formed by the channel of Panther Branch is utilized as a Safe Shutdown Impoundment, holding water for normal and emergency cooling use. The area and capacity characteristics of this cooling water pond are given in Tables 2.4-18 and 2.4.19. The secondary reservoir is separated from the main body of the reservoir by a rock-fill dam. An open channel was excavated through the narrow ridge to the southwest of the SSI Dam to connect the SSI with the main body of the reservoir. The floor of the channel is at elevation 769.5, six inches below the normal minimum operating level, and under normal operating conditions water will pass back and forth to keep the large and small reservoir surfaces at the same elevation. If the level in the main reservoir should drop due to some emergency, the SSI Dam will hold back between 284 acre-feet and 367 acre-feet of reserve water to allow continued cooling and safe shutdown of the plant.

Details of the SSI Dam embankment are shown in Figure 2.4-21. The middle zone is of select, impervious material, wetted and rolled and carried down to impervious foundation material for effective cut-off.

[redacted]

Design bases for the spillway at the Safe Shutdown Impoundment are as follows:

a. Spillway width: [redacted]

b. Side Slopes [redacted]

c. Slope of Spillway channel: [redacted]

d. Manning's "n" of spillway channel: (Ref: Chow: Open-Channel Hydraulics) [redacted]

e. Entrance loss assumed to be 0.1 V**2/2g

f. Exit loss assumed to be V**2/2g

The spillway channel is in limestone and is unlined. The velocity through the spillway will reach 10.3 fps. A concrete erosion slab was constructed in the channel to maintain the control level at elevation 769.5.

The rock used to construct the outer zones of the SSI dam was selectively quarried and processed from planned plant site excavations to produce a reasonably well graded product conforming to the limits shown on Figure 2.5.6-12. Basic consideration in selecting the rock gradation were seismic performance and protection of the interior filters. Normal construction techniques for the rock fill resulted in larger rock sizes accumulating on the outer edges of the slopes. Analysis of wave protection requirements was based on an average over-water wind of 81 mph (probable maximum wind - 200 year frequency) over the effective fetch distance. The method of computing the effective fetch distance set forth in Department of Army, Office of the Chief of Engineers ETL 1110-2-221, 29 November 1976, was adopted. Comparison of the as constructed conditions with conventional rip rap protection requirements as set forth in EM-1110-2-2300 (1 MARCH 1971) indicates adequate protection. To assure continued performance of the SSI, the planned annual inspection (see Section 2.5.6.8.1) of the dam will specifically include observations of slope protection.

Estimated sediment production from the Panther Branch watershed above the SSI during the 40-yr projected service life of CPNPP was derived based on analytical procedures for small watersheds as described in Reference [38]. The anticipated reduction in storage capacity of the SSI during that period due to accumulation of sediment was found to be 91 ac-ft, of which 85 ac-ft would be below elevation 770.0 and the remaining 6 ac-ft between elevations 770.0 and 775.0. Comparative plots of area and capacity characteristics before and after sedimentation are shown in Figure 2.4-22. Table 2.4-19 outlines the predicted area and capacity values at the end of the 40-year period.

Inspections of the service water intake channel for sedimentation buildup will be performed at the frequencies stated in Regulatory Guide 1.127. This inspection will consist of a direct measurement of sediment depth at the bottom of the intake channel at a minimum of five locations along its length. Measurements will be taken at approximately the same location each time the inspection is performed.

If it is determined that, as a result of these inspections, the sediment has accumulated enough to increase the bottom elevation one and one-half (1.5) feet over the entire length of the inspection area, then measures will be employed to remove the sediment from the intake channel. At that time, procedures will be developed and approved to accomplish this task.

A detailed layout of the SSI design features is given in Figure 2.4-23.

Seismic Design Criteria for the SSI are discussed in Section 3.7.

The ability of the SSI to meet criteria of Regulatory Guide 1.27 is discussed in Section 9.2.5.

2.4.9 CHANNEL DIVERSIONS

The SCR catchment has developed streams with distinct valleys and has sustained numerous farm ponds. Therefore, diversion of water from the catchment appears impossible. The reservoir is formed in the Glen Rose formation, a predominately limestone sequence. Information developed regarding this formation indicated it is relatively impermeable and free of sinkholes and solutioning. Thus, significant loss of water is improbable.

Lake Granbury, which is on the Brazos River, will be a major source of makeup cooling water. The loss of Lake Granbury makeup water due to the diversion of the Brazos River is highly

improbable. Above Lake Granbury, the Brazos River channel is cut into bedrock which precludes any reasonable possibility of the river changing its channel significantly within the life of the CPNPP and thus affecting the supply of water.

Extraction of groundwater, oil, and gas from the region is relatively nominal. It is concluded that subsidence sometimes associated with these extractions will not occur in the vicinity of the CPNPP. The potential of subsidence at the site is discussed in detail in Section 2.5.1.2.6.

2.4.10 FLOODING PROTECTION REQUIREMENTS

Safety-related structures, except the Service Water Intake Structure and the Electrical and Control Building, are not subject to flooding, wave action, or wave runup and do not require flood or wave protection. The plant grade is at elevation 810 ft, and the peak SCR level is at elevation 789.7 ft for the probable maximum flood (PMF). (See Section 2.4.3.3.1)

The Service Water Intake Structure is protected from the effects of wind wave activity on the Squaw Creek Reservoir by the Safe Shutdown Impoundment (SSI) Dam. An overland 40-mph wind is assumed to occur coincidentally with the SSI PMF level of 790.5 ft. Since the wind wave activity at the Service Water Intake Structure is negligible, there are no significant dynamic forces to be considered. (See Section 2.4.5.) The design hydrostatic load includes the maximum runup elevation (see Section 2.4.3.6) caused by the 40-mph wind coincident with the PMF.

Design criteria for the Service Water Intake Structure are discussed in Section 3.8.4.1.4. The Electrical and Control Building would be subject to flooding if flood protection measures were not taken. These measures are described in Sections 3.4 and 13.5. It is not necessary to implement any other flood protection measures or emergency procedures.

2.4.11 LOW WATER CONSIDERATIONS

The SCR provides the cooling water for plant operation. In general, the combined amounts of natural and induced evaporation, plus releases for control of chemical quality, are more than the available runoff from Squaw Creek. Supplemental water will be brought from Lake Granbury on the Brazos River, in accordance with an agreement by and between Brazos River Authority and TP&L, TESCO, and DP&L, to hold the reservoir at the required operating elevation [39]. This agreement has no limitations which could be placed on the water that would have an adverse effect on safety-related makeup.

2.4.11.1 Low Flow In Rivers And Streams

Low flow in Squaw Creek or in the Brazos River is not of concern to plant safety because station cooling water is obtained from SCR. Thus, low flow considerations are significant in terms of successful over-all plant operations, but are not safety-related.

A study by the Texas Water Development Board indicated that from 1891 to 1960 Texas experienced 11 significant drought periods of varying severity and areal extent. Their ranking and time of occurrence are listed below:

1.	Most Severe	1954-1956
2.	Second	1916-1918
3.	Third	1909-1912
4.	Fourth	1901
5.	Fifth	1953
6.	Sixth	1933-1934
7.	Seventh	1950-1952
8.	Eighth	1924-1925
9.	Ninth	1891-1893
10.	Tenth	1937-1939
11.	Eleventh	1896-1899

The 1954-1956 drought was the most severe and was immediately preceded by the fifth and seventh ranked droughts, comprising a continuous series of years of rainfall deficiencies. This series, 1950 through 1956, comprises the most intense seven-year drought period that the State as a whole has experienced within the 70-year period of rainfall records. Dendrochronological studies in the southwestern part of the United States suggest that the 1950-56 drought period ranks among the most severe droughts of the past 400 years. Results of the studies indicate that records of stream flows during the 1950-56 period provide a basis for evaluation of the dependable amounts of water which can be obtained from existing and proposed reservoirs [37].

Detailed analysis of performance of SCR under the critical drought conditions of 1950 through 1956 [25] indicates a potential need for diversions from Lake Granbury ranging from 52,450 acre-feet per year. Of these amounts, an estimated 26,400 acre-feet per year would be returned at a steady rate to Lake Granbury in order to maintain proper balance of water quality in the two reservoirs. Thus, the net volumes of water taken from Lake Granbury during the drought would average 33,100 acre-feet per year and would range from a minimum of 26,050 acre-feet per year to a maximum of 38,260 acre-feet per year.

Substantially more than the required amounts will be available to SCR from Lake Granbury under terms of an existing agreement with the Brazos River Authority. This agreement covers total use from Lake Granbury and/or Lake Possum Kingdom of 70,000 acre-feet per year. The dependable yield of Lake Granbury [26] has been evaluated as at least 69,200 acre-feet per year, exclusive of the additional yield which could be made available by releases from Lake Possum Kingdom. The 70,000 acre-feet per year of potential supply is more than adequate to provide the necessary net diversions to SCR, plus anticipated requirements of other facilities which might also draw on Lake Granbury.

As a further check on the adequacy of the basic water supply for CPNPP, additional yield studies were carried out for Lake Granbury and Possum Kingdom Reservoir based on the years 1950-1957 and the following assumptions:

1. Historical inflows to Possum Kingdom Reservoir during the years in question were reduced to reflect:

    a. Total exclusion of runoff that originated above Hubbard Creek Dam, White River Dam, Salt Creek Dam, and Millers Creek Dam. These are the projects which either have been completed since the drought years or are expected to be completed in the foreseeable future.

    b. Maximum utilization by the City of Abilene of the increase in diversion rights on the Clear Fork of the Brazos, granted by the Texas Water Rights Commission since the drought years.

2. Releases of water from Possum Kingdom Dam for generation of hydroelectric power were reduced to a rate of 50,000 acre-feet per year, as compared with an average of approximately 350,000 acre-feet per year during the years of the study.

3. Runoff originating above Lake Palo Pinto was excluded from inflows to the Brazos between Possum Kingdom and Lake Granbury.

4. Historical losses of water in transit between Possum Kingdom and the site of Lake Granbury were assumed to still occur, although the releases from Possum Kingdom were substantially reduced.

5. Reservoir storage capacities were reduced to reflect predicted siltation to about the year 2006.

6. The studies were started with Lake Possum Kingdom assumed to be at the same elevation as actually experienced at the beginning of 1950, and Granbury was assumed to start at elevation 688.0, or five feet below the top of conservation storage.

7. The seasonal pattern of hydroelectric releases from Possum Kingdom was based on the actual pattern of such releases during the years of the study. The seasonal pattern of demand at Lake Granbury was based on the combined requirements of Squaw Creek Reservoir and the fossil-fueled power plants which will also derive their cooling water supply from the lake.

Under these conditions, which are believed to be highly conservative, the studies show that Lake Granbury would provide a firm yield of 70,000 acre-feet per year by utilizing only the upper 51 percent of the available conservation storage volume.

2.4.11.2 Low Water Resulting From Surges, Seiches or Tsunamis

Not applicable (See Sections 2.4.5 and 2.4.6).

2.4.11.3 Historical Low Water

The extreme variability of flow in the Brazos River is depicted through a flow probability curve (Figure 2.4-24), which shows that the average discharge of 1,555 cfs at gaging station 8-0910 is equalled or exceeded only about 17 percent of the time [27]. This flow is modified by regulation of water by upstream reservoirs which tend to decrease the variability. The impact that upstream control has had upon flow extremes is indicated from data which show that the Brazos River was known to dry up completely before construction of Possum Kingdom Reservoir and from Figure 2.4-25 which shows the lessening of annual flood events subsequent to Possum Kingdom Reservoir.

Squaw Creek has not been gaged long enough to allow a direct measure of flow variability, but indirect generalization of variability is gained by comparison with the Paluxy River. A flow probability curve for the Paluxy River is illustrated in Figure 2.4-25, which shows that the average discharge of 70.8 cfs was exceeded only about 11 percent of the time. Since the SCR catchment size is only about 16 percent that of the Paluxy watershed at gaging station 8-0915, this variability will be much more pronounced. Thus, inflow from Squaw Creek will be extremely variable.

Lake Granbury and SCR will serve to regulate the naturally variable flows and provide suitable minimum water levels on a dependable basis.

The Lake Granbury yield discussed in 2.4.11.1 above is based on not drawing that reservoir below elevation 675.0 [26]. The normal operating level in SCR will be held not less than elevation 770.0 feet.

2.4.11.4 Future Control

Development of additional control on the upriver sections of the Brazos River is possible; an initial study of potential reservoirs by the Brazos River Authority [40] identified three possible sites between Possum Kingdom Reservoir and Lake Granbury. These sites are briefly outlined on Table 2.4-3. Any one of these possible developments would increase storage availability and should strengthen water availability.

Downstream of DeCordova Bend Dam there is a possible reservoir site at Bee Mountain. The water at maximum level would be elevation 609 feet [40] and would impound the Brazos River channel almost to DeCordova Bend Dam. It would be technically feasible to withdraw water from that lake also, offering an additional source of makeup water.

Under the Water Rights system of the State of Texas, issuance by the Texas Water Rights Commission of the permit to build and operate SCR precluded any further significant development and control upstream on Squaw Creek watershed itself.

2.4.11.5 Plant Requirements

The single source of safety-related cooling water and the ultimate plant heat sink for the Comanche Peak Nuclear Power Plant (CPNPP) is the SSI. This reservoir contains a volume of water, including evaporative contingency, that is sufficient to provide cooling for a period of over 30 days without makeup to safely limit the effects of an accident in one unit, to permit the safe shutdown of the other unit, or simultaneous shutdown of both units and maintaining them both in

a safe shutdown condition. The available volume of water is determined during postulated 100-yr drought conditions as specified by NRC Regulatory Guide 1.27 and after a postulated 40 years of sedimentation. The minimum safety-related cooling water flow required for the two units during accident operation is 34,000 gpm, which represents the cooling water requirements of 17,000 gpm for post-LOCA cooling of one unit and 17,000 gpm for safe shutdown of the other unit. Expected safety-related cooling water flow is 51,000 gpm, which represents 17,000 gpm for post-LOCA cooling of one unit and 34,000 gpm for safe shutdown of the other unit. Plant water requirements for all modes of operation are given on Figures 2.4-26, 2.4-27, 2.4-28, and 2.4-29.

Cooling water for both units is withdrawn from the SSI and delivered by four 17,000-gpm-capacity station service water pumps enclosed in a seismic Category I structure, the Service Water Intake Structure. The Service Water Intake Structure sump descends to elevation 755 ft 0 in, and the service water pump impeller blades descend to elevation 758 ft 0 in. Each pump is designed to operate with a minimum submergence requirement of 4 feet - 6 inches above the bellmouth flare (El. 757 ft). As a result, a minimum water elevation of at least 761 ft 6 in is necessary for service water pump operation. The minimum water elevation, considering no makeup of water and the most severe period for evaporation described in Section 2.3.1.2.10, is 766 ft 4 in. at 30 days and 765 ft. 4 in. at 39 days. Therefore, substantial margin for submergence is provided.

Cooling water is returned to the SSI through the Service Water Discharge Structure. Water from this structure enters the SSI at a point remote enough from the Service Water Intake Structure and at a velocity high enough to ensure adequate mixing, dispersion, and evaporative cooling of the effluent. The station service water pumps, Service Water Intake Structure, and Service Water Discharge Structure are described in Section 9.2.1.

The SSI is formed from an inlet of the Squaw Creek Reservoir (SCR) and is separated from the reservoir by a seismic Category I dam. The surface elevation of both bodies of water is a minimum 770 ft 0 in during normal operation. The seismic Category I dam, however, will maintain the SSI at a surface elevation of 769 ft 6 inches in the event of an accident involving water loss from the SCR. The ultimate Heat Sink is described in Section 9.2.5.

The SSI is constructed specifically to serve as the ultimate heat sink for the CPNPP. Except for a backup source for auxiliary feedwater (Section 10.4.9.3), there are no other uses of this water during accident and safe shutdown operations. Water rights to the SSI are guaranteed by the Texas Water Rights Commission. For use of water near the plant site, see Subsection 2.4.13.

2.4.11.6 Heat Sink Dependability Requirements

The source of plant cooling water for the CPNPP is the SCR. This reservoir is formed by a dam structure extending across the Squaw Creek and creating a cooling water impoundment in the Squaw Creek Basin behind it (see Figure 2.4-4). The impoundment is normally supplied with makeup water from Lake Granbury. In addition, water is exchanged, as necessary, between Lake Granbury on the Brazos River and the SCR to reduce total dissolved solids levels.

The single source of safety-related cooling water is the SSI, which functions as the ultimate heat sink for the CPNPP. The SSI is formed from an inlet of the SCR and separated from it by a seismic Category I dam. A canal connects the SSI with the SCR and maintains an equal water level between the two bodies of water. The seismic Category I dam and canal maintain the water level of the SSI at 769 ft 6 inches in the event of accidental water loss from the SCR. Waterflow

through the canal will stop at this elevation. A simultaneous failure of both the SCR dam and the SSI Dam is considered unlikely since the SSI Dam is a seismic Category I structure.

Cooling water for normal plant operation is withdrawn from the SCR by eight 275,000-gpm-capacity circulating water pumps. Each pump is a 25-percent-capacity unit, and all pumps are located in the Circulating Water Intake Structure. Each pump has impeller blades which extend to elevation 758 ft 0 in and to a minimum submergence requirement of 12 ft. The circulating water pumps are not required for plant shutdown.

Cooling water is returned to the SCR via the Circulating Water Discharge Structure. The structure discharge is located at an adequate distance from the Circulating Water Intake Structure to ensure sufficient water mixing and evaporative cooling.

Safety-related cooling water is withdrawn from the SSI by four 17,000-gpm-capacity service water pumps. All pumps are located in the Service Water Intake Structure, a seismic Category I building. Safety-related cooling water is returned to the SSI through the Service Water Discharge Structure. The discharge structure is located at a sufficient distance from the Service Water Intake Structure to ensure adequate water mixing and evaporative cooling.

The minimum water level of both the SCR and the SSI during normal plant operation is 770 ft 0 in. This water level is adequate for both circulating water pump and station service water pump operation. During postulated 100-year drought conditions, and after 40 years of sedimentation, the SSI is determined to have 284 acre-ft of water.

Figures 2.4-26 through 2.4-29 describe cooling water requirements for the various modes of plant operation. Section 9.2.5 discusses design bases and safety functions of the SSI as the CPNPP ultimate heat sink.

The anticipated loss from the SSI caused by evaporation is 92 acre-feet. The seepage and drift loss is negligible in comparison to the evaporation losses. Instrumentation, which is read in the Control Room, is provided to measure the SSI water level as shown on Figure 9.2-1. An alarm is provided in the Control Room for low SSI water level and high differential level across the travelling screens. The low level alarm is set at or above the normal low SSI water level as desired by the operator as an aid for lake level management. The SSI will be dredged as required.

The CPNPP design of the SSI as the single ultimate heat sink complies with the intent of NRC Regulatory Guide 1.27 as discussed in Chapter 1, Appendix 1A(B).

The SSI is the source of fire protection storage tank emergency fill water. SSI level changes caused of the Fire Protection System are insignificant since the system is used infrequently and for periods of short duration. Refer to Section 9.5.1 for a description of the Fire Protection System.

Cooling water is withdrawn from the SSI at the Service Water Intake Structure. Elevations of intake structure pump deck and channel floor are established with due consideration for pump minimum submergence requirements and reservoir level fluctuations. For elevations and layouts of Service Water Intake Structure components, see Section 9.2. Plant water requirements for various modes of operation are given in Figures 2.4-26, 2.4-27, 2.4-28, and 2.4-29.

2.4.12 DISPERSION, DILUTION, AND TRAVEL TIME OF ACCIDENTAL RELEASES OF LIQUID EFFLUENTS IN SURFACE WATERS

2.4.12.1 Introduction

[redacted]

[redacted]

It was conservatively assumed that all the liquid radwaste (24,000 gallons, or 7.36 x 10^{-2} acre-feet) is spilled into Squaw Creek Reservoir. Minimum dilution in Squaw Creek Reservoir would occur at minimum pool elevation 770.00 feet (msl), corresponding to a storage volume of 135,062 acre-feet. Assuming complete mixing, the minimum dilution factor is 135,062⁄(7.36 x 10-2) or 1.84 x 106.

The instantaneous concentrations in Squaw Creek Reservoir are calculated by dividing the concentrations in the tank by the dilution factor. Due to the decay characteristics of the radionuclides, most concentrations decrease with time, however, some radionuclides build up in the reservoir as decay products. A computer code, RADIOISOTOPE, described in Appendix 15B Section 15B.6, was used to calculated the decayed concentrations. The concentrations of each radionuclide in Squaw Creek Reservoir at the end of 1 day, 1 month and 1 year is shown in Table 2.4-21. Since the intent of the analysis is to demonstrate that the concentrations of radionuclides in the reservoir do not exceed the effluent concentrations for unrestricted areas given in 10CFR20 Appendix B, the total effluent concentration fraction is also given for each of the above time periods. The results demonstrate that the water volume of the reservoir provides sufficient dilution, and that most of the activity would decay away after one month.

The water usage pathways involving Squaw Creek Reservoir indicate that a portion of the reservoir inventory may be transferred to Lake Granbury and Lake Whitney. This transfer would provide for additional dilution of radionuclides due to the added water volumes, and it is expected that the concentrations of radionuclides in Lake Granbury and Lake Whitney would be much lower than those in Squaw Creek Reservoir. The flow pattern which exists among these bodies of water, and the overall potential for further dilution of Squaw Creek Reservoir concentrations provided by those other two lakes is more fully addressed in Appendix 11A.

2.4.13 GROUNDWATER

The investigation of groundwater features included:

1. A review of groundwater information obtained from public agencies and from literature.

2. A field inventory of all wells used for water supply within two miles of the site and reservoir fringe.

3. A review of municipal, industrial, and irrigation wells within 20 miles of the site.

4. Measurements of water levels in several exploratory borings which were drilled to obtain geologic, geohydrologic, and foundation data.

5. The evaluation of the probable influence SCR and CPNPP will have on the quality and piezometric level of groundwater in the site vicinity.

[General References 29, 30, 31, 32].

2.4.13.1 Description and On-Site Use

2.4.13.1.1 General Groundwater Features

The CPNPP site is located within the Great Plains Physiographic Province, about 4 1/2 miles north of Glen Rose, Texas, and approximately four miles west of the Brazos River. The power plant site is on a relatively narrow ridge which trends east-southeast and is flanked on the north and south by the SCR (Figure 2.1-2). Topography in the site vicinity ranges from slightly undulating to stair-stepped. Ground surface near the site ranges from elevations 600 to 700 feet (Mean Sea Level Datum) in valleys to elevations 900 to 1000 feet on ridges. The Brazos River channel a few miles east of the site is at approximate elevation 560.

The site is underlain by a sedimentary rock sequence which, at the surface, has been weathered to a clayey, silty, sandy overburden soil with some rock fragments. Overburden on the ridges and slopes ranges in thickness from a few inches to a few feet and rock outcrops are common. The soils and much of the rock are relatively impermeable. In valley bottoms, rock is overlain by a combined thickness of alluvial sediments and underlying residual soil. Total overburden ranges from 10 to 15 feet in depth. The sediments are of minor thickness and vary from slightly permeable to essentially impermeable.

In the site area, including the floodplain, infiltration into subsurface formation is retarded because of low permeability of the strata. Most precipitation flows across the surface and drains away as surface runoff or returns to the atmosphere by evaporation and transpiration. Water-bearing strata in the area are mainly recharged in their outcrops areas.

Data from a nearby gaging station on the Paluxy River indicate that the net surface runoff and base flow (which is derived from shallow groundwater) together total some two inches annually. Evaporation from a free water surface, such as a lake, is approximately 72 inches per year [33].

Most of the groundwater in the site region occurs in bedrock. Some water does exist in shallow floodplain alluvium in stream valleys, but is not withdrawn for use. Regional bedrock aquifers in order of increasing age are the Paluxy, Glen Rose and Twin Mountains formations, of the Comanche series, Cretaceous age [34]. Locally, CPNPP and SCR are on the Glen Rose outcrop, which, in turn, is underlain by the Twin Mountains Formation. The Paluxy Formation is absent at the CPNPP location, and within the limits of the reservoir; the Glen Rose Formation is the upper stratigraphic unit exposed in these areas.

The structure, stratigraphy, and composition of the three strata are described in detail in Section 2.5.1. A geologic cross section representing the approximate orientation of these strata near the site is shown on Figure 2.5.1.2-5 (see upper right portion of cross section). The

approximate limits of formation outcrops in the counties surrounding the site are shown on Figures 2.4-30, 2.4-31 and 2.4-32.

The Paluxy, Glen Rose, and Twin Mountains formations are large in area. Their outcrops form a strip of land tens of miles wide that extends south from Central Oklahoma, strikes westward in Central Texas, and extends into Mexico [35]. The formations in the site region dip eastward.

The Twin Mountains and Paluxy formations are principally sandstone, but also have shale, limestone, claystone, and siltstone inclusions. Limestone is the dominant rock type within the Glen Rose Formation, but it also contains significant quantities of shale, siltstone and claystone. In these formations, groundwater percolates slowly along bedrock joints and fractures, and through interstices in the rock fabric.

The Twin Mountains is the only relatively productive bedrock zone in the site vicinity. The Paluxy Formation has nominal pumpage near the site and the Glen Rose Formation yields very little water in the site area and is usually less productive than the other formations.

At distances of 20 to 50 miles downdip from the outcrop, the groundwater becomes saline and the formations lose their importance as sources of fresh water [36]. The three formations are discussed individually in succeeding sections.

2.4.13.1.2 Twin Mountains Formation

A detailed description of the lithology, stratigraphy, and structure of the Twin Mountains Formation is given in Section 2.5.1. The formation is predominantly sandstone with subsidiary shale, claystone, siltstone, and limestone.

The principal origins of the groundwater within the Twin Mountains Formation are rainfall and streamflow occurring in the outcrop area (Figure 2.4-32).

Downdip from the outcrop, groundwater in the Twin Mountains Formation is confined by fine-grained materials in the overlying Glen Rose Formation. Hydrostatic pressure in the Twin Mountains is great enough to create static water levels which rise above the formation and, sometimes, great enough to cause flowing wells. The piezometric level measured in this formation at the site in Boring P-10 is approximately elevation 670, about 60 feet above the formation surface.

Groundwater is discharged in the outcrop area by evapotranspiration and localized springs and seeps along drainages incised below the water table. Downdip (where the formation is confined, such as at CPNPP site), natural discharge is limited to a minimal upward movement into overlying formations.

Although the Twin Mountains Formation is a moderately productive stratum in the site vicinity, two packer pressure tests of 60 feet of this rock in a boring at the CPNPP site did not result in water take. This test indicates that there are essentially impermeable rock zones within this formation.

2.4.13.1.3 Glen Rose Formation

This formation is predominantly limestone, but significant amounts of shale, siltstone and claystone are also present. A full description of the geology of the Glen Rose Formation is presented in Section 2.5.1.

The principal origins of groundwater in the Glen Rose Formation are rainfall on the outcrop area and minor seepage from the overlying Paluxy Formation and underlying Twin Mountains Formation. The Glen Rose Formation outcrop area is shown on Figure 2.4-31.

CPNPP and SCR is constructed on the Glen Rose Formation; thus the character and rate of groundwater movement in this formation is of special interest. The Glen Rose limestones are essentially impermeable due to slight amounts of argillaceous impurity and are thus resistant to solution effects. Open voids, caverns, joints, collapse features, and frequent fractures common to some limestones are notably absent in the Glen Rose Formation at the site; therefore, the groundwater moves very slowly through and into the Glen Rose Formation, principally through the joints and fractures that do exist. Occasional isolated sand lenses also contain groundwater.

Detailed examination of cores from borings revealed no solutioning features and minimal fractures. Packer pressure tests in the Glen Rose Formation performed in most borings at the station, SSI Dam and spillway, and Squaw Creek dam and spillway incurred essentially no “water take” in rock beneath the upper, usually thin, weathered zone. Pressure tests were performed within the rock in many borings to evaluate jointing and/or the absence of solutioning features and to evaluate general permeability characteristics. Tests employed single and double packers and gage pressure ranging to 80 psi. The results of packer tests are presented on Table 2.5.6-1. Only zones at a depth range of 194 feet to 214 feet (elevation 649.04 to 629.04 feet) recorded any water loss. Upon review of the Log of Boring for Boring P-10, the cause of the water losses can be attributed to a zone of sandstone and sand lenses.

Drill water occasionally was lost while drilling through the upper weathered zone. A relatively thick pervious zone was encountered in Borings DI-8 and DI-9, approximately 1 1/4 miles southeast of the station. These borings are at the middle to outer extremity of a peninsula which will form the south abutment for Squaw Creek Dam. There, a large amount of drill water was lost while advancing Boring DI-8 to 56 ft and DI-9 to shallower depth through some zones of weathered, fractured rock. Indications were that water loss occurred principally within the upper 20 to 30 feet of each boring. There is no evidence of solutioning in the zone of water loss. Boring DI-10, drilled farthest from the peninsula point, incurred no drill water loss, thereby indicating that conditions improve southward along the peninsula.

Northwest of the site, where the Glen Rose Formation is covered by outliers of the Paluxy Formation, a few domestic water wells are completed in the Glen Rose Formation. These wells produce potable water and they are reliable during droughts; this reliability is due to the slow release of groundwater to the Glen Rose Formation from the overlying Paluxy Formation. Elsewhere, wells completed in the Glen Rose Formation are often unreliable during droughts.

In its outcrop areas, the Glen Rose Formation discharges water naturally through springs and seeps. In the confined portions of the formation, when differential hydraulic pressures occur, there is very minor transfer of water into overlying and underlying formations from the Glen Rose Formation.

2.4.13.1.4 Paluxy Formation

This formation is predominately sandstone, but shale, siltstone, claystone and limestone are also present. A detailed description of the lithology, stratigraphy and structure of the Paluxy Formation is given in Section 2.5.1. The Paluxy Formation is not present at the CPNPP and SCR locations.

Recharge to the Paluxy Formation occurs in the outcrop areas as a result of infiltration of rainfall and of seepage from streams.

It also receives water from water-bearing units under greater hydraulic head which adjoin the Paluxy Formation. Figure 2.4-30 shows the outcrop area of the Paluxy Formation. South of the CPNPP site, across the Paluxy River, the formation is confined by overlying fine-grained bedrock strata. These strata are not of significance to CPNPP.

Groundwater discharges from the Paluxy Formation as springs and seeps in some outcrop areas. Where the formation is confined, there is limited water movement into overlying confining units if those units are at lower hydraulic head.

2.4.13.1.5 Onsite Water Table

Following the subsurface exploration program, a number of the borings were used to determine water levels. Of these borings, P-10 was completed in the Twin Mountains aquifer; the piezometric water level in that boring is elevation 670. The remainder of the borings monitored for groundwater were completed in the Glen Rose Formation. Static water levels observed in these borings are presented in Figure 2.5.5-77 and range from elevation 749 to 830.

As indicated in Section 3.8.5.1.5, groundwater is not expected to reach higher than elevation 775.0 feet. All piezometric levels recorded on Figure 2.55-77 were measures of perched water in the upper zone of the Glen Rose Formation in the immediate area of each piezometer. The resulting elevation range of 749 to 830 feet is attributed to surface run-off and not a true measure of permanent groundwater in the Formation.

Water levels in the Glen Rose Formation are expected to show some variation in response to seasonal climatic changes; those in the Twin Mountains Formation will be much less influenced by seasonal conditions because of the distance from the recharge area.

Piezometers which measured the levels recorded in Figure 2.5.5-77 were installed during preliminary design work at the site, before the site was excavated to plant grade (elevation 810). A permanent system of piezometors has been installed in order to monitor ground water levels at the site. This program is described in Section 2.5.4.13. A Groundwater Monitoring Program is established and incorporates several sentinel wells in various locations throughout the plant site for prompt identification of potential radiological release source locations.

2.4.13.1.6 Water Quality

Potable groundwater occurs in the Twin Mountains, Glen Rose and Paluxy formations. The results of chemical analyses of groundwater obtained from wells drawing from these formations are summarized in Table 2.4-22. (Well locations are shown on Figure 2.4-33).

Water in the Twin Mountains Formation is a sodium bicarbonate type with a dissolved solids content varying generally from 200 to 900 mg/1. In and near the outcrop areas, Twin Mountains water is used for irrigation. At the site, however, the water is unsuitable for irrigation due to the local soil conditions and the increased sodium content of the water. The results of physical and chemical analyses performed on the samples taken from the production and observation wells during the years of 1975-76 are presented and discussed in the Environmental Report/Operating License Stage (ER/OLS). The sodium content of the water samples ranges from 100 to 150 mg/1, with dissolved solids content varying from 300 to 500 mg/1. The temperature of groundwater follows the seasonal atmospheric average temperature values, and ranges from 20° to 26°C (68° to 79°F). The conductivity values vary between 550 to 1300 mhos.

The quality of water obtained from the Glen Rose Formation is variable; in localized areas it is not potable. Northwest of the site, water is produced from the Glen Rose Formation where it is capped by an outlier of Paluxy Formation. The analysis from well No. 48 is an example of the water quality obtained from this area. The chemical analysis from well No. 48 is presented in Table 2.4-22.

The Paluxy Formation is tapped by some domestic water wells south of the Paluxy River. The chemical analysis of water from a well five miles east of Walnut Springs in Bosque County is shown in Table 2.4-22. This well is located close to the outcrop area of the Paluxy Formation, where the water is typically a hard calcium bicarbonate type. Further downdip, the water becomes a progressively softer, sodium bicarbonate type.

2.4.13.1.7 Onsite Water Uses

Groundwater usage on the site is presented in Table 2.4-23. Continuous usage will be about 127 gpm and the peak plant requirement is estimated to be 330 gpm. Alternate source of supply of water for this usage will be from the surface water pre-treatment system.

2.4.13.2 Sources

2.4.13.2.1 Regional Use

1. Paluxy and Glen Rose Formations

   Groundwater is pumped from the Paluxy and Glen Rose formations by small-capacity wells for livestock and rural domestic use. Pumpage is not metered within the region. Withdrawals from both formations, however, are estimated to be less than 100 acre-feet per year. Water extraction from these formations has no identifiable effect on regional piezometric levels. Groundwater use is not expected to increase significantly in the future because these formations are poor aquifers and will probably not be developed for water supply by either cities or industries or for large scale irrigation. More favorable water supplies are available from surface sources or from the Twin Mountains Formation.

   The regional movement of water in the Paluxy and Glen Rose formations is downdip to the east. The hydraulic gradient in the Paluxy is about 20 feet per mile in downdip areas. The rate of regional groundwater movement is estimated to be on the order of one foot per day or less in the Paluxy Formation.

Because groundwater in the Paluxy is used only for domestic and livestock purposes in rural areas, wells are usually of small pumping capacity, typically under 10 gallons per minute or less. It is estimated that maximum potential well yield in the region is probably under 50 gallons per minute.

There are few wells withdrawing water from the Glen Rose Formation. This formation typically is not capable of supplying more than about 10 gallons per minute to wells. Water levels in the Glen Rose fluctuate in response to precipitation, and some wells in the Glen Rose are reported to have failed during certain droughts.

Generally, water use from the Paluxy and Glen Rose formations is small and individual wells are of very limited capacity. The aquifers are variable in their hydraulic characteristics and also in the quality of water they yield. As a result, no significant development of these sources of groundwater is anticipated.

2. Twin Mountains Formation

Prior to 1880 there was relatively little groundwater development from this formation. Since the early 1900's pumpage has increased to include wells from municipal, industrial and irrigation purposes.

The Twin Mountains Formation is the primary source of groundwater used in the region although this use is not extensive.

Principal wells in the area, i.e., public supply, irrigation and industrial, which are within 20 miles of the site, are listed on Table 2.4-24 and locations are shown on Figure 2.4-33. Texas Water Development Board studies [37] indicate that current annual pumpage from the Twin Mountains Formation is about 100 acre-feet per year within a 20-mile radius of the site. By the year 2020, the total pumpage is projected to be not more than 200 acre-feet per year.

The groundwater movement is downdip to the east (Figure 2.4-34), at a rate of approximately two feet per day. The current piezometric gradient is about 20 feet per mile. Permeability of the formation ranges from 90 to 240 gallons per day per square foot [34].

The recharge area (outcrop area) is shown on Figure 2.4-32. Because the site is near the recharge area and because of the relatively small projected amount of future pumping, no significant change in groundwater level is expected in the site vicinity during the life of the plant.

2.4.13.2.2 Local Use

All water wells within a two-mile radius of the site were inventoried. In addition, information was gathered on water wells in and adjacent to the planned impoundment. The locations of wells in the vicinity are shown on Figure 2.4-35. The well data are listed on Table 2.4-25. All wells in the site vicinity are of small capacity and are used for individual rural home and livestock requirements. With few exceptions, all are deep wells, completed in the Twin Mountains aquifer.

To the north of the site, a few wells are completed in the Glen Rose Formation. The presence of adequate and reliable supplies of groundwater in the Glen Rose Formation is dependent on a sandstone cover (the Paluxy Formation). This sandstone cap results in prolonged percolation to the Glen Rose and results in relatively high water levels, even during drought conditions.

Data collected on local water levels has permitted mapping of the Twin Mountains piezometric surface in the site area; this map is shown on Figure 2.4-36, which is more detailed than the regional map, Figure 2.4-33.

Two production wells (PW-1 and 2), and three observation wells (OB-1, 2 and 4) are constructed onsite and their locations are shown in Figure 2.4-37. Observation well No. 3 was an existing well in the plant property. All these wells tap water from Twin Mountain Formation. Pumping tests were run PW-2 as the pumped well and PW-1 as observation well. From these tests a coefficient of transmissibility of 12,000 gpd/ft and a storage coefficient of 0.00005 were calculated.

Using these aquifer characteristics and a pumping rate of Q = 100 gpm, a series of drawn-down curves in relation to distance and time are plotted (Figure 2.4-38).

To satisfy water demands during construction, pumpage has occurred in the production wells. The pumpage rates for 1975 are presented in Table 2.4-26. These figures show that the average pumping rate was about 150 to 160 gpm. The hydrographs of observation wells during this pumpage are shown in Figure 2.4-39. The early measurements made in OB-4 indicate an abnormally high water level and sudden change in the level from August to September. This abnormality and change may be due to incomplete development of the well after completion. Each of these wells is sampled by pumping once a month as part of the quality monitoring program. Therefore, OB-4 may have been further developed by the pumpage and by the removal of any obstruction.

The average effect on the water levels of the observation wells due to plant pumpage is approximately nine feet. The hydrograph of the observation wells indicates that water levels from September to December have remained fairly constant. This constancy begins after approximately 200 days of pumpage, which conforms to the distance draw-down curves where the greatest amount of draw-down occurs in the first 180 days.

Operational pumpage of the plant will be 127 gpm on continuous basis. The peak plant requirement is estimated to be 330 gpm for a short time period. The alternate source of water supply is the surface water pre-treatment system taking raw water from Squaw Creek Reservoir. This minimizes the effects of operational pumpage on draw-down. The nearest boundary line of the project area to the production wells is more than one mile. From the draw-down curves presented in Figure 2.4-38, it can be estimated that draw-down due to 34.5 gpm continuous pumpage during the life of the plant (40 years) will not be more than 2.5 feet at the boundary line. In case of 330 gpm peak pumpage rate, the temporary draw-down will be 3.3 feet for one day pumpage and 7.25 feet for three days pumpage at the same location.

Historical groundwater levels around the plant site can be estimated from the records of four Texas Water Development Board observation wells in Somervell County. The locations of these wells are also shown in Figure 2.4-37 and their records are presented in Table 2.4-27. The records indicate a fluctuation of levels and also localized cones of depression.

Based upon the geohydrologic characteristics at the site, it is estimated that the piezometric level in the Twin Mountains Formation will be depressed locally due to pumpage from the production wells, but without adverse effect on the station or the existing wells withdrawing water from the formation. Within the Glen Rose Formation, water levels will not be affected due to this pumpage.

All wells and borings in the impoundment area are grouted and sealed to insure no direct intrusion of reservoir water into subsurface aquifers.

2.4.13.3 Accident Effects

2.4.13.3.1 Introduction

[redacted]

[redacted]

The Auxiliary Building is founded in the Glen Rose limestone which is an essentially impermeable formation (see section 2.4.13.1.3). No ground water was encountered during excavation into the Glen Rose limestone for the plant foundations. However, during design validation efforts, it was determined that perched water may exist at elevations higher than 775'-0". This condition was created by the excavation and backfill process associated with buried piping ductbanks and the service water intake structure when backfill was placed using pervious material. This arrangement allows surface runoff to be trapped in the pervious zone (backfilled area) thus raising the local water level (called perched water level) above elevation 775'-0". This ground water therefore, is not hydraulically connected to the Twin Mountains aquifer which is approximately 200 feet below plant grade. Design Basis groundwater level for lateral forces on the plant structures is conservatively taken as 810'-0" except at the Service Water Intake Structure. It is expected that the ground water gradient will be from the reservoir toward the plant site, thus restricting the movement of any released liquids above elevation 810'-0" to predominantly vertical flow. A buildup in the ground water level through percolation of rainfall over the plant site into the essentially impervious limestone is considered unlikely. Therefore, because mounding due to percolation is highly unlikely, it is correspondingly improbable that recharge in the plant area would increase the potential for outward horizontal flow toward the reservoir. If the released liquid could travel horizontally through the Glen Rose limestone, it would enter Squaw Creek reservoir. The ability of the surface water regime to dilute and disperse such releases is discussed in Section 2.4.12.

In order to evaluate the effect of a postulated accident on the Twin Mountains aquifer, a conservative mathematical model with simplifying assumptions was used to model the dispersion of the liquid through the Glen Rose limestone down to the top of the Twin Mountains aquifer.

2.4.13.3.2 Description of the Model

The dispersion and decay of the radionuclides within the Glen Rose limestone was evaluated using the model described briefly below.

The governing equation employed in this one-dimensional dispersive and convective model may be written as follows:

$$\frac{\partial}{\partial t}(R^j C_j) + \frac{\partial}{\partial x}(UC_j) = S^j + \frac{\partial}{\partial x}\left\{Dx^j \frac{\partial C_j}{\partial x}\right\} - R\lambda^j jC_j$$

where

C_j is the concentration of the chemical species j;

R^j is the retardation factor for the species j, comprising adsorption, ion exchange, precipitation, colloid filtration and irreversible mineralization;

U is the groundwater velocity in the x-direction;

S^j is the source term for chemical species j;

D_x^j is the dispersion coefficient for species j is the x direction;

λ^j is the decay coefficient for species j (also given by $1n2/T^{1/2}$ where $T^{1/2}$ is the radionuclide half-life);

x is the distance in the x-direction; and

t is the elapsed time.

This governing equation is solved by a numerical model which employs a partly implicit solution procedure to predict chemical species concentrations as a function of space and time.

The discretized form of the governing equation is obtained by integration over control volumes defined by a numerical grid set up for the region of interest.

2.4.13.3.3 Selection of Parameters

1. Initial and Boundary Conditions

Initial and boundary conditions must be supplied to the numerical model in order to complete the mathematical specification of the problem. The initial conditions designate the distribution of radionuclides over the entire solution domain at the commencement of the analysis. In this problem, zero concentrations were specified everywhere initially.

Boundary conditions represent variations of the concentrations, the concentration fluxes, or a combination of these, at the boundaries of the domain. In the case being considered, the lower boundary condition was specified as a zero gradient boundary. That is, the radionuclide concentrations just within the upper part of the Twin Mountains aquifer were considered to be identical to those just within the lower part of the Glen Rose limestone; i.e., the radionuclides are transported by convection alone. The upper boundary coincides with the base of the storage tank. The upper boundary condition was therefore the radionuclide source of the concentration contained in the tank.

2. Reduction Factor

The reduction factor was conservatively assumed to be equal to 1, implying that no retardation in movement or interaction between radionuclides and soil occurs.

3. Initial Flow Velocity

The initial flow velocity of radionuclides out of the base of the tank is limited by the capacity of the soil to absorb the flow; i.e., the saturated vertical permeability of the Glen Rose limestone. The permeability value was estimated from packer-test data to be:

$$k = 2.8 \times 10^{-2} \text{ ft/day.}$$

4. Dispersion Coefficient

The equation given by Fried and Combarnous (43) can be utilized in the calculations:

$$Dx = D_o [0.67 + 0.5(U_x d_{50}/D_o)1.2]$$

where d_{50} is the mean particle size (ft), U_x is the groundwater velocity (ft/day), and D_o is the molecular diffusion in bulk water (ft^2/day). D_o is equal to approximately 9.7×10^{-4} ft^2/day. Letting the groundwater velocity go the zero, and changing units yields:

$$D_x = 0.0004 \text{ cm}^2\text{/minute}$$

Another value reported for the soils similar in dispersion characteristics is the value given in Reference 44, which is:

$$D_x = 0.0028 \text{ cm}^2\text{/minute}$$

Taking the geometric average of these two values as a conservative approximation of the dispersion coefficient yields:

$$D_x = 0.001 \text{ cm}^2\text{/minute} = 1.6 \times 10^{-3} \text{ ft}^2\text{/day.}$$

5. Decay Coefficient

The decay coefficient, λ^j, is calculated from known half-life values for each of the radionuclides of concern.

6. Source Term

The source term, S^j, is calculated from the known curie content of the tank, and the volume of fluid within the tank, assuming that the entire base of the tank ruptures instantaneously.

2.4.13.3.4 Computation Results

The analysis showed that only one radionuclide, CS-137, penetrated the entire 150-foot depth of the Glen Rose Limestone to reach the Twin Mountains aquifer below. To illustrate the dispersion of the major radionuclides of concern, the results for those with the greatest release concentrations and longest half-lifes have been tabulated in Table 2.4-28. This table illustrates the maximum depth to which significant concentrations penetrate. Concentrations of less than 10^{-13} μ Ci/ml (2.83 x 10^{-15} Ci/ft^3) were considered insignificant.

CS-137 is shown to penetrate the entire 150 feet in 400 years; therefore, more detailed results are presented for this radionuclide in Table 2.4-29. This table shows the concentrations of CS-137 throughout the limestone as a function of time. This conservative analysis calculates the maximum concentration of any radionuclide anywhere in the groundwater to be 4.8 x 10^{-12} μ Ci/ml as a result of the postulated accident.

2.4.13.4 Monitoring or Safeguard Requirements

No planned releases to the ground water environment will take place at the plantsite. However a Groundwater Monitoring Program exists for early detection of inadvertent releases of radioactive material. Pertinent information is provided in Section 6.1 of the Environmental Report.

2.4.13.5 Design Bases for Subsurface Hydrostatic Loading

The lateral pressure (σ) caused by the groundwater at a given point is equal to the unit weight of water (γ) times the vertical distance from the water table to the point at which the pressure is computed (H):

$$\sigma = \gamma H$$

Uplift pressures are similarly computed as H, where H is the vertical distance from the water table to the surface on which the uplift is computed.

No ground water was encountered during excavation and construction of the plant structures. However, during design validation efforts it was determined that ground water or perched water may exist at elevations higher than 775'-0". Therefore, safety-related plant structures are conservatively designed for hydrostatic loads with the design basis ground water level at elevation 810'-0", except for the Service Water Intake Structure. Hydrostatic loads on the SWIS are determined with a design basis ground water level at elevation 793'-0".

There is no dewatering at the site during or after construction.

2.4.14 TECHNICAL SPECIFICATION AND EMERGENCY OPERATION REQUIREMENTS

The most adverse hydrological conditions detailed in the preceding sections do not affect the operation of safety-related facilities. Emergency procedures are required, however, if Squaw Creek Reservoir elevation exceeds 778 feet to ensure that the Electrical and Control Building is not flooded via the Circulating Water System. See Section 13.5 for a discussion of these procedures.

The maximum predicted normal SSI temperature for two unit full power operation is 102°F. Therefore, this is the initial condition assumed in the Station Service Water System (Section 9.2.1), Component Cooling Water System (Section 9.2.2), and Containment Heat Removal (Section 6.2.2) analyses and specified in the Technical Specifications.

The lowest normal SSI elevation is 770 ft. 0 in. as described in Section 2.4.11.5. This elevation is the initial condition assumed in the ultimate heat sink analysis described in Section 9.2.5.

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TABLE 2.4-1
PRINCIPAL DAMS AND RESERVOIRS UPSTREAM OF COX BEND

(Sheet 1 of 4)

White River Dam and White River Reservoir

Location - on White River in Crosby County

Catchment - 172 sq. Mi.

Capacity - 38,600 ac-ft.

Owner- White River Municipal Water District

Use - municipal, industrial, mining

[redacted]

Sweetwater Dam and Lake Sweetwater

Location - on Bitter and Cottonwood Creeks in Noland County

Catchment - 104 sq. miles

Capacity – 11,900 ac-ft.

Owner - City of Sweetwater

Use - municipal and industrial

[redacted]

Fort Phantom Hill Dam and Fort Phantom Hill Reservoir

Location - on Elm Creek in Taylor County

Catchment - 478 sq. mi.

Capacity - 74,310 ac-ft.

Owner - City of Abilene

Use - municipal and recreational

[redacted]

TABLE 2.4-1
PRINCIPAL DAMS AND RESERVOIRS UPSTREAM OF COX BEND

(Sheet 2 of 4)

<u>Stamford Dam and Lake Stamford</u>

Location - on Paint Creek in Haskell County

Catchment - 360 sq. mi.

Capacity - 53,070 ac-ft.

Owner - City of Stamford

Use - municipal and industrial

[redacted]

<u>Hubbard Creek Dam and Hubbard Creek Reservoir</u>

Location - on Hubbard Creek in Stephens County

Catchment - 1,107 sq. mi.

Capacity - 317,800 ac-ft.

Owner - West Central Texas Municipal Water District

Use - municipal, mining and industrial

[redacted]

<u>Gonzales Creek Dam and Lake Daniel</u>

Location - on Gonzales Creek in Stephens County

Catchment - 115 sq. mi.

Capacity - 10,000 ac-ft.

Owner - City of Breckenridge

Use - municipal and industrial

[redacted]

TABLE 2.4-1
PRINCIPAL DAMS AND RESERVOIRS UPSTREAM OF COX BEND

(Sheet 3 of 4)

Graham Dam and Lake Graham

Location - on Salt Creek in Young County

Catchment - 205 sq. mi.

Capacity - 53,680 ac-ft.

Owner - City of Graham

Use - municipal and industrial

[redacted]

Morris Sheppard Dam and Possum Kingdom Reservoir

Location - on Brazos River at River Mile 687 in Palo Pinto County

Catchment - 13,310 sq. mi. contributing area.

Capacity - 600,000 ac-ft. (original capacity was 724,700 ac-ft., but sedimentation had reduced capacity to 600,000 ac-ft. by 1966.)

Owner - Brazos River Authority

Use - municipal, mining, irrigation, power and recreation

[redacted]

Palo Pinto Creek Dam and Lake Palo Pinto

Location - on Palo Pinto Creek in Palo Pinto County

Catchment - 471 sq. mi.

Capacity - 44,100 ac-ft.

Owner - Palo Pinto County Municipal District No. 1

Use - municipal and industrial

TABLE 2.4-1
PRINCIPAL DAMS AND RESERVOIRS UPSTREAM OF COX BEND

(Sheet 4 of 4)

[redacted]

DE Cordova Bend Dam and Lake Granbury

Location - on Brazos River at River Mile 542.5 in Hood County

Catchment - 15,451 sq. mi. contributing area.

Capacity - 155,000 ac-ft.

Owner - Brazos River Authority

Use - municipal, industrial, irrigational and recreational.

[redacted]

Reference: "Report 48, Dams and Reservoirs in Texas, Historical and Descriptive Information," Texas Water Development Board, 1967.

TABLE 2.4-2
PRINCIPAL DAMS AND RESERVOIRS DOWNSTREAM OF COX BEND

Whitney Dam and Whitney Reservoir (Lake Whitney)

Location - on Brazos River at River Mile 442.4 in Hill and Bosque Counties

Catchment - 16,930 sq. mi. contributing area

Capacity - 435,000 ac-ft.

Owner - U.S. Army Corps of Engineers

Use - Power and Flood Control

[redacted]

Note: Although there are many reservoirs downstream of Cox Bend on tributaries of the Brazos River, there are no other structures on the Brazos River.

Reference: "Report 48, Dams and Reservoirs in Texas, Historical and Descriptive Information," Texas Water Development Board, 1967.

TABLE 2.4-3
POSSIBLE FUTURE RESERVOIRS ON BRAZOS RIVER BETWEEN POSSUM KINGDOM RESERVOIR AND LAKE WHITNEY

Name	Location	Water Elevation When Filled (feet)	Storage Volume (acre-feet)
Turkey Creek	Downstream from Possum Kingdom Reservoir	884	159,000
Inspiration Point	Between Turkey Creek and Hightower	820	203,000
Hightower	Upstream of Lake Granbury	752	520,000
Bee Mountain	Between Lake Granbury and Lake Whitney	609	306,000

TABLE 2.4-4

SURFACE WATER CLAIMS FILED (IRRIGATIONAL) - SQUAW CREEK[a]

Applicant	Location of Applicant	Amount Requested (Ac-ft/yr)
Dean Williams	Within Squaw Creek Reservoir in Somervell County near Somervell-Hood County line	30
Carlisle Cravens	Within Squaw Creek Reservoir in Hood County near Somervell-Hood County Line	150

a) This list was derived from the “Water Rights Master File” of the Texas Water Rights Commission. There are no permits for non-irrigational water users on Squaw Creek.

TABLE 2.4-5
MUNICIPAL, INDUSTRIAL, MINING AND HYDROELECTRIC WATER USERS
ON THE BRAZOS RIVER[a]

(Sheet 1 of 2)

User	County	Amount Allocated (ac-ft/yr)	User[b]
Brazos River Authority	Palo Pinto	1,500,000	H
Brazos River Authority	Hood	10,000	M
Brazos River Authority	Hood	70,000	I
General Portland Inc.	Johnson	250	Mi
Harles Williams	Johnson	75	Mi
Texas Power & Light Co.	McLennan	12,000	I
Young Brothers, Inc.	McLennan	20	I
City of Waco	McLennan	5,510	M
City of Waco	McLennan	3,537	R
City of Marlin	Falls	3,500	M
City of Marlin	Falls	2,000	I
Texas A&M University	Burleson	500	I
Richmond Rice Assoc.	Ft. Bend	12,000	I
Brazos River Authority	Ft. Bend	50,000	I
Brazos River Authority	Ft. Bend	25,000	M
General Crude Oil, and Dow Chemical	Ft. Bend	20,000	I
Turner Lumber Co.	Brazoria	265	R
Dow Chemical Co.	Brazoria	260,000	I

TABLE 2.4-5
MUNICIPAL, INDUSTRIAL, MINING AND HYDROELECTRIC WATER USERS ON THE BRAZOS RIVER[(a)]

(Sheet 2 of 2)

User	County	Amount Allocated (ac-ft/yr)	User[(b)]
Troy Dacos	Brazoria	160	R
Robert P. York	Brazoria	1,500	R
City of Freeport	Brazoria	31,360	M

a) This list includes all applications, claims and certified filings which appeared on the "Water Right Master File" of the Texas Water Rights Commission in 1976.

b) Explanation of symbols:

H - Hydroelectric, Mi - Mining, I - Industrial, R - Recreational, M - Municipal.

TABLE 2.4-6

IRRIGATIONAL WATER USAGE FROM BRAZOS RIVER BY COUNTY[a]

County	Amount Allocated (ac-ft/yr)
Palo Pinto	4,400
Parker	3,000
Hood: Brazos River Authority	20,000
Other	2,300
Somervell	500
Bosque	6,900
Johnson	30
Hill	1,400
McLennan	9,100
Falls	6,200
Robertson	13,600
Milan	1,500
Burleson	6,200
Brazos	7,200
Waller	1,300
Grimes	6,000
Washington	50
Austin	90
Ft. Bend	258,000
Brazoria	2,600

a) This list includes applications, claims and certified filings derived from the “Water Right Master File” of the Texas Water Rights Commission during 1976.

TABLE 2.4-7
ANNUAL FLOODS AT BRAZOS RIVER GAGING STATION 8-0910
(NEAR GLEN ROSE)

(Sheet 1 of 3)

Location. 4.4 miles upstream from Paluxy River confluence. 6 miles northeast of Glen Rose at Brazos River Mile 511.

Catchment area. 24,830 sq. mi., approximately; of which about 15,590 sq. Mi. contributes directly to surface runoff.

Gage. Nonrecording at site 2.5 miles downstream prior to May 8, 1931; recording thereafter. At site 2.4 miles downstream May 9, 1931, to Sept. 30, 1957. Present gage used as supplementary flood gage for 1957. Datum of gage is 567.82 ft. above mean sea level, datum of 1929.

Stage-discharge relation. Defined by current-meter measurements.

Bankfull Stage. 20 ft.

Remarks. Stages affected by backwater from Paluxy River at times and, since 1945, by medium-water bridge 2.5 miles downstream. Peaks partly retarded by Possum Kingdom Reservoir since March, 1941.

Average Discharge. 1,555 cfs

Water Year	Date	Gage Height (Feet)	Discharge (cfs)
1924	Oct. 17, 1923	13.0	37,500
1925	May 8, 1925	15.1	45,700
1926	June 21, 1926	13.2	38,300
1927	Oct. 19, 1926	14.0	41,400
1928	May 20, 1928	10.4	27,700
1928	Sept. 12, 1929	13.42	38,400
1930	June 17, 1930	19.6	68,300
1931	Oct. 7, 1930	12.18	31,700
1932	Sept. 10, 1932	16.37	49,300
1933	May 27, 1933	13.19	36,600
1934	Mar. 4, 1934	4.11	5,240
1935	May 18, 1935	23.68	97,600
1936	Sept. 27, 1936	19.42	67,300
1937	June 9, 1937	9.93	22,200
1938	Mar. 29, 1938	15.12	45,200
1939	June 23, 1939	9.85	22,600

TABLE 2.4-7
ANNUAL FLOODS AT BRAZOS RIVER GAGING STATION 8-0910
(NEAR GLEN ROSE)

(Sheet 2 of 3)

Water Year	Date	Gage Height (Feet)	Discharge (cfs)
1940	Aug. 19, 1940	13.62	38,300
1941	Nov. 25, 1940	14.90	44,200
1942	Apr. 26, 1942	19.23	66,400
1943	Oct. 18, 1942	17.47	54,100
1944	May 2, 1944	10.21	24,100
1945	Mar. 30, 1945	13.85	39,200
1946	Sept. 27, 1946	8.24	11,500
1947	Dec. 12, 1946	16.89	38,900
1948	Feb. 25, 1948	8.68	12,500
1949	May 17, 1949	26.7	74,000
1950	July 28, 1950	11.92	20,700
1951	June 18, 1951	5.05	5,680
1952	May 24, 1952	14.19	27,900
1953	May 17, 1953	5.21	5,920
1954	May 15, 1954	17.34	25,600
1955	Sept. 30, 1955	19.74	42,300
1956	Oct. 9, 1955	15.78	30,600
1957	May 27, 1957	33.87[a]	87,400
1958	May 2, 1958	21.00	36,100
1959	July 8, 1959	11.50	8,900
1960	Oct. 5, 1959	28.10	65,500
1961	June 19, 1961	16.80	21,700
1962	July 29, 1962	25.32	50,500
1963	Apr. 30, 1963	13.37	13,100
1964	Sept. 22, 1964	11.01	8,110
1965	May 20, 1965	17.43	23,500
1966	May 3, 1966	25.90	49,800
1967	July 22, 1967	14.19	15,000

TABLE 2.4-7
ANNUAL FLOODS AT BRAZOS RIVER GAGING STATION 8-0910
(NEAR GLEN ROSE)

(Sheet 3 of 3)

Water Year	Date	Gage Height (Feet)	Discharge (cfs)
1968	Mar. 21, 1968	19.01	28,400
1969	May 9, 1969	21.20	35,700
1970	Dec. 30, 1970	16.65	21,300
1971	Sept. 2, 1971	12.66	11,400
1972	Oct. 20, 1971	13.05	12,200
1973	Apr. 23, 1973	13.61	13,600
1974	Oct. 15, 1973	11.94	9,190
1975	Nov. 1, 1974	25.42	46,800

Reference: "Bulletin 6311, Floods in Texas, Magnitude and Frequency of Peak Floods", Texas Water Commission in 1963.

"Geological Survey Water Supply Paper 1682, Magnitude and Frequency of Floods in the United States", Part 8, U.S. Geological Survey.

"Geological Survey Water Supply Paper 1922, Surface Water Supply of the United States 1961-65", Part 8, Volume 1, U.S. Geological Survey.

"Water Resources Data for Texas", Part 1, Surface Water Records, U.S. Geological Survey, annual publications, water years 1966-70.

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a) Peak flood level of record (Elevation 601.69 feet). Peak flood occurred in 1876; no data are available for this flood.

TABLE 2.4-8
ANNUAL FLOODS AT GAGING STATION 8-0917 ON PANTER BRANCH OF SQUAW CREEK

Location[(a)] -- 4.6 miles southeast of Tolar at culvert on State Highway 51.

Catchment area. -- 7.82 sq. mi.

Type of gage. --Crest --Stage

Water Year	Date	Max. Discharge (cfs)
1966	April 29, 1966	880
1967	May 20, 1967	1,650
1968	May 9, 1968	3,800
1969	May 7, 1969	610

Reference: "Flood Stages and Discharges for Small Streams in Texas" by E. E. Schroeder, a U.S. Geological Survey Texas District Open-File Report.

a) Location shown on Figure 2.4-1.

TABLE 2.4-9
ANNUAL FLOODS AT GAGING STATION 08091750 ON SQUAW CREEK NEAR GLEN ROSE

Location - Lat. 32°16'12", long. 97°43'56", Somervell County, on left bank at downstream side of bridge on State Highway 144, 2.1 miles upstream from mouth, and 2.8 miles northeast of Glen Rose

Catchment Area - 62.5 $mi.^2$

Type of Gage - Water-stape recorder. Datum of gage is 569.02 ft. above sea level.

Water Year	Date	Max. Discharge (cfs)
1974	October 12, 1973	730
1975	April 8, 1975	9,030

Reference: U.S. Geological Survey.

TABLE 2.4-10
ANNUAL FLOODS AT GAGING STATION 8-0915 ON PALUXY RIVER NEAR GLEN ROSE

(Sheet 1 of 2)

Location. -- On left bank of Paluxy River at downstream side of pier of bridge on U.S. Highway 67, 1 mile upstream from Cross Branch, 1.2 miles southwest of Glen Rose, Somervell County, and 4.7 miles upstream from the mouth.

Catchment area. -- 410 sq. mi.

Gage. -- Nonrecording at site 1.8 miles downstream at datum 13.62 ft. lower prior to May 14, 1947; recording thereafter. Datum of gage is 609.66 ft. above mean sea level, datum of 1929, Fort Worth supplementary adjustment of 1942.

Stage-discharge relation. -- Defined by current-meter measurements below 150 cfs 1923-25; defined by current-meter measurements below 32,000 cfs and extended to 59,000 cfs by logarithmic plotting subsequent to May, 1947.

Historical Data. -- Flood of April 17, 1908, was the greatest since at least 1877, from information by local resident.

Average Discharge. -- 70.8 cfs

Water Year	Date	Gage Height (Feet)	Discharge (cfs)
1908	Apr. 17, 1908	27.2 Est.[(a)]	59,000 est.
1919	Nov. , 1918	26	53,000
1922	May 21, 1922	26	53,000
1947	Sept. 15, 1947	7.16	2,580
1948	Feb. 25, 1948	13.92	11,000
1949	May 17, 1949	25.1	48,500
1950	Oct. 24, 1949	9.18	4,570
1951	June 3, 1951	8.80	4,130
1952	May 23, 1952	22.3	36,200
1953	May 15, 1953	8.64	3,930
1954	April 12, 1954	10.0	5,510
1955	May 19, 1955	22.5	37,000
1956	May 1, 1956	16.6	17,300
1957	Apr. 26, 1957	24.12	44,000
1958	July 6, 1958	9.5	4,900
1959	Apr. 19, 1959	8.22	3,530

TABLE 2.4-10
ANNUAL FLOODS AT GAGING STATION 8-0915 ON PALUXY RIVER NEAR GLEN ROSE

(Sheet 2 of 2)

Water Year	Date	Gage Height (Feet)	Discharge (cfs)
1960	Oct. 4, 1959	25.4	50,000
1961	July 17, 1961	8.63	4,100
1962	Oct. 9, 1961	17.48	19,800
1963	Oct. 8, 1962	18.23	21,900
1964	Apr. 21, 1964	13.13	9,960
1965	May 10, 1965	12.79	9,480
1966	Apr. 30, 1966	12.38	8,840
1967	July 19, 1967	11.39	7,240
1968	May 20, 1968	15.92	15,500
1969	Apr. 17, 1969	14.05	12,700
1970	Oct. 12, 1970	11.97	8,150
1971	May 29, 1971	8.14	3,740
1972	Oct. 19, 1971	14.49	12,500
1973	Apr. 24, 1973	19.05	24,600
1974	Sept. 20, 1974	7.09	2,820
1975	Oct. 31, 1974	10.75	6,450

References: Same as for Table 2.4-7.

a) Maximum flood, since 1877 (based upon information from local resident), corresponding to Elevation 637 feet

TABLE 2.4-11
SQUAW CREEK RESERVOIR PROBABLE MAXIMUM FLOOD

(Sheet 1 of 2)

Hours	Probable Maximum Storm Rainfall (Inches)	Losses (Inches)	Rainfall Excess (Inches)	Probable Maximum Flood Hydrograph (cfs)	Probable Maximum Flood Hydrograph (ac-ft)	Rainfall on Reservoir (ac-ft)	Cumulative Inflow (ac-ft)
3	.5	.5	.0	0	0	158	158
6	.5	.3	.2	951	118	158	434
9	.6	.3	.3	2,358	410	189	1,033
12	.7	.3	.4	3,774	760	221	2,014
15	.8	.3	.5	5,140	1,105	253	3,372
18	.8	.3	.5	6,002	1,382	253	5,007
21	.9	.3	.6	6,864	1,595	284	6,886
24	.9	.3	.6	7,473	1,778	284	8,948
27	2.3	.3	2.0	14,424	2,585	726	12,259
30	5.5	.3	5.2	34,370	5,665	1,737	19,661
33	20.0	.3	19.7	121,907	14,958	6,317	40,936
36	3.5	.3	3.2	142,576	33,962	1,105	76,003
39	.6	.3	.3	66,914	25,258	189	101,450

TABLE 2.4-11
SQUAW CREEK RESERVOIR PROBABLE MAXIMUM FLOOD

(Sheet 2 of 2)

Hours	Probable Maximum Storm Rainfall (Inches)	Losses (Inches)	Rainfall Excess (Inches)	Probable Maximum Flood Hydrograph (cfs)	Probable Maximum Flood Hydrograph (ac-ft)	Rainfall on Reservoir (ac-ft)	Cumulative Inflow (ac-ft)
42	.5	.3	.2	21,545	10,402	158	112,010
45	.5	.3	.2	7,796	3,281	158	115,449
48	.5	.3	.2	4,079	1,389	158	116,996
51				2,118	768		117,764
54				907	375		118,139
57				329	153		118,292
60				115	55		118,347
63				40	19		118,366
66				15	7		118,373
69				4	2		118,375
72				2	1		118,376
Totals:	39.1	5.0	34.1				

TABLE 2.4-12
COMPARISON OF PROBABLE MAXIMUM PRECIPITATION MAXIMUM RECORDED RAINFALL AND MAXIMUM RAINFALL LIKELY TO OCCUR AT SELECTED GAGING STATIONS NEAR CPNPP

Station	Period of Record Analyzed	PMP[a] (Inches)	Maximum Recorded in 24 Hours (Inches)	Maximum Likely to Occur in 24 Hours[b] (Inches)
Iredell	1964-1971	39.5	4.45	22.4
Kopperl	1952-1971	39.5	4.90	20.2
Rainbow	1936-1971	39.5	6.00	23.6
Stephenville	1952-1971	39.5	7.75	29.6

a) 24-hour point PMP as obtained from HMR #33 (Reference 9) is approximately 39.5 inches for all gaging stations. 24-hour point rainfall was converted to 48-hour 64-square mile rainfall (38.7 inches) for PMF determination.

b) 24-hour maximum rainfall likely to occur as computed through use of a statistical envelope technique developed by Hershfield (Reference 11).

TABLE 2.4-13
UNIT HYDROGRAPH CHARACTERISTICS

		Lower SCR Catchment	Upper SCR Catchment (Except Maximum Six Hours)	Upper SCR Catchment (During Maximum Six Hours)
1.	A (Sq. Mi.)	20.3	38.0	38.0
2.	L (Mi.)	4.4[(a)]	13.1	13.1
3.	Lca (Mi.)	2.7[(a)]	6.0	6.0
4.	$(LLca)^{.3}$	2.1[(a)]	3.7	3.7
5.	C_t	.6	11.1	1.1
6.	$t_p=C_t(LLca)^{.3}$ (hours)	1.26	4.07	4.07
7.	$t_a=t_p/5.5$ (hours)	.23	.74	.74
8.	t_r (hours)	3.00	3.00	3.00
9.	$t_{pr}=t_p+.25(t_r-t_a)$ (hours)	1.95	4.64	4.64
10.	$t_{pr}+.5t_r$ (hours)	3.45	6.14	6.14
11.	C_p640	420	440	440 x 1.3[(b)]
12.	$\frac{Q_{pr} = C_p640xA}{t_{pr}(cfs)}$	4,370	3,600	4,680[(b)]

a) Typical values for adjoining areas.

b) For the most intense 6-hour rainfall period, the unitgraph ordinate is increased by 30 percent of the Upper SCR Catchment.

TABLE 2.4-14
COINCIDENT WIND WAVE ACTIVITIES

WIND & WAVE CHARACTERISTICS	PMF (elev. 789.7) and 40 mph Overland Wind			10 Year Return Period Flood (elev. 778.1) and PMW (81 mph Overland Wind)		
	PLANT SITE	SQUAW CREEK DAM	SAFE SHUTDOWN IMPOUNDMENT	PLANT SITE	SQUAW CREEK DAM	SAFE SHUTDOWN IMPOUNDMENT
Effective Fetch	1.25 mi	1.28 mi	0.36 mi	1.25 mi	1.28 mi	0.36 mi
Average Depth	88 ft.	88 ft.	68 ft.	78 ft.	78 ft.	58 ft.
Wind Ratio	1.155	1.18	1.05	1.155	1.158	1.05
Set-up	0.04 ft.	0.06 ft.	0.01 ft.	0.20 ft.	0.21 ft.	0.06 ft.
Significant Wave	2.25 ft.	2.5 ft.	1.1 ft.	4.7 ft.	4.8 ft.	2.3 ft.
Maximum Wave	3.76 ft.	4.17 ft.	1.84 ft.	7.85 ft.	8.01 ft.	3.84 ft.
Wave Period	2.8 sec.	3.0 sec.	1.9 sec.	3.8 sed.	3.85 sec.	2.6 sec.
Wave Length	40.14 ft.	46.1 ft.	18.48 ft.	74.71 ft.	75.9 ft.	34.6 ft.
Wave Steepness	0.094	0.09	0.1	0.105	0.106	0.11
Relative Runup	1.3 (Smooth 1:3 Slope)	0.95 (rip-rap 1:2 Slope)	0.85 (rip-rap 1:2 1/2 Slope)	1.3 (Smooth 1:3 Slope)	0.85 (rip-rap 1:2 Slope)	0.85 (rip-rap 1:2 1/2 Slope)
Runup	4.9 ft.	3.96 ft.	1.56 ft.	10.20 ft.	6.81 ft.	3.26 ft.
Runup + Setup	5.0 ft.	4.0 ft.	1.6 ft.	10.40 ft.	7.0 ft.	3.3 ft.
Elevation Reached	794.7 ft.	793.7 ft.	791.3 ft.	788.5 ft.	785.1 ft.	781.4 ft.

TABLE 2.4-15
SAFE SHUTDOWN IMPOUNDMENT PROBABLE MAXIMUM FLOOD

(Sheet 1 of 2)

Time in Hours	Incremental Rainfall (Inches)	Incremental Rainfall Excess (Inches)	PMF Hydrograph (cfs)	PMF Hydrograph (ac-ft)	Rainfall on SSI Surface (ac-ft)	Cumulative Inflow (ac-ft)	SSI Surface Elevation	SSI Spillway Flow (cfs)
3	.5	.0	0	0	1	1	775.0	0
6	.5	.2	111	14	2	17	775.3	60
9	.6	.3	200	39	2	58	775.5	130
12	.7	.4	285	60	3	121	775.7	200
15	.8	.5	354	79	3	203	776.0	270
18	.8	.5	368	89	3	295	776.5	320
21	.9	.6	431	99	3	397	777.0	350
24	.9	.6	442	108	4	509	777.5	370
25	.6	.5	504	39	4	552	777.8	380
26	.8	.7	851	55	4	611	778.1	380
27	1.2	1.1	1,311	88	4	703	778.6	830
28	2.2	2.1	2,103	140	10	853	779.3	1,900
29	2.6	2.5	3,586	231	11	1,095	780.3	3,000
30	2.9	2.8	4,683	340	11	1,446	781.5	4,200
30-1/2	2.4	2.35	5,151	203	10	1,659	782.1	4,600
31	2.6	2.55	5,883	227	11	1,897	782.9	4,900
31-1/2	5.9	5.85	7,451	275	25	2,197	784.2	6,200
32	9.3	9.25	10,079	361	40	2,598	785.5	8,400

TABLE 2.4-15
SAFE SHUTDOWN IMPOUNDMENT PROBABLE MAXIMUM FLOOD

(Sheet 2 of 2)

			PMF Hydrograph					
Time in Hours	Incremental Rainfall (Inches)	Incremental Rainfall Excess (Inches)	(cfs)	(ac-ft)	Rainfall on SSI Surface (ac-ft)	Cumulative Inflow (ac-ft)	SSI Surface Elevation	SSI Spillway Flow (cfs)
32-1/2	1.6	1.55	15,828	526	7	3,131	787.5	11,600
33	1.5	1.45	20,849	799	6	3,936	790.1	17,600
33-1/2	1.0	.95	17,310	798	4	4,738	790.5	18,400
34	.9	.85	13,321	633	4	5,375	789.8	15,400
34-1/2	.7	.65	10,124	483	3	5,861	789.2	10,200
35	.4	.35	7,783	370	2	6,233	789.5	7,200
35-1/2	.3	.25	6,107	285	1	6,519	789.7	5,600
36	.2	.15	4,787	225	1	6,745	789.8	4,600
37	.2	.1	2,832	314	1	7,060	789.7	3,500
38	.2	.1	1,538	178	1	7,239	789.2	2,000
39	.2	.1	838	97	1	7,337	788.5	1,500
42	.5	.2	178	101	2	7,440	786.4	600
45	.5	.2	145	40	2	7,482	784.9	300
48	.5	.2	146	36	1	7,519	783.9	100
51	.0	.0	28	22		7,541	783.3	100
54	.0	.0	3	4		7,545	782.9	100
	44.9	39.9						

TABLE 2.4-16
UNIT HYDROGRAPH CHARACTERISTICS FOR THE PANTHER BRANCH WATERSHED ABOVE THE SAFE SHUTDOWN IMPOUNDMENT

1. A = 3.47 Square Miles
2. L = 4.15 Miles
3. L_{ca} = 2.05 Miles
4. $(LL_{ca})^{.3}$ = 1.90
5. C_t = .6
6. $t_p = C_t(LL_{ca})^{.3}$ = 1.14 Hours
7. $t_r = t_p/5.5$ = .21 Hour
8. t_R = .5 Hour
9. $t_{pR} = t_p + .25(t_R - t_r)$ = 1.21 Hours
10. $t_{pR} = .5t_R$ = 1.46 Hours
11. C_p640 = 420
12. $Q_{pR} = C_p640 \times A / t_{pR}$ = 1,200 cfs
13. $q_{pR} = C_p640/t_{pR}$ = 347 cfs per Square Mile
14. W-50 = 1.4 Hours
15. W-75 = .8 Hour

TABLE 2.4-17
SQUAW CREEK RESERVOIR AREA AND CAPACITY CHARACTERISTICS

(Sheet 1 of 3)

Elev.	0	1	2	3	4	5	6	7	8	9	
650	-	-	-	-	-	0	5	11	17	22	Acres
	-	-	-	-	-	0	3	11	25	45	Ac-ft
660	28	34	38	43	51	59	69	79	91	104	Acres
	70	101	137	177	224	279	343	417	502	599	Ac-ft
670	118	132	146	158	172	188	204	216	232	250	Acres
	710	835	974	1,126	1,291	1,471	1,667	1,877	2,101	2,342	Ac-ft
680	268	292	316	344	368	396	420	448	472	500	Acres
	2,601	2,881	3,185	3,515	3,871	4,253	4,661	5,095	5,555	6,041	Ac-ft
690	524	536	548	562	573	586	598	611	624	637	Acres
	6,553	7,083	7,625	8,180	8,748	9,328	9,920	10,525	11,143	11,773	Ac-ft

TABLE 2.4-17
SQUAW CREEK RESERVOIR AREA AND CAPACITY CHARACTERISTICS

(Sheet 2 of 3)

Elev.	0	1	2	3	4	5	6	7	8	9	
700	652	670	691	712	733	755	776	797	820	842	Acres
	12,417	13,078	13,758	14,460	15,182	15,926	16,692	17,478	18,286	19,117	Ac-ft
710	866	892	924	956	988	1,018	1,050	1,081	1,114	1,147	Acres
	19,971	20,850	21,758	22,698	23,670	24,673	25,707	26,773	27,871	29,002	Ac-ft
720	1,180	1,210	1,244	1,276	1,310	1,344	1,378	1,414	1,447	1,482	Acres
	30,165	31,360	32,587	33,847	35,140	36,467	37,828	39,224	40,655	42,120	Ac-ft
730	1,516	1,554	1,592	1,630	1,967	1,705	1,743	1,781	1,819	1,857	Acres
	43,619	45,154	46,727	48,338	49,985	51,672	53,396	55,158	56,958	58,796	Ac-ft
740	1,895	1,933	1,969	2,007	2,044	2,080	2,117	2,154	2,192	2,230	Acres
	60,672	62,586	64,537	66,525	68,551	70,613	72,712	74,848	77,021	79,232	Ac-ft
750	2,268	2,308	2,348	2,390	2,431	2,473	2,516	2,558	2,600	2,642	Acres
	81,481	83,769	86,097	88,466	90,876	93,328	95,822	98,359	100,938	103,559	Ac-ft

TABLE 2.4-17
SQUAW CREEK RESERVOIR AREA AND CAPACITY CHARACTERISTICS

(Sheet 3 of 3)

Elev.	0	1	2	3	4	5	6	7	8	9	
760	2,684	2,724	2,764	2,803	2,843	2,884	2,924	2,964	3,004	3,045	Acres
	106,222	108,926	11,670	114,454	117,277	120,141	123,045	125,989	128,973	131,998	Ac-ft
770	3,084	3,122	3,162	3,195	3,234	3,272	3,308	3,329	3,354	3,380	Acres
	135,062	138,165	141,307	144,485	147,700	150,953	154,243	157,562	160,903	164,270	Ac-ft
780	3,411	3,445	3,489	3,534	3,578	3,624	3,672	3,722	3,772	3,823	Acres
	165,665	171,093	174,560	178,072	181,628	185,229	188,877	192,574	196,321	200,119	Ac-ft
790	3,874	3,925	3,976	4,030	4,079	4,130	4,082	4,235	4,286	4,339	Acres
	203,967	207,867	211,818	215,821	219,875	223,980	228,136	232,345	236,606	240,919	Ac-ft
800	4,391	-	-	-	-	-	-	-	-	-	Acres
	245,284	-	-	-	-	-	-	-	-	-	Ac-ft

<u>Note</u>: Based on sedimentation survey range sestablished pursuant to the requirements of the Texas Water Rights Commission.

TABLE 2.4-18
SAFE SHUTDOWN IMPOUNDMENT AREA AND CAPACITY CHARACTERISTICS

Elev.	0	1	2	3	4	5	6	7	8	9	
730	-	-	-	-	-	-	0.0	0.1	0.2	0.4	Acres
	-	-	-	-	-	-	0.0	0.0	0.2	0.5	5Ac-ft
740	0.7	1.1	1.6	2.2	2.8	3.4	4.0	4.6	5.2	5.9	Acres
	1	2	3	5	8	11	15	19	24	29	Ac-ft
750	6.6	7.4	8.2	9.1	10.0	11.0	12.1	13.2	14.3	15.5	Acres
	36	43	50	59	69	79	91	103	117	132	Ac-ft
760	16.7	17.9	19.2	20.5	21.8	23.2	24.7	26.2	27.7	29.2	Acres
	148	165	184	204	225	247	271	297	324	352	Ac-ft
770	30.8	32.5	34.3	36.1	37.9	39.8	41.7	43.6	45.6	47.6	Acres
	382	414	447	482	519	558	599	642	686	733	Ac-ft
780	49.7	51.8	53.9	56.0	58.1	60.3	62.5	64.8	67.1	69.4	Acres
	781	832	885	940	997	1,056	1,118	1,181	1,247	1,316	Ac-ft
790	71.7	-	-	-	-	-	-	-	-	-	Acres
	1,386	-	-	-	-	-	-	-	-	-	Ac-Ft.

TABLE 2.4-19
PREDICTED AREA AND CAPACITY CHARACTERISTICS OF THE SAFE SHUTDOWN IMPOUNDMENT AFTER FORTY YEARS OF SEDIMENTATION

Elev	0	1	2	3	4	5	6	7	8	9	
740					0	0.5	1.1	1.7	2.3	3.0	Acres
					0	0.3	1	2	4	6	Ac-Ft
750	3.7	4.5	5.3	6.2	7.1	8.1	9.2	10.3	11.4	12.6	Acres
	9	13.1	18.0	24	30	38	46	56	67	79	Ac-ft
760	13.8	15.0	16.3	17.6	18.9	20.3	21.8	23.3	24.8	26.3	Acres
	92	107	122	139	157	177	198	220	244	270	Ac-ft
770	27.9	30.5	33.1	35.4	37.8	39.8	41.7	43.6	45.6	47.6	Acres
	297	325	357	391	428	467	508	550	595	642	Ac-ft
780	49.7	51.8	53.9	56.0	58.1	60.3	62.5	64.8	67.1	69.4	Acres
	690	741	794	849	906	965	1027	1090	1156	1225	Ac-ft
790	71.7										Acres
	1295										Ac-ft

TABLE 2.4-20
CONCENTRATIONS OF RADIONUCLIDES IN POSTULATED ACCIDENTAL RELEASE[a]

(Sheet 1 of 3)

Isotope	Floor Drain Tank Concentration uCi/cc	Half Life (Year)
Br-83	5.4-3	2.73-4
Br-84	3.0-3	6.05-5
Br-85	3.4-4	5.45-6
I-130	2.3-3	1.41-3
I-131	2.8-1	2.20-2
I-132	1.1-1	2.63-4
I-133	4.0-1	2.37-3
I-134	5.3-2	9.99-5
I-135	2.1-1	7.55-4
Rb-86	8.9-5	5.11-2
Rb-88	2.3-1	3.39-5
Sr-89	3.6-4	1.38-1
Sr-90	1.0-5	2.92+1
Sr-91	7.0-4	1.08-3
Y-90	1.2-6	7.30-3
Y-91M	4.1-4	9.47-5
Y-91	6.5-5	1.60-1
Y-93	3.7-5	1.15-3
Zr-95	6.1-5	1.76-1
Nb-95	5.1-5	9.64-2
Mo-99	8.7-2	7.53-3

TABLE 2.4-20
CONCENTRATIONS OF RADIONUCLIDES IN POSTULATED ACCIDENTAL RELEASE[(a)]

(Sheet 2 of 3)

Isotope	Floor Drain Tank Concentration uCi/cc	Half Life (Year)
Tc-99M	5.2-2	6.87-4
Ru-103	4.6-5	1.08-1
Ru-106	1.0-5	1.01+0
Rh-103M	5.1-5	1.07-4
Rh-106	1.1-5	9.47-7
Te-125M	2.9-5	1.59-1
Te-127M	2.8-4	2.99-1
Te-127	9.2-4	1.07-3
Te-129M	1.4-3	9.20-2
Te-129	1.8-3	1.32-4
Te-131M	2.6-3	3.42-3
Te-131	1.2-3	4.76-5
Te-132	2.8-2	8.93-3
Cs-134	2.6-2	2.05+0
Cs-136	1.4-2	3.59-2
Cs-137	1.9-2	3.00+1
Ba-137M	1.8-2	4.85-6
Ba-140	2.2-4	3.51-2
La-140	1.6-4	4.59-3
Ce-141	7.1-5	8.90-2
Ce-143	4.2-5	3.76-3

TABLE 2.4-20
CONCENTRATIONS OF RADIONUCLIDES IN POSTULATED ACCIDENTAL RELEASE[(a)]

(Sheet 3 of 3)

Isotope	Floor Drain Tank Concentration uCi/cc	Half Life (Year)
Ce-144	3.3-5	7.79-1
Pr-143	5.1-5	3.72-2
Pr-144	3.8-5	3.29-5
H-3	1.0+0	1.23+1
Cr-51	1.9-3	7.58-2
Mn-54	3.1-4	8.55-1
Fe-55	1.6-3	2.60+0
Fe-59	1.0-3	1.23-1
Co-58	1.6-2	1.95-1
Co-60	2.0-3	5.27+0
Np-239	1.2-3	6.45-3

a) Note: 5.4-3 = 5.4×10^{-3}

TABLE 2.4-20A
CONCENTRATIONS OF RADIONUCLIDES IN POSTULATED ACCIDENTAL RELEASE[(a)]

(Sheet 1 of 2)

Radionuclide	Release (Curies)	Half Life (Years)
H-3	3.18 E+2	1.23 E+1
Br-84	3.91 E+0	6.10 E-5
Rb-88	3.36 E+2	3.40 E-5
RB-89	9.99 E+0	3.00 E-5
Sr-89	3.00 E-1	1.40 E-1
Sr-90	1.54 E-2	2.60 E+1
Sr-91	1.73 E-1	1.10 E-3
Sr-92	6.72 E-2	2.97 E-4
Y-90	1.82 E-2	7.33 E-3
Y-91	5.54 E-1	1.61 E-1
Y-92	6.54 E-2	4.11 E-4
Zr-95	6.36 E-2	1.78 E-1
Nb-95	6.27 E-2	9.59 E-2
Mo-99	4.81 E+2	7.64 E-3
I-131	2.27 E+2	2.20 E-2
I-132	8.18 E+1	2.62 E-4
I-133	3.63 E+2	2.40 E-3
I-134	5.45 E+1	9.99 E-5
I-135	2.00 E+2	7.64 E-4
Te-132	2.36 E+1	8.90 E-3
Te-134	2.63 E+0	8.00 E-5
Cs-134	2.73 E+1	2.05 E+0

TABLE 2.4-20A
CONCENTRATIONS OF RADIONUCLIDES IN POSTULATED ACCIDENTAL RELEASE[a]

(Sheet 2 of 2)

Radionuclide	Release (Curies)	Half Life (Years)
Cs-136	1.36 E+1	3.56 E-2
Cs-137	1.36 E+2	3.01 E+1
Cs-138	8.90 E+1	6.10 E-5
Ba-140	3.91 E-1	3.51 E-2
La-140	1.36 E-1	4.60 E-3
Ce-144	3.09 E-2	7.78 E-1
Pr-144	3.09 E-2	3.30 E-5
Cr-51	8.64 E-2	7.62 E-2
Mn-54	7.18 E-2	8.30 E-1
Mn-56	2.73 E+0	3.00 E-4
Co-58	2.36 E+0	1.95 E-1
Co-60	6.99 E-2	5.26 E+0
Fe-59	1.00 E-2	1.24 E-1

a) E-5 = 10^{-5}

TABLE 2.4-21
MAXIMUM CONCENTRATIONS IN SURFACE WATER DUE TO POSTULATED RELEASES FROM THE LIQUID RADIOACTIVE WASTE STORAGE TANK

(Sheet 1 of 3)

Concentration in Squaw Creek Reservoir (uCi/cc) Based on Time After Tank Rupture

Isotope	Instantaneous	One Day	One Month	One Year
Br-83	2.94-09[(a)]	2.78-12	0.00+00	0.00+00
Br-84	1.64-09	3.92-23	0.00+00	0.00+00
Br-85	1.85-10	0.00+00	0.00+00	0.00+00
I-129	0.00+00	4.03-20	7.39-19	1.58-18
I-130	1.25-09	3.26-10	3.45-27	0.00+00
I-131	1.53-07	1.40-07	1.15-08	3.28-21
I-132	6.00-08	1.28-08	2.68-11	3.20-42
I-133	2.18-07	9.80-08	8.22-18	0.00+00
I-134	2.89-08	1.61-16	0.00+00	0.00+00
I-135	1.15-07	9.27-09	2.00-40	0.00+00
Rb-86	4.85-11	4.68-11	1.59-11	6.26-17
Rb-88	1.25-07	5.57-32	0.00+00	0.00+00
Sr-89	1.96-10	1.94-10	1.30-10	1.30-12
Sr-90	5.45-12	5.45-12	5.44-12	5.32-12
Sr-91	3.82-10	6.61-11	5.37-33	0.00+00
Y-90	6.54-13	1.75-12	5.44-12	5.33-12
Y-91M	2.24-10	4.20-11	3.42-33	0.00+00
Y-91	3.54-11	3.73-11	2.68-11	5.07-13
Y-93	2.02-11	3.87-12	6.37-33	0.00+00
Zr-95	3.33-11	3.29-11	2.41-11	6.46-13
Nb-95M	0.00+00	4.04-14	1.78-13	4.79-15

TABLE 2.4-21
MAXIMUM CONCENTRATIONS IN SURFACE WATER DUE TO POSTULATED RELEASES FROM THE LIQUID RADIOACTIVE WASTE STORAGE TANK

(Sheet 2 of 3)

Concentration in Squaw Creek Reservoir (uCi/cc) Based on Time After Tank Rupture

Isotope	Instantaneous	One Day	One Month	One Year
Nb-95	2.78-11	2.79-11	2.79-11	1.40-12
Mo-99	4.74-08	3.69-08	2.45-11	4.83-48
Tc-99M	2.84-08	3.44-08	2.36-11	4.66-48
Ru-103	2.51-11	2.46-11	1.48-11	4.03-14
Ru-106	5.45-12	5.44-12	5.15-12	2.74-12
Rh-103M	2.78-11	2.22-11	1.33-11	3.64-14
Rh-106	6.00-12	5.44-12	5.15-12	2.74-12
Te-125M	1.58-11	1.56-11	1.11-11	2.04-13
Te-127M	1.53-10	1.52-10	1.26-10	1.50-11
Te-127	5.02-10	2.11-10	1.27-10	1.50-11
Te-129M	7.63-10	7.48-10	4.11-10	4.07-13
Te-129	9.82-10	4.87-10	2.67-10	2.65-13
Te-131M	1.42-09	8.14-10	8.41-17	0.00+00
Te-131	6.54-10	1.82-10	1.88-17	0.00+00
Te-132	1.53-08	1.23-08	2.60-11	3.10-42
Cs-134	1.42-08	1.42-08	1.38-08	1.01-08
Cs-136	7.63-09	7.24-09	1.56-09	3.17-17
Cs-137	1.04-08	1.04-08	1.03-08	1.01-08
Ba-137M	9.82-09	9.80-09	9.78-09	9.58-09
Ba-140	1.20-10	1.14-10	2.36-11	3.10-19
La-140	8.72-11	9.72-11	2.72-11	3.57-19

TABLE 2.4-21
MAXIMUM CONCENTRATIONS IN SURFACE WATER DUE TO POSTULATED RELEASES FROM THE LIQUID RADIOACTIVE WASTE STORAGE TANK

(Sheet 3 of 3)

Concentration in Squaw Creek Reservoir (uCi/cc) Based on Time After Tank Rupture

Isotope	Instantaneous	One Day	One Month	One Year
Ce-141	3.87-11	3.79-11	2.04-11	1.60-14
Ce-143	2.29-11	1.38-11	6.11-18	0.00+00
Ce-144	1.80-11	1.80-11	1.67-11	7.39-12
Pr-143	2.78-11	2.73-11	6.57-12	2.45-19
Pr-144	2.07-11	1.80-11	1.67-11	7.39-12
H-3	5.45-07	5.45-07	5.43-07	5.16-07
Cr-51	1.04-09	1.01-09	4.89-10	1.11-13
Mn-54	1.69-10	1.69-10	1.58-10	7.52-11
Fe-55	8.72-10	8.72-10	8.54-10	6.68-10
Fe-59	5.45-10	5.37-10	3.44-10	1.99-12
Co-58	8.72-09	8.64-09	6.51-09	2.47-10
Co-60	1.09-09	1.09-09	1.08-09	9.56-10
Np-239	6.54-10	4.87-10	9.49-14	1.30-56
Pu-239	0.00+00	4.47-17	1.75-16	1.75-16
Total Effluent Concentration Fraction (10CFR20)	0.22	0.19	0.04	0.02

a) Note: 2.94-09 = 2.94×10^{-9}

TABLE 2.4-22
GROUNDWATER CHEMICAL ANALYSES

Well Number[a] Or Location	Silica (SiO_2)	Calcium (Ca)	Magnesium (Mg)	Sodium[a] (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved Solids	Total Hardness $CaCO_3$
9	15	13.5	8.2	142	5.9	372	28.0	35.0	0.2	0.2	620	67.5
11	15	16.9	7.2	161	6.0	360	56.0	52.5	0.4	0.2	675	71.7
13	15	13.5	10.3	173	6.0	302	61.3	105	0.4	0.1	686	75.9
14	15	18.6	9.5	194	7.5	354	74.9	105	0.4	0.1	779	85.3
37	15	16.9	7.2	204	6.8	250	90.1	158	1.0	0.05	749	71.1
39	15	11.8	5.1	170	5.5	400	25.5	52.5	0.3	0.01	504	50.4
42	10	11.8	8.2	201	6.7	326	64.2	123	0.4	0.07	751	63.1
48	15	107	8.2	84	1.9	363	36.2	105	0.3	0.5	721	301
City of Glen Rose	--	21	18	107	--	390	21.0	17.0	0.3	0.4	377	129
State Well 3259501 5 miles East of Walnut Springs (Paluxy Aquifer)	13	46	29	60	--	379	17.0	22.0	0.1	6.8	386	234

a) See Table 2.4-25

Values are milligrams per liter

TABLE 2.4-23
ESTIMATED WATER USAGE AT CPNPP[(a)]

	Annual Usage (gallons)	Avg. Annual flow (gpm)	Max. Daily flow (gpm)
Makeup water required	55,713,600	106	305
Potable and Sanitary	11,037,600	21	25
Total water required	66,751,200	127	330

a) To be supplied by water wells or surface water pre-treatment system or both.

TABLE 2.4-24
PUBLIC SUPPLY, INDUSTRIAL AND IRRIGATION WELLS, 0-20 MILES

(Sheet 1 of 2)

Well Number[a]	Piezometric Elevation (ft) and Date		Yield (gpm)	Drawdown[b] (feet)	Use[c]	
1	701	3/15/68	100	90	PS	City of Walnut Springs
2	-	--	135	90	PS	City of Walnut Springs
3	628	8/24/66	-	110	Irr	James Smith
4	890	10/14/65	69	0	Irr	Lee Manning
5	974	3/27/69	150	0	Irr	J. W. Waldie
6	992	10/14/65	150	0	Irr	J. W. Waldie
7	-	--	550	0	Irr	Triangle Ranch
8	-	--	-	0	Irr	Triangle Ranch
9	845	10/26/65	120	0	Irr	Stanley Allen
10	834	3/27/69	46	0	Irr	Stanley Allen
11	868	3/26/69	-	30	Irr	E. L. Huffman
12	855	10/15/65	-	30	Irr	E. L. Huffman
13	615	9/13/60	-	40	Irr	Roy Kenedy
14	620	1960	614	100	PS	City of Glen Rose
15	627	9/21/60	250	100	PS	City of Glen Rose

TABLE 2.4-24
PUBLIC SUPPLY, INDUSTRIAL AND IRRIGATION WELLS, 0-20 MILES

(Sheet 2 of 2)

Well Number[a]	Piezometric Elevation (ft) and Date		Yield (gpm)	Drawdown[b] (feet)	Use[c]	
16	620	6/19/30	50	100	PS	Young Women's Christian Ass.
17	611	9/14/60	-	90	Irr	Squaw Creek Cemetery Ass.
18	508	7/20/66	222	190	Ind	Texas Lime Company
19	575	9/15/60	100	140	Ind	Texas Cedar Oil Company
20	481	6/06/68	-	210	PS	U.S. Army Corps of Engineers
21	-	--	-	0	PS	City of Tolar
22	-	--	-	0	PS	City of Tolar
23	-	--	65	0	Irr	City of Granbury (9 wells)
24	-	--	-	25	Irr	L. L. Williams
25	-	--	-	100	PS	Camp El Jesom

a) Well locations are shown on Figure 2.4-33.

b) Estimated drawdown, based on original static, piezometric level, before 1900.

c) Use: Ind, Industrial; Irr, Irrigation; PS, Public Supply.

TABLE 2.4-25
LOCAL WATER WELLS

(Sheet 1 of 3)

Well	Owner	Driller	Date Completed	Depth of well (ft)	Casing Diameter (in)	Casing Depth (ft)	Water-bearing Unit	Altitude of land surface (ft)	Water Level Below land surface datum (ft)	Water Level Date of Measure-ment	Method of Lift	Use of Water
1	John Stufflebeme	Morris Pollack	__	__	__	__	Twin Mtn	660	__	__	E	D
2	do well 2	do	__	__	__	__	do	700	__	__	W	S
3	do well 3	do	__	__	6	__	do	825	__	__	C,E	S
4	do well 4	do	__	__	6	__	do	680	__	__	W	S
5	do well 5	do	__	__	6	__	do	760	__	__	W	S
6	do well 6	do	__	__	6	__	do	700	__	__	W	S
7	do well 7	do	__	__	6	__	do	850	__	__	W	S
8	do well 8	do	__	__	6	__	do	690	__	__	W	S
9	Mary Lou Strawn	Morris Pollack	10/68	292 (?)	__	__	do	670	__	__	S,E	D,S
10	-- Miller	__	5/72	201	__	__	do	710	76	5/31/72	S,E	D,S
11	Charles Branham Well 1	Morris Pollack	__	200 (?)	__	__	Twin Mtn	710	__	__	J,E	D,S
12	Unknown	__	__	__	__	__	Twin Mtn	690	__	__	E	S
13	A. H. Weeks	Morris Pollack	8/68	360	4	364.5	Twin Mtn	905	250	8/24/68	S,E	D,S
14	Carlisle Cravens Well 1	__	1920 (?)	138	__	__	Twin Mtn	750	__	__	S,E	D
15	do well 2	__	1950 (?)	320	__	__	Twin Mtn	810	__	__	C,W	S
16	do well 3	__	1920 (?)	320	__	__	Twin Mtn	885	__	__	W	S
17	do well 4	__	1920 (?)	320	__	__	Twin Mtn	915	__	__	W	S
18	do well 5	__	1920 (?)	150	__	__	Twin Mtn	760	__	__	W	S
19	Carlisle Cravens Well 6	__	1920 (?)	320	__	__	Twin Mtn	925	__	__	W	S
20	do well 7	__	do	150	__	__	Twin Mtn	925	__	__	W	S